# ELECTRICAL ENGINEERING EXAM PREP

## *Problems and Solutions*

R. R. GUPTA
J. R. CLAYCOMB

MLI EXAM PREP SERIES

# ELECTRICAL ENGINEERING EXAM PREP

## LICENSE, DISCLAIMER OF LIABILITY, AND LIMITED WARRANTY

# Electrical Engineering Exam Prep

*Problems and Solutions*

**R. R. Gupta**
**James R. Claycomb, PhD**

**MLI Exam Prep Series**
*Sarhan Musa, PhD*
*Prairie View A&M*
*(Series Editor)*

Mercury Learning and Information
Dulles, Virginia
Boston, Massachusetts
New Delhi

Part of the *MLI Exam Prep Series*. S. Musa / Series Editor.

Original Title and Copyright: *Electrical Engineering*. ©2014 by Khanna Publishers. 978-8174092-02-1.



Publisher: David Pallai
Mercury Learning And Information
22841 Quicksilver Drive
Dulles, VA 20166
info@merclearning.com
www.merclearning.com
(800) 232-0223

R. R. Gupta and James R. Claycomb. *Electrical Engineering Exam Prep: Problems and Solutions.*
ISBN: 978-1-68392-112-7



Library of Congress Control Number: 2017915454

192021321 This book is printed on acid-free paper in the United States of America.

# CONTENTS

# 1

# ENGINEERING MATHEMATICS

**1.** $\cos^2\theta$ is equal to

$(a)$ $1+\sin^2\theta$

$(b)$ $\frac{1}{2}(1+\cos 2\theta)$

$(c)$ $\frac{1}{2}(1-\cos 2\theta)$

$(d)$ $\frac{1}{2}(1+\sin 2\theta)$

**2.** $\sin^2\theta$ is equal to

$(a)$ $1+\cos^2\theta$

$(b)$ $\frac{1}{2}(1+\cos 2\theta)$

$(c)$ $\frac{1}{2}(1-\cos 2\theta)$

$(d)$ $\frac{1}{2}(1+\sin 2\theta)$

**3.** $\sin^2\theta+\cos^2\theta$ is equal to

$(a)$ $1$

$(b)$ $-1$

$(c)$ $2\sin\theta\cos\theta$

$(d)$ $-2\sin\theta\cos\theta$

**4.** The area of a trapezoid above is

(a) $ha + hb$

(b) $\frac{1}{2}(a+b)h$

(c) $\frac{1}{2}(b-a)h$

(d) $h\sqrt{a^2+b^2}$

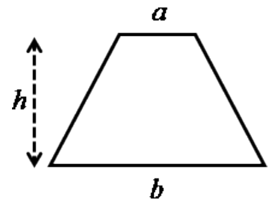


**Fig. Q. 4.**

**5.** $\int_0^{\pi} \cos^2\theta d\theta$ is equal to

(a) $\pi/2$

(b) $0$

(c) $-\pi/2$

(d) $1$

**6.** $\int_0^{\pi} \sin^2\theta d\theta$ is equal to

(a) $\pi/2$

(b) $0$

(c) $-\pi/2$

(d) $1$

**7.** $\int \sin\theta \cos\theta d\theta$ is equal to (plus a constant)

(a) $\frac{1}{2}\sin^2\theta$

(b) $\frac{1}{2}\cos^2\theta$

(c) $\sin^2\theta - 1$

(d) $1-\cos^2\theta$

**8.** Consider a triangle with sides $a$, $b$ and $c$ with $\theta$ between sides $a$ and $b$

(a) $c^2 = a^2 + b^2 - 2ab\cos\theta$

(b) $c^2 = a^2 + b^2 + 2ab\cos\theta$

(c) $c^2 = a^2 + b^2 - 2ab\sin\theta$

(d) $c^2 = a^2 + b^2 + 2ab\sin\theta$

**9.** Given $f(x)$ and $g(x)$ are inverse functions

($a$) $f(g(x)) = g(f(x))$

($b$) $f(g(x)) = x$

($c$) $g(f(x)) = x$

($d$) all the above

**10.** The expression $\ln(e^x)$ is equal to

($a$) $e^{\ln x}$

($b$) $x$

($c$) 1

($d$) Answers ($a$) and ($b$) only

**11.** The log of a product $\ln\left(\prod_i a_i\right)$ is equal to

($a$) $\sum_i \ln a_i$

($b$) $\ln \sum_i a_i$

($c$) Both ($a$) and ($b$)

($d$) Neither ($a$) nor ($b$)

**12.** The equation $\tan x = x$ is

($a$) a transcendental equation

($b$) is solvable graphically or numerically

($c$) is not solvable analytically

($d$) all the above

**13.** The function $f(x) = x \sin x$ is

($a$) an even function

($b$) an odd function

($c$) neither even nor odd

($d$) such that $f(x) = -f(-x)$

**14.** The function $f(x) = x\exp(-x^2)$ is

($a$) an even function
($b$) an odd function
($c$) neither even nor odd
($d$) such that $f(x) = f(-x)$

**15.** The function $f(x) = x^2 - x^3$ is

($a$) an even function
($b$) an odd function
($c$) neither even nor odd
($d$) such that $f(x) = f(-x)$

**16.** The integral $\int_{-\infty}^{\infty} x^6 \exp(-x^2) dx$

($a$) diverges
($b$) is equal to zero
($c$) is equal to $2\int_{0}^{\infty} x^6 \exp(-x^2) dx$
($d$) is equal to $-2\int_{-\infty}^{0} x^6 \exp(-x^2) dx$

**17.** The integral $\int_{-\infty}^{\infty} \sin(x)\exp(-x^2) dx$

($a$) diverges
($b$) is equal to zero
($c$) is equal to $2\int_{0}^{\infty} \sin(x)\exp(-x^2) dx$
($d$) is equal to $-2\int_{-\infty}^{0} \sin(x)\exp(-x^2) dx$

**18.** Given $E(x,t) = A\exp(-\alpha x^2)\sin(\omega t)$ where the units of $E$, $x$, and $t$ are V/m, m, and $s$, respectively. What are the respective units of $A$, $\alpha$, and $\omega$?

(*a*) V/m, 1/m, and 1/s

(*b*) V/m, 1/m$^2$, and 1/s

(*c*) V/m/s, 1/m, and 1/s

(*d*) V/m, dimensionless, and dimensionless

**19.** The solutions to $r^2 + r + 1 = 0$ are

(*a*) both real

(*b*) both imaginary

(*c*) both complex

(*d*) real and imaginary

**20.** Given $r^2 + r + 1 = 0$ the $\mathrm{Im}(r)$ equals

(*a*) $\pm\sqrt{3}/2$

(*b*) $\pm\sqrt{3}j/2$

(*c*) 0

(*d*) $-\mathrm{Re}(r)$

**21.** Given an analytic function $f(z)$ where $z = x + jy$

(*a*) $\mathrm{Re}\, f(z)$ satisfies Laplace's equation

(*b*) $\mathrm{Im}\, f(z)$ satisfies Laplace's equation

(*c*) Both (*a*) and (*b*)

(*d*) Neither (*a*) nor (*b*)

**22.** The integral $\int f(x)dx = g(x) + C$ is

(*a*) a definite integral

(*b*) an indefinite integral

(*c*) such that $g'(x) = f(x)$

(*d*) Answers (*b*) and (*c*)

**23.** The integral $\int \frac{9x^2 - 4x + 5}{3x^3 - 2x^2 + 5x + 2}\, dx$ is best solved

(*a*) by substituting $u = 3x^3 - 2x^2 + 5x + 2$

(*b*) integrating by parts

(*c*) by performing a partial fractions decomposition

(*d*) by performing a trigonometric substitution

**24.** The integral $\int_{-1}^{1} x \exp\left(-x^2\right) dx$ is

(*a*) a definite integral

(*b*) an indefinite integral

(*c*) equal to zero

(*d*) answers (*a*) and (*c*)

**25.** The derivative $\frac{d}{dx} \ln f(x)$ for $f(x) > 0$ is

(*a*) $e^{f(x)}$

(*b*) $f(x)/f'(x)$

(*c*) $f'(x)/f(x)$

(*d*) $-\frac{1}{2} f^2(x)$

**26.** $\frac{d}{dx} \ln \sin(ax)$

(*a*) $e^{\sin(x)}$

(*b*) $a \cot(ax)$

(*c*) $\tan(ax)/a$

(*d*) $-\frac{1}{2} \sin^2(ax)$

**27.** The integral $\int e^{\sin(x)} \cos(x)\, dx$ is best solved by

(*a*) substituting $u = \cos(x)$

(*b*) substituting $u = \sin(x)$

(*c*) parts

(*d*) using a numerical method with trial limits

**28.** The dot product $(\mathbf{A}-\mathbf{B})\cdot(\mathbf{A}-\mathbf{B})$ where the angle between $\mathbf{A}$ and $\mathbf{B}$ is $\theta$

(*a*) $A^2+B^2-2AB\cos\theta$

(*b*) $A^2+B^2$ if $\mathbf{A}$ and $\mathbf{B}$ are orthogonal

(*c*) $A^2-B^2$

(*d*) answers (*a*) and (*b*)

**29.** The magnitude of the vector $\mathbf{A}=3\hat{\mathbf{i}}-3\hat{\mathbf{j}}$ is

(*a*) 6

(*b*) $9\sqrt{2}$

(*c*) 0

(*d*) $3\sqrt{2}$

**30.** Given the cross product $\mathbf{A}\times\mathbf{B}=\mathbf{C}$ where $\mathbf{C}\neq 0$ then

(*a*) $\mathbf{A}$ is parallel to $\mathbf{B}$

(*b*) both $\mathbf{A}$ and $\mathbf{B}$ are perpendicular to $\mathbf{C}$

(*c*) both $\mathbf{A}$ and $\mathbf{B}$ are parallel to $\mathbf{C}$

(*d*) both (*a*) and (*b*) are true

**31.** Given the dot product $\mathbf{A}\cdot\mathbf{B}=0$

(*a*) $\mathbf{A}$ is antiparallel to $\mathbf{B}$

(*b*) $\mathbf{A}$ and $\mathbf{B}$ are orthogonal

(*c*) $\mathbf{A}=-\mathbf{B}$

(*d*) both answers (*a*) and (*c*) are true

**32.** A unit vector perpendicular to the plane $x+y-z=5$ is

(*a*) $\left(\hat{\mathbf{i}}+\hat{\mathbf{j}}+\hat{\mathbf{k}}\right)/\sqrt{3}$

(*b*) $\left(\hat{\mathbf{i}}+\hat{\mathbf{j}}-\hat{\mathbf{k}}\right)/\sqrt{3}$

(*c*) $\left(\hat{\mathbf{i}}+\hat{\mathbf{j}}+\hat{\mathbf{k}}\right)/\sqrt{5}$

(*d*) $\left(\hat{\mathbf{i}}+\hat{\mathbf{j}}-\hat{\mathbf{k}}\right)/\sqrt{5}$

**33.** Two vectors **A** and **B** are equal if they have the same

(*a*) magnitude

(*b*) direction

(*c*) magnitude and units

(*d*) magnitude, direction, and units

**34.** The matrix product $\begin{pmatrix} 1 & 2 & 3 \end{pmatrix} \begin{pmatrix} a \\ b \\ c \end{pmatrix}$ is equal to

(*a*) $a + 2b + 3c$

(*b*) $6abc$

(*c*) $\begin{pmatrix} a & 2a & 3a \\ b & 2b & 3b \\ c & 2c & 3c \end{pmatrix}$

(*d*) $\begin{pmatrix} a \\ 2b \\ 3c \end{pmatrix}$

**35.** The matrix product $\begin{pmatrix} a \\ b \\ c \end{pmatrix} \begin{pmatrix} 1 & 2 & 3 \end{pmatrix}$

(*a*) $a + 2b + 3c$

(*b*) $6abc$

(*c*) $\begin{pmatrix} a & 2a & 3a \\ b & 2b & 3b \\ c & 2c & 3c \end{pmatrix}$

(*d*) $\begin{pmatrix} 1 & 2a & 3c \end{pmatrix}$

**36.** The trace of a square matrix is

(*a*) the sum of diagonal elements

(*b*) product of diagonal elements

(*c*) determinate of the matrix inverse

(*d*) determinate of the matrix transpose

**37.** If $\mathbf{A}$ is the inverse matrix of $\mathbf{B}$ then

(*a*) $\mathbf{AB} = \mathbf{BA}$

(*b*) $\mathbf{AB} = -\mathbf{BA}$

(*c*) $\mathbf{AB}$ is equal to the identity matrix

(*d*) answers (*a*) and (*c*) are true

**38.** The determinate of the matrix $\begin{pmatrix} 1 & 0 & 0 \\ 2 & 1 & -1 \\ 5 & 3 & 2 \end{pmatrix}$ is

(*a*) not defined

(*b*) 5

(*c*) 13

(*d*) 0

**39.** A function $f(x)$ has a critical point where the slope is zero at $x_0$ if

(*a*) $\left.\dfrac{df(x)}{dx}\right|_{x_0} = 0$

(*b*) $\left.\dfrac{df(x)}{dx}\right|_{x_0} > 0$

(*c*) $\left.\dfrac{df(x)}{dx}\right|_{x_0} < 0$

(*d*) Either (*b*) or (*c*) can be true for a critical point

**40.** If $\left.\dfrac{d^2 f(x)}{dx^2}\right|_{x_0} < 0$ at a critical point $x_0$ then the point is

(*a*) a local maximum

(*b*) a local minimum

(*c*) an inflection point

(*d*) answers (*b*) or (*c*) can be true

**41.** If $\left.\dfrac{d^2 f(x)}{dx^2}\right|_{x_0} > 0$ at a critical point $x_0$ then the point is

$(a)$ a local maximum
$(b)$ a local minimum
$(c)$ an inflection point
$(d)$ answers $(a)$ or $(c)$ can be true

**42.** If $\left.\dfrac{d^2 f(x)}{dx^2}\right|_{x_0} = 0$ at a critical point $x_0$ then the point is

$(a)$ a local maximum
$(b)$ a local minimum
$(c)$ an inflection point
$(d)$ answers $(a)$ or $(b)$ can be true

**43.** Given $\int_0^\infty x^n e^{-\beta x} dx = \dfrac{n!}{\beta^{n+1}}$ evaluate $\int_0^\infty x^3 e^{-3x} dx$

$(a)$ $\dfrac{3!}{3^4}$
$(b)$ 0.074
$(c)$ $\dfrac{1}{27}$
$(d)$ answers $(a)$ and $(b)$ are true

**44.** The integral $\int \ln x dx$ for $x > 0$ is equal to

$(a)$ $e^x + C$
$(b)$ $x \ln x - x + C$
$(c)$ $x \ln x + x + C$
$(d)$ $\ln x - x + C$

**45.** Given $f(x,t) = e^{-\alpha x} \cos(\omega t)$ the quantity $\dfrac{\partial^2 f}{\partial x^2} + \dfrac{\partial^2 f}{\partial t^2}$ is equal to

$(a)$ $\alpha^2 + \omega^2$
$(b)$ $\left(\alpha^2 - \omega^2\right) f(x,t)$

(*c*) $\left(\alpha^2+\omega^2\right)f(x,t)$

(*d*) 0

**46.** Given $\dfrac{1}{1-x}=\sum_{n=0}^{\infty}x^n$ for $|x|<1$ the infinite sum $1+\dfrac{1}{3}+\dfrac{1}{9}+\dfrac{1}{27}+\dfrac{1}{81}+\cdots$

(*a*) diverges

(*b*) is equal to 3/2

(*c*) is equal to 2/3

(*d*) is equal to 2

**47.** Given the approximation $(1+x)^n \approx 1+nx$ for $x<<1$ the quantity $\dfrac{1}{\sqrt{1-\dfrac{v^2}{c^2}}}$

for $v<<c$ is approximately

(*a*) $c/2$

(*b*) $1-\dfrac{v^2}{c^2}$

(*c*) $1+\dfrac{1}{2}\dfrac{v^2}{c^2}$

(*d*) $1-\dfrac{1}{2}\dfrac{v^2}{c^2}$

**48.** Given $G(x,y,z)=xyz$ the gradient $\nabla G$ is equal to

(*a*) 3

(*b*) $yz+xz+yz$

(*c*) $yz\hat{\mathbf{i}}+xz\hat{\mathbf{j}}+yz\hat{\mathbf{k}}$

(*d*) 0

**49.** Given $G(x,y,z)=x^2+y^2+z^2$ the scalar Laplacian $\nabla^2 G$ is equal to

(*a*) $2x\hat{\mathbf{i}}+2y\hat{\mathbf{j}}+2z\hat{\mathbf{k}}$

(*b*) 6

(*c*) $2x+2y+2z$

(*d*) 3

**50.** The differential equation $\frac{d^2x}{dt^2}+2\frac{dx}{dt}+x^2=\sin(t)$ is

($a$) is second order, linear, homogeneous
($b$) is second order, nonlinear, inhomogeneous
($c$) is first order, nonlinear, inhomogeneous
($d$) is first order, linear, homogeneous

**51.** The differential equation $\frac{dx}{dt}+x^2=\sin(t)$ is

($a$) is second order, linear, homogeneous
($b$) is second order, nonlinear, inhomogeneous
($c$) is first order, nonlinear, inhomogeneous
($d$) is first order, linear, homogeneous

**52.** The Dirac delta function $\delta(x)$ is

($a$) one if $x=0$ and zero if $x\neq 0$
($b$) infinite if $x=0$ and zero if $x\neq 0$
($c$) one if $x=0$ and undefined for $x\neq 0$
($d$) zero if $x<0$ and one if $x\geq 0$

**53.** The Dirac delta function $\delta(x-a)$ is

($a$) one if $x=a$ and zero if $x\neq a$
($b$) infinite if $x=a$ and zero if $x\neq a$
($c$) one if $x=a$ and undefined for $x\neq a$
($d$) zero if $x<a$ and one if $x\geq a$

**54.** The Heaviside step function $\Theta(x-a)$ is

($a$) one if $x=a$ and zero if $x\neq a$
($b$) infinite if $x=a$ and zero if $x\neq a$
($c$) one if $x=a$ and undefined for $x\neq a$
($d$) zero if $x<a$ and one if $x\geq a$

**55.** The following functions are orthogonal over the interval $[-\pi,\pi]$

($a$) $\sin(x)$ and $\sin(2x)$

($b$) $e^x$ and $e^{2x}$

$(c)$ $\sin(x)$ and $e^x$

$(d)$ $\sin(x)$ and $2\sin(x)$

**56.** The integral involving a Dirac delta function $\int_{-\infty}^{\infty} e^{j(kx-\omega t)}\delta(x-a)\,dx$ evaluates to

$(a)$ $e^{j(ka-\omega t)}$

$(b)$ $e^{jka}$

$(c)$ 0

$(d)$ -1

**57.** A solution to the differential equation $(1-x^2)\dfrac{d^2y}{dx^2}-2x\dfrac{dy}{dx}+6y=0$ is

$(a)$ $y=\dfrac{3}{2}x^2-\dfrac{1}{2}$

$(b)$ $y=x$

$(c)$ $y=c_1e^{3x}+c_2e^{-3x}$

$(d)$ $y=c_1\cos(3x)+c_2\sin(3x)$

**58.** A solution to the differential equation $\dfrac{d^2y}{dt^2}+9y=0$ is

$(a)$ $y=\dfrac{3}{2}t^2-\dfrac{1}{2}$

$(b)$ $y=t$

$(c)$ $y=c_1e^{3t}+c_2e^{-3t}$

$(d)$ $y=c_1\cos(3t)+c_2\sin(3t)$

**59.** A solution to the differential equation $\dfrac{d^2y}{dt^2}-9y=0$ is

$(a)$ $y=\dfrac{3}{2}t^2-\dfrac{1}{2}$

$(b)$ $y=t$

$(c)$ $y=c_1e^{3t}+c_2e^{-3t}$

$(d)$ $y=c_1\cos(3t)+c_2\sin(3t)$

**60.** Substitution of $e^{rt}$ into the differential equation $\dfrac{d^3y}{dt^3}+2\dfrac{d^2y}{dt^2}+3\dfrac{dy}{dt}-9y=0$ gives the characteristic equation

(*a*) $r^3+2r^2+3r-9=0$

(*b*) $\dfrac{1}{4}r^4+\dfrac{2}{3}r^3+3\dfrac{r^2}{2}-9r=0$

(*c*) $r^3+2r^2+3r=0$

(*d*) $r^2+2r+3=0$

**61.** The matrix $\begin{pmatrix}1 & 1\\ 1 & -1\end{pmatrix}$

(*a*) has determinate equal to -2

(*b*) has zero trace

(*c*) is equal to twice its inverse

(*d*) all the above

**62.** The inverse of the matrix $\begin{pmatrix}2 & 0\\ 0 & -1\end{pmatrix}$

(*a*) is $\begin{pmatrix}\frac{1}{2} & 0\\ 0 & -1\end{pmatrix}$

(*b*) is $\begin{pmatrix}-2 & 0\\ 0 & 1\end{pmatrix}$

(*c*) is $\begin{pmatrix}0 & 1\\ -2 & 1\end{pmatrix}$

(*d*) does not exist

**63.** The inverse of the matrix $\begin{pmatrix}\cos\theta & \sin\theta & 0\\ -\sin\theta & \cos\theta & 0\\ 0 & 0 & 1\end{pmatrix}$

(*a*) is $\begin{pmatrix}\cos\theta & -\sin\theta & 0\\ \sin\theta & \cos\theta & 0\\ 0 & 0 & 1\end{pmatrix}$

(*b*) is $\begin{pmatrix} \sin\theta & \cos\theta & 0 \\ -\cos\theta & \sin\theta & 0 \\ 0 & 0 & 1 \end{pmatrix}$

(*c*) is $\begin{pmatrix} \cos\theta & 0 & -\sin\theta \\ 0 & 1 & 0 \\ \sin\theta & 0 & \cos\theta \end{pmatrix}$

(*d*) does not exist

**64.** The determinant of the matrix $\begin{pmatrix} \cos\theta & \sin\theta & 0 \\ -\sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{pmatrix}$ is

(*a*) $\cos^2\theta - \sin^2\theta$

(*b*) equal to $1$

(*c*) equal to $-1$

(*d*) is not defined

**65.** The inverse of the matrix $\begin{pmatrix} 0 & 1 & 0 \\ -1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}$ is

(*a*) $\begin{pmatrix} 0 & -1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}$

(*b*) $\begin{pmatrix} 0 & -1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & -1 \end{pmatrix}$

(*c*) $\begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}$

(*d*) not defined

**66.** The numerical approximation of the first derivative $f'(x) \approx \dfrac{f(x+\Delta x) - f(x)}{\Delta x}$

$(a)$ is first order, forward difference
$(b)$ is second order, forward difference
$(c)$ is first order, backward difference
$(d)$ is second order, backward difference

**67.** The numerical approximation of the first derivative $f'(x) \approx \dfrac{f(x) - f(x-\Delta x)}{\Delta x}$

$(a)$ is first order, forward difference
$(b)$ is second order, forward difference
$(c)$ is first order, backward difference
$(d)$ is second order, backward difference

**68.** The numerical approximation of the second derivative

$$f''(x) \approx \frac{f(x+\Delta x) - 2f(x) + f(x-\Delta x)}{\Delta x^2}$$

$(a)$ is first order, forward difference
$(b)$ is second order, forward difference
$(c)$ is first order, central difference
$(d)$ is second order, central difference

**69.** The direct product $\begin{pmatrix} 1 \\ 0 \end{pmatrix} \otimes \begin{pmatrix} 1 \\ 1 \end{pmatrix}$ is equal to

$(a)$ $\begin{pmatrix} 1 \\ 0 \\ 1 \\ 0 \end{pmatrix}$

$(b)$ $\begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix}$

$(c)$ $\begin{pmatrix} 1 \\ 1 \\ 0 \\ 0 \end{pmatrix}$

$(d)$ 1

**70.** Given that the Laplace transform of $f(t)$ is $L[f(t)] = \int_0^\infty e^{-st} f(t)dt$ the transform $L[\delta(t-1)] = \int_0^\infty e^{-st} f(t)dt$ is equal to

$(a)$ 1

$(b)$ $e^{-s}$

$(c)$ 0

$(d)$ $e^{s}$

**71.** The divergence of a

$(a)$ vector field gives a scalar field

$(b)$ vector field gives a vector field

$(c)$ scalar field gives a vector field

$(d)$ scalar field gives a scalar field

**72.** The gradient of

$(a)$ vector field gives a scalar field

$(b)$ vector field gives a vector field

$(c)$ scalar field gives a vector field

$(d)$ scalar field gives a scalar field

**73.** The curl of

$(a)$ vector field gives a scalar field

$(b)$ vector field gives a vector field

$(c)$ scalar field gives a vector field

$(d)$ scalar field gives a scalar field

**74.** The scalar Laplacian of

$(a)$ vector field gives a scalar field

$(b)$ vector field gives a vector field

$(c)$ scalar field gives a vector field

$(d)$ scalar field gives a scalar field

**75.** The vector Laplacian of

(*a*) vector field gives a scalar field

(*b*) vector field gives a vector field

(*c*) scalar field gives a vector field

(*d*) scalar field gives a scalar field

**76.** To apply the Laplace transform method to solve for the charge $q(t)$ in an $LC$ series circuit driven by a time dependent voltage source according to the differential equation $L\frac{d^2q}{dt^2}+\frac{q}{C}=V_0 t\sin(\omega t)$ the following information is needed

(*a*) $q(0)$

(*b*) $\dot{q}(0)$

(*c*) both $q(0)$ and $\dot{q}(0)$

(*d*) neither $q(0)$ nor $\dot{q}(0)$

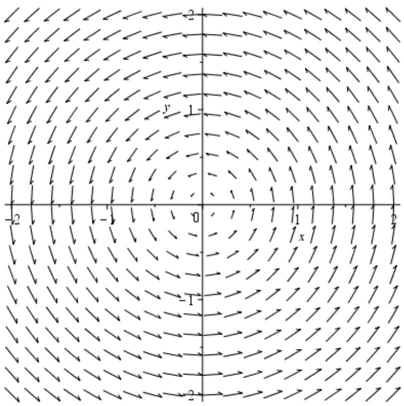


**Fig. Q. 77.**

**77.** The vector field above has

(*a*) curl only

(*b*) divergence only

(*c*) both divergence and curl

(*d*) neither divergence nor curl

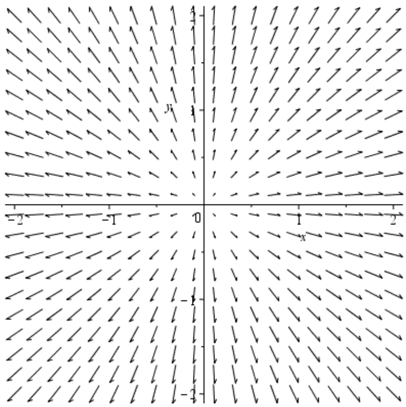

**Fig. Q. 78.**

**78.** The vector field above has

(*a*) curl only

(*b*) divergence only

(*c*) both divergence and curl

(*d*) neither divergence nor curl

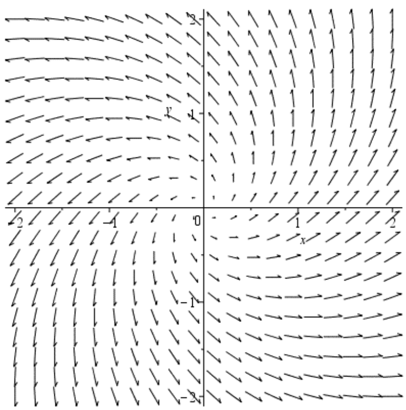

**Fig. Q. 79.**

**79.** The vector field above has

(*a*) curl only

(*b*) divergence only

(*c*) both divergence and curl

(*d*) neither divergence nor curl

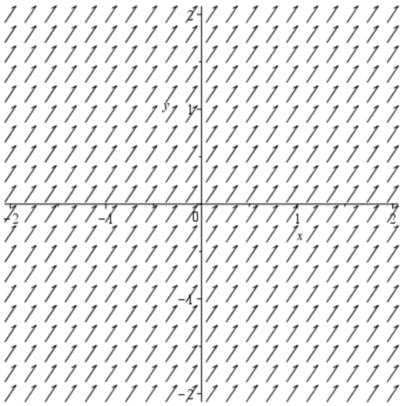


**Fig. Q. 80.**

**80.** The vector field above has

(*a*) curl only

(*b*) divergence only

(*c*) both divergence and curl

(*d*) neither divergence nor curl

**81.** The vector field $\mathbf{F}(x,y) = x\hat{\mathbf{i}} + y\hat{\mathbf{j}}$ has

(*a*) curl only

(*b*) divergence only

(*c*) both divergence and curl

(*d*) neither divergence nor curl

**82.** The vector field $\mathbf{F}(x\ y) = y\hat{\mathbf{i}} - x\hat{\mathbf{j}}$ has

(*a*) curl only

(*b*) divergence only

(*c*) both divergence and curl

(*d*) neither divergence nor curl

**83.** The vector field $\mathbf{F}(x,y) = 3\hat{\mathbf{i}} + 2\hat{\mathbf{j}}$ has

(*a*) curl only

(*b*) divergence only

(*c*) both divergence and curl

(*d*) neither divergence nor curl

**84.** The vector field $\mathbf{F}(x,y)=(x-y)\hat{\mathbf{i}}+(x+y)\hat{\mathbf{j}}$ has

(*a*) curl only
(*b*) divergence only
(*c*) both divergence and curl
(*d*) neither divergence nor curl

**85.** Given $f(x)$ and $g(y)$ are arbitrary scalar functions of $x$ and $y$. The vector field $\mathbf{F}(x,y)=f(x)\hat{\mathbf{i}}+g(y)\hat{\mathbf{j}}$ could only have

(*a*) curl
(*b*) divergence
(*c*) both divergence and curl
(*d*) neither divergence nor curl

**86.** Given $f(x)$ and $g(y)$ are arbitrary scalar functions of $x$ and $y$. The vector field $\mathbf{F}(x,y)=g(y)\hat{\mathbf{i}}+f(x)\hat{\mathbf{j}}$ could only have

(*a*) curl
(*b*) divergence
(*c*) both divergence and curl
(*d*) neither divergence nor curl

**87.** Gauss's divergence theorem states that the volume integral $\int_{\text{vol}}\nabla\cdot\mathbf{F}dv$ is equal to

(*a*) closed surface integral $\oint_{\text{surf}}\mathbf{F}\cdot\hat{\mathbf{n}}da$
(*b*) open surface integral $\int_{\text{surf}}\mathbf{F}\cdot\hat{\mathbf{n}}da$
(*c*) closed line integral $\oint_{\text{line}}\mathbf{F}\cdot d\bar{\ell}$
(*d*) open line integral $\int_{\text{line}}\mathbf{F}\cdot d\bar{\ell}$

**88.** Stokes' curl theorem states that the open surface integral $\int_{\text{surf}} \nabla\times\mathbf{F}\cdot\hat{\mathbf{n}}da$ is equal to

($a$) closed surface integral $\oint_{\text{surf}} \mathbf{F}\cdot\hat{\mathbf{n}}da$

($b$) open surface integral $\int_{\text{surf}} \mathbf{F}\cdot\hat{\mathbf{n}}da$

($c$) closed line integral $\oint_{\text{line}} \mathbf{F}\cdot d\vec{\ell}$

($d$) open line integral $\int_{\text{line}} \mathbf{F}\cdot d\vec{\ell}$

**89.** The expression $(1-\cos n\pi)(1-\cos m\pi)$

($a$) is zero for even values of $m$ and $n$.

($b$) is zero for odd values of $m$ and $n$.

($c$) is 4 for even values of $m$ and $n$.

($d$) is 4 for odd values of $m$ and $n$.

($e$) answers ($a$) and ($d$)

**90.** The complex exponential $e^{j\pi}$ is equal to

($a$) 0

($b$) 1

($c$) $-1$

($d$) $j$

($e$) $-j$

**91.** The complex expression $j^5$ is equal to

($a$) 1

($b$) $-1$

($c$) $j$

($d$) $-j$

**92.** Adding a complex number to its complex conjugate gives

($a$) a real number

($b$) a pure imaginary number

($c$) a complex number

($d$) zero

**93.** Subtracting a complex number and its complex conjugate gives
(*a*) a real number
(*b*) a pure imaginary number
(*c*) a complex number
(*d*) zero

**94.** A square matrix $\mathbf{A}$ is noninvertible if
(*a*) its determinate is zero
(*b*) if its determinate is nonzero
(*c*) its determinate is negative
(*d*) its determinate is imaginary

**95.** Square matrices $\mathbf{A}$ and $\mathbf{B}$ are said to commute if
(*a*) $\mathbf{AB} = \mathbf{BA}$
(*b*) $\mathbf{AB} = -\mathbf{BA}$
(*c*) either $\mathbf{A}$ or $\mathbf{B}$ are invertible
(*d*) only if $\mathbf{A}$ and $\mathbf{B}$ are real matrices

**96.** Square matrices $\mathbf{A}$ and $\mathbf{B}$ are said to anti-commute if
(*a*) $\mathbf{AB} = \mathbf{BA}$
(*b*) $\mathbf{AB} = -\mathbf{BA}$
(*c*) either $\mathbf{A}$ or $\mathbf{B}$ are invertible
(*d*) only if $\mathbf{A}$ and $\mathbf{B}$ are real matrices

**97.** The expression $\dfrac{e^{j\theta} + e^{-j\theta}}{2}$ is equal to
(*a*) $\cos\theta$
(*b*) $\sin\theta$
(*c*) $\cosh\theta$
(*d*) $\sinh\theta$

**98.** The expression $\dfrac{e^{j\theta} - e^{-j\theta}}{2j}$ is equal to
(*a*) $\cos\theta$
(*b*) $\sin\theta$
(*c*) $\cosh\theta$
(*d*) $\sinh\theta$

**99.** The expression $\dfrac{e^{\theta}+e^{-\theta}}{2}$ is equal to

(*a*) $\cos\theta$
(*b*) $\sin\theta$
(*c*) $\cosh\theta$
(*d*) $\sinh\theta$

**100.** The expression $\dfrac{e^{\theta}-e^{-\theta}}{2}$ is equal to

(*a*) $\cos\theta$
(*b*) $\sin\theta$
(*c*) $\cosh\theta$
(*d*) $\sinh\theta$

**101.** The expression $\dfrac{e^{j\theta}-e^{-j\theta}}{e^{j\theta}+e^{-j\theta}}$ is equal to

(*a*) $\coth\theta$
(*b*) $\tanh\theta$
(*c*) $j\tan(\theta)$
(*d*) $\cot\theta$

**102.** The expression $\dfrac{e^{j\theta}+e^{-j\theta}}{e^{j\theta}-e^{-j\theta}}$ is equal to

(*a*) $\coth\theta$
(*b*) $\tanh\theta$
(*c*) $-j\cot(\theta)$
(*d*) $j\cot(\theta)$

**103.** The expression $\dfrac{e^{\theta}-e^{-\theta}}{e^{\theta}+e^{-\theta}}$ is equal to

(*a*) $\coth\theta$
(*b*) $\tanh\theta$
(*c*) $\tan\theta$
(*d*) $\cot\theta$

**104.** The expression $\dfrac{e^{\theta}+e^{-\theta}}{e^{\theta}-e^{-\theta}}$ is equal to

($a$) $\coth\theta$

($b$) $\tanh\theta$

($c$) $\tan\theta$

($d$) $\cot\theta$

**105.** The real part of $\dfrac{1}{3+2j}$ is equal to

($a$) $3/13$

($b$) $-2/13$

($c$) $1/13$

($d$) $2/13$

**106.** The imaginary part of $\dfrac{1}{3+2j}$ is equal to

($a$) $3/13$

($b$) $-2/13$

($c$) $1/13$

($d$) $2/13$

**107.** The magnitude of $4-3j$ is equal to

($a$) 5

($b$) 25

($c$) 1

($d$) 7

**108.** Given a scalar function $V$, the curl of the gradient $\nabla\times\nabla V$ is

($a$) zero

($b$) equal to the Laplacian $\nabla^2 V$

($c$) not given by a specific identity

**109.** Given a vector function $\mathbf{F}$, the divergence of the curl $\nabla\cdot(\nabla\times\mathbf{F})$ is

($a$) zero

($b$) equal to the vector Laplacian $\nabla^2\mathbf{F}$

($c$) not given by a specific identity

**110.** Given a vector function $\mathbf{F}$, the curl of the curl $\nabla\times(\nabla\times\mathbf{F})$ is

($a$) zero

($b$) equal to the vector Laplacian $\nabla^2\mathbf{F}$

($c$) equal to $\nabla(\nabla\cdot\mathbf{F})-\nabla^2\mathbf{F}$

($d$) there is no specific identity

**111.** The Laplacian of a vector field $\nabla^2\mathbf{F}$ is

($a$) defined the same way as the scalar Laplacian

($b$) defined as $\nabla(\nabla\cdot\mathbf{F})-\nabla\times(\nabla\times\mathbf{F})$

($c$) defined as $\nabla\times(\nabla\times\mathbf{F})$

($d$) zero

**112.** The integral $\int\cosh(x)\mathrm{e}^{\sinh(x)}\,dx$ is best solved using

($a$) integration by parts

($b$) $u$-substitution

($c$) trig substitution

($d$) numerical solution

**113.** The integral $\int\frac{6x^2-2x+3}{2x^3-x^2+3x+11}\,dx$ is best solved using

($a$) integration by parts

($b$) $u$-substitution

($c$) trig substitution

($d$) numerical solution

**114.** The series $1+x+\frac{x^2}{2!}+\frac{x^3}{3!}+\cdots$ is

($a$) $e^x$

($b$) $\sin(x)$

($c$) $\cos(x)$

($d$) $\tan(x)$

**115.** The series $x+\frac{x^3}{3}+\frac{2}{15}x^5+\cdots$ is

(*a*) $e^x$

(*b*) $\sin(x)$

(*c*) $\cos(x)$

(*d*) $\tan(x)$

**116.** The series $x-\frac{x^3}{3!}+\frac{x^5}{5!}-\frac{x^7}{7!}+\cdots$ is

(*a*) $e^x$

(*b*) $\sin(x)$

(*c*) $\cos(x)$

(*d*) $\tan(x)$

**117.** The series $1-\frac{x^2}{2!}+\frac{x^4}{4!}-\frac{x^6}{6!}+\cdots$ is

(*a*) $e^x$

(*b*) $\sin(x)$

(*c*) $\cos(x)$

(*d*) $\tan(x)$

**118.** $f(x)=\frac{1}{0!}f(a)+\frac{1}{1!}f'(a)(x-a)+\frac{1}{2!}f''(a)(x-a)^2+\cdots$ is a

(*a*) Taylor series

(*b*) Maclaurin series when $a=0$

(*c*) divergent series

(*d*) both (*a*) and (*b*)

# 2

# ELECTRICAL MACHINES

**1.** The left-hand rule is applicable to a

(*a*) generator
(*b*) motor
(*c*) transformer
(*d*) (*a*) and (*b*) both
(*e*) (*a*) or (*b*)

**2.** The eddy current losses in the transformer will be reduced if

(*a*) the laminations are thick
(*b*) number of turns in the primary winding is reduced
(*c*) the number of turns in the secondary winding is reduced
(*d*) the laminations are thin

**3.** The speed of a D.C. series motor at no load is

(*a*) zero
(*b*) 1500 R.P.M.
(*c*) infinity
(*d*) 3000 R.P.M.
(*e*) none of the above

**4.** A sinusoidal voltage of frequency 1 Hz is applied to the field of a D.C. generator. The armature voltage will be

(*a*) 1 Hz square wave
(*b*) 1 Hz sinusoidal voltage
(*c*) D.C. voltage
(*d*) none of the above

**5.** The function of the commutator in a D.C. machine is

(*a*) to change alternating current to a direct current
(*b*) to improve commutation
(*c*) for easy control
(*d*) to change alternating voltage to direct voltage

**6.** The phase sequence of voltage generated in the alternator can be reversed by reversing its field current.

(*a*) true (*b*) false

**7.** The rotation of a three-phase induction motor can be reversed by interchanging any two of the supply phases.

(*a*) true (*b*) false

**8.** The starting torque of the three-phase induction motor can be increased by

(*a*) increasing the rotor reactance (*b*) increasing the rotor resistance

(*c*) increasing the stator resistance (*d*) none of the above

**9.** In the induction motor the torque is

(*a*) proportional to slip

(*b*) inversely proportional to slip

(*c*) proportional to the square of the slip

(*d*) none of the above

**10.** The single-phase induction motor (capacitor start capacitor run) basically is a

(*a*) single-phase motor (*b*) two-phase motor

(*c*) A.C. series motor (*d*) none of the above

**11.** For the equal output the total current is more in

(*a*) wave winding (*b*) lap winding

(*c*) simplex lap winding (*d*) none of the above

**12.** The maximum starting torque in the induction motor is developed when

(*a*) the reactance of the rotor is half of the resistance

(*b*) the reactance of the rotor is twice the rotor resistance

(*c*) the reactance of the rotor is equal to the rotor resistance

(*d*) none of the above

**13.** The direction of rotation of a D.C. series motor can be changed

(*a*) by interchanging supply terminals

(*b*) by interchanging field terminals

(*c*) either (*a*) or (*b*)

(*d*) none of the above

**14.** A D.C. shunt generator driven at a normal speed in the normal direction fails to build up armature voltage because

(*a*) the resistance of armature is high

(*b*) field current is not sufficiently high

(*c*) there is no residual magnetism

(*d*) field winding has small number of turns

**15.** The skin effect can be reduced

(*a*) by increasing the radius of the conductor

(*b*) by decreasing the radius of the conductor

(*c*) by increasing the frequency of the supply

(*d*) if the hollow conductor is used

(*e*) (*b*) and (*d*) both

**16.** If a D.C. motor is connected across A.C. supply, the D.C. motor will

(*a*) burn as the eddy currents in the field produce heat

(*b*) run at its normal speed

(*c*) run at a lower speed

(*d*) run continuously but the sparking takes place at the brushes

**17.** What would happen if the field of a D.C. shunt motor is opened?

(*a*) The speed of the motor will be reduced

(*b*) It will continue to run at its normal speed

(*c*) The speed of the motor will be enormously high and might destroy itself

(*d*) The current in the armature will increase

**18.** A single-phase induction motor can be run on two or three-phase lines.

(*a*) true (*b*) false

**19.** What is standard direction of rotation of a motor?

(*a*) Clockwise when looking at the front end of the motor

(*b*) Counter-clockwise when looking at the front end of the motor

**20.** If the field of a synchronous motor is under-excited the power factor will be

(*a*) lagging (*b*) leading

(*c*) unity (*d*) more than unity

**21.** The rotation of wound-rotor induction motor can be reversed by

(*a*) transposing any two leads from the slip rings

(*b*) transposing any two-line leads

(*c*) none of the above

**22.** A split-phase motor has high starting torque.

(*a*) true (*b*) false

**23.** The direction of rotation of a split-phase motor can be reversed

(*a*) by reversing the leads of main winding

(*b*) by reversing the leads of auxiliary winding

(*c*) (*a*) and (*c*) both

(*d*) none of the above

**24.** The capacitor-start motor has a high starting torque.

(*a*) true (*b*) false

**25.** A universal motor can be run either on A.C. or D.C.

(*a*) true (*b*) false

**26.** The phase relationship between the primary and secondary voltages of a transformer is

(*a*) 90 degrees out of phase (*b*) in the same phase

(*c*) 180 degrees out of phase (*d*) none of the above

**27.** A four-point starter in the D.C. motor is used

(*a*) to increase the field current

(*b*) to decrease the field current

(*c*) not to affect the current passing through HOLD ON coil even if any change in the field current takes place

(*d*) none of the above

**28.** Which of the following motors is used in locomotive motor drives?

(*a*) A.C. series motor (*b*) Induction motor

(*c*) D.C. series motor (*d*) Synchronous motor

**29.** Which of the following motors has high starting torque?

(*a*) D.C. shunt motor (*b*) Squirrel cage induction motor

(*c*) D.C. series motor (*d*) A.C. series motor

**30.** The efficiency of D.C. shunt generator is maximum when

(*a*) magnetic losses are equal to mechanical losses

(*b*) armature copper losses are equal to constant losses

(*c*) field copper losses are equal to constant losses

(*d*) stray losses are equal to copper losses

**31.** In the case of D.C. shunt generation, the shunt copper loss is practically constant.

(*a*) true (*b*) false

**32.** Armature reaction is attributed to

(*a*) the effect of magnetic field set up field current

(*b*) the effect of the magnetic field set up by armature current

(*c*) the effect of the magnetic field set up by back E.M.F.

(*d*) none of the above

**33.** The dummy coil in D.C. machines is used to

(*a*) eliminate armature reaction

(*b*) bring out mechanical balance of armature

(*c*) eliminate reactance voltage

(*d*) none of the above

**34.** Equalizer rings in the D.C. generator (lap winding) are used

(*a*) to avoid unequal distribution of current at the brushes, thereby helping to get sparkless commutation

(*b*) to avoid harmonics developed in the machine

(*c*) to avoid noise developed in the machine

(*d*) to avoid overhang

**35.** The speed of the D.C. motor decreases as the flux in the field winding decreases.

(*a*) true (*b*) false

**36.** The sparking at the brushes in the D.C. generator is attributed to

(*a*) quick reversal of current in the coil under commutation

(*b*) armature reaction

(*c*) reactance voltage

(*d*) high resistance of the brushes

**37.** Interpoles in the armature of a D.C. generator are used

(*a*) to neutralize the reactance voltage only

(*b*) to neutralize the reactance voltage and cross-magnetizing effect of armature reaction

(*c*) to neutralize the cross-magnetizing effect of armature reaction only

(*d*) none of the above

**38.** The transformer is not used in the D.C. line because

(*a*) there is no need to step up the D.C. voltage

(*b*) losses in the D.C. circuit are high

(*c*) Faraday's low is not valid as the rate of change of flux is zero

(*d*) harmonics developed in the transformer will cause distortion in the voltage

**39.** The transformer is analogous to gear trains.

(*a*) true (*b*) false

**40.** D.C. shunt generators are not suited for parallel operation because of their slightly drooping voltage characteristics.

(*a*) true (*b*) false

**41.** The relationship between no-load generated E.M.F. in the armature and field excitation of a D.C. generator is known as

(*a*) internal characteristic of generator

(*b*) external characteristic of generator

(*c*) magnetic characteristic or open circuit characteristic of generator

(*d*) total characteristic of generator

**42.** The critical resistance of the D.C. generator is the resistance of

(*a*) armature (*b*) load

(*c*) field (*d*) brushes

**43.** When a bank of two single-phase transformers in an open delta arrangement is used, each of them supplies

(*a*) 33.3% of its output rating (*b*) 86.6% of its output rating

(*c*) 48.6% of its output rating (*d*) 100% of its output rating

**44.** Two single-phase transformers with proper connections can be used to achieve a three-phase output from three-phase input.

(*a*) true (*b*) false

**45.** A thicker wire is used in the D.C. series field winding than D.C. shunt field winding in D.C. machines

(*a*) to prevent mechanical vibrations

(*b*) to produce large flux

(*c*) because it carries the load current which is much higher than shunt field current for the same rating of D.C. machines

(*d*) to provide strength

**46.** Transformer core is laminated

(*a*) because it is difficult to fabricate solid core

(*b*) because laminated core provides high flux density

(*c*) to avoid eddy current and hysteresis losses

(*d*) to increase the main flux

**47.** The mechanical power developed by the D.C. motor is maximum when

(*a*) back E.M.F. is equal to applied voltage

(*b*) back E.M.F. is equal to zero

(*c*) back E.M.F. is equal to half the applied voltage

(*d*) none of the above

**48.** Which motor is used to drive constant speed line shafting, lathes, blowers, and fans?

(*a*) D.C. shunt motor (*b*) D.C. series motor

(*c*) Cumulative compound motor (*d*) None of the above

**49.** In series-parallel control method when two D.C. series motors are connected in series, the speed of the set is

(*a*) half of the speed of the motors when connected in parallel

(*b*) one-fourth of the speed of motors when connected in parallel

(*c*) same as in parallel

(*d*) rated speed of any one of the motors

**50.** The torque produced by series combination of two D.C. series motors is

(*a*) equal to the torque when they are connected in parallel

(*b*) half of the torque when they are connected in parallel

(*c*) four times the torque when they are connected in parallel

(*d*) twice the torque when they are connected in parallel

**51.** The use of the starter in D.C. motors is necessary because

(*a*) they are not self-starting

(*b*) initially there is no back E.M.F. and armature current is very high, which is to be avoided by using high resistance starter

(*c*) to overcome back E.M.F.

(*d*) none of the above

**52.** The speed of the D.C. motor can be varied

(*a*) by varying field current only

(*b*) by varying field current or armature resistance

(*c*) by varying supply voltage only

(*d*) (*b*) or (*c*)

**53.** Electrical energy can be converted into chemical energy.

(*a*) true (*b*) false

**54.** The mercury-arc rectifier can be used as an inverter.

(*a*) true (*b*) false

**55.** The hum in the transformer is mainly attributed to

(*a*) laminations of the transformer (*b*) magnetostriction

(*c*) oil of the transformer (*d*) walls of the tanks

**56.** To obtain a sinusoidal voltage the poles should have a shape such that the length of the air gap at any point is

(*a*) proportional to $1/\sin\theta$, where $\theta$ is the angle measured in electrical degrees between the point in the question and the center of the pole

(*b*) proportional to $1/\cos\theta$, where $\theta$ is same as defined in (*a*)

(*c*) proportional to $\sin\theta$

(*d*) proportional to $\cos\theta$

**57.** The power transformer is a

(*a*) constant current device (*b*) constant main flux device

(*c*) constant voltage device (*d*) constant power device

**58.** An induction motor is

(*a*) self-starting with zero torque

(*b*) self-starting with high torque

(*c*) self-starting with small torque rather than rated torque

(*d*) none of the above

**59.** As the load is increased the speed of D.C. shunt motor will

(*a*) increase proportionately (*b*) remain almost constant

(*c*) increase slightly (*d*) reduce slightly

**60.** Two transformers operating in parallel will share the load depending upon their

(*a*) ratings (*b*) leakage reactance

(*c*) efficiency (*d*) per unit impedance

**61.** The equalizer rings are used in

(*a*) lap winding (*b*) wave winding

(*c*) multilayer wave winding (*d*) none of the above

**62.** The generator is called flat compounded if

(*a*) the series field ampere turns are such as to produce the same voltage at rated load as at no load

(*b*) the series field turns are such that the rated load voltage is greater than no-load voltage

(*c*) the rated voltage is less than the no-load voltage

(*d*) none of the above

**63.** The slip test is used

(*a*) to measure the slip of the induction motor

(*b*) to measure the torque of the induction motor

(*c*) to measure the $X_d$ and $X_q$ of the alternator

(*d*) for none of the above

**64.** What will happen if the back E.M.F. in the D.C. motor absent?

(*a*) Motor will run faster than rated value

(*b*) Motor will burn

(*c*) Armature drop will be reduced substantially

(*d*) None of the above

**65.** The armature torque of the D.C. shunt motor is proportional to

(*a*) armature current only (*b*) field flux only

(*c*) armature current and flux both (*d*) none of the above

**66.** The back E.M.F. has no relation with armature torque in D.C. motors.

(*a*) true (*b*) false

**67.** The speed of the D.C. shunt motor increases as the armature torque increases.

(*a*) true (*b*) false

**68.** The horsepower obtained from the shaft torque is called

(*a*) indicated horsepower or I.H.P. (*b*) brake horsepower or B.H.P.

(*c*) F.H.P. (*d*) none of the above

**69.** For D.C. shunt motors the speed is dependent on back E.M.F. only because

(*a*) flux is practically constant in D.C. shunt motors

(*b*) flux is proportional to armature current

(*c*) armature drop is negligible

(*d*) back E.M.F. is equal to armature drop

**70.** It is preferable to start a D.C. series motor with some mechanical load because

(*a*) it may develop excessive speed otherwise and damage itself

(*b*) it will not run at no load

(*c*) a little load will act as a starter to the motor

(*d*) none of the above

**71.** When the torque of the D.C. series motor is doubled the power is increased by

(*a*) 70% (*b*) 50% to 60%

(*c*) 20% (*d*) 100%

**72.** When two D.C. series generators are running in parallel an equalizer bar is used

(*a*) because two similar machines will pass approximately equal currents to the load

(*b*) to reduce the combined effect of armature reaction of both machines

(*c*) to increase the speed and hence generated E.M.F.

(*d*) to increase the series flux

**73.** The speed of D.C. motors can be controlled by

(*a*) controlling flux only

(*b*) controlling flux, armature resistance, and voltage

(*c*) controlling voltage and flux only

(*d*) controlling armature resistance and voltage only

**74.** The diverter in D.C. machine is basically a potential divider.

(*a*) true (*b*) false

**75.** The speed/current curve for a D.C. series motor with resistance in series field will lie above the curve without resistance in series field.

(*a*) true (*b*) false

**76.** A diverter across the armature of a D.C. motor cannot be used for giving speeds lower than the rated speed.

(*a*) true (*b*) false

**77.** The field flux of the D.C. motor can be controlled to achieve

(*a*) speeds above the rated speed

(*b*) speeds lower than rated speed

(*c*) speeds above and below the rated speed

(*d*) steady speed

**78.** The reversal of rotation of motors and as electric braking is known as

(*a*) regenerative braking

(*b*) plugging

(*c*) dynamic braking

(*d*) none of the above

**79.** Which of the following methods of braking is used in rolling mills?

(*a*) Plugging (*b*) Regenerative braking

(*c*) Dynamic braking (*d*) Mechanical brakes

**80.** The regenerative method of braking is based on the fact that

(*a*) the back E.M.F. of the motor is more than the applied voltage

(*b*) the back E.M.F. is equal to the applied voltage

(*c*) the back E.M.F. is less than the applied voltage

(*d*) none of the above

**81.** Swinburne's test is applied to

(*a*) those machines in which the flux is practically constant

(*b*) those machines in which flux is varying

(*c*) those machines in which flux is proportional to armature current

(*d*) none of the above

**82.** The retardation test is applicable to shunt motors and generators and is used to find

(*a*) stray losses
(*b*) copper losses
(*c*) eddy current losses
(*d*) friction losses

**83.** In the load Field's test, two similar D.C. series machines are mechanically coupled. The output of the generator is fed to the resistance and hence is called the regenerative test.

(*a*) true
(*b*) false

**84.** The use of higher flux density in the transformer design

(*a*) reduces the weight per KVA
(*b*) increases the weight per KVA
(*c*) has no relation with the weight of the transformer
(*d*) increases the weight per KW

**85.** The oil used in the small transformer provides

(*a*) cooling only
(*b*) insulation only
(*c*) insulation and cooling both
(*d*) lubrication only

**86.** The oil used in the transformer should be free from moisture because

(*a*) moisture will reduce the density of the oil, which is slightly undesirable
(*b*) moisture will reduce the dielectric strength of the oil and hence insulation is weakened
(*c*) moisture will reduce the lubricating property of the oil
(*d*) moisture will develop rust

**87.** ASKARELS is the trade name given to

(*a*) natural mineral oil used in the transformer
(*b*) synthetic insulating fluids used in the transformer
(*c*) insulating materials for transformers
(*d*) insulating materials for motors and generators

**88.** The conservator is used in the transformer

(*a*) to supply oil to the transformer whenever needed
(*b*) to protect the transformer from damage when oil expands due to rise in temperature. It stores the increasing volume of the oil
(*c*) to provide fresh air to cool down the oil
(*d*) to store water for transformer cooling

**89.** Which of the following statements is correct?
(*a*) Induction coil works on A.C.
(*b*) Transformer is used to step up the potential of D.C.
(*c*) The output current of induction coil is nearly unindirectional
(*d*) In step-down transformers, the transformation ratio is always greater than one

**90.** The induced E.M.F. in the transformer secondary will depend on
(*a*) frequently of the supply only
(*b*) number of turns in secondary only
(*c*) maximum flux in core and frequency only
(*d*) frequency, flux, and number of turns in the secondary

**91.** No-load primary input is practically equal to the iron loss in the transformer because primary current is very small.
(*a*) true (*b*) false

**92.** If $R_2$ is the resistance of secondary winding of the transformer and $K$ is the transformation ratio, then the equivalent secondary resistance referred to primary will be
(*a*) $R_2/K^2$ (*b*) $R_2^2/K^2$
(*c*) $R_2/K$ (*d*) $R_2/\sqrt{K}$

**93.** A transformer with magnetic leakage is equivalent to an ideal transformer with inductive coils connected in both primary and secondary.
(*a*) true (*b*) false

**94.** The leakage flux links both windings of the transformer and hence contributes to the transfer of energy from primary of the transformer to secondary.
(*a*) true (*b*) false

**95.** The vector diagram of the three-phase transformer is equivalent to the vector diagram of three-phase induction motor with short circuited secondary. If the secondary of the transformer is wound on a shaft and treated as rotor and primary is fed three-phase supply, the rotor will run and behave like an induction motor.
(*a*) true (*b*) false

**96.** The short-circuit test in the transformer is used to determine

(*a*) the iron loss at any load

(*b*) the copper loss at any load or at full load

(*c*) the hysteresis loss

(*d*) the eddy current loss

**97.** If the power factor is leading, the regulation of a good transformer will be higher than when it is lagging.

(*a*) true (*b*) false

**98.** A good transformer must have regulation as high as possible.

(*a*) true (*b*) false

**99.** The percentage resistance, reactance, and impedance are the same whether referring to primary or secondary of the transformer.

(*a*) true (*b*) false

**100.** Which of the following electrical machines has the highest efficiency?

(*a*) D.C. shunt motor

(*b*) Transformer

(*c*) Induction motor

(*d*) Synchronous motor

**101.** The efficiency of the transformer is independent of power factor.

(*a*) true (*b*) false

**102.** The condition for maximum efficiency of the transformer is that

(*a*) copper losses are half of iron losses

(*b*) copper losses are equal to iron losses

(*c*) copper losses are negligible in comparison to iron losses

(*d*) iron losses are zero

**103.** If the iron loss and full load copper losses are given, then the load at which two losses would be equal (*i.e.* corresponding to maximum efficiency) is given by

(*a*) $\text{full load} \times \dfrac{\text{iron loss}}{\text{f.l.cu–loss}}$ (*b*) $\text{full load} \times \dfrac{(\text{iron loss})^2}{\text{f.l.cu–loss}}$

(*c*) $\text{full load} \times \sqrt{\dfrac{\text{iron loss}}{\text{f.l.cu–loss}}}$ (*d*) $\text{full load} \times \sqrt{\dfrac{\text{f.l.cu–loss}}{\text{iron loss}}}$

**104.** The distribution transformers are designed to keep core losses minimum, and copper losses are relatively less important because

(*a*) the primary of such transformers is energized for all twenty-four hours and core losses occur throughout the day, whereas copper losses will occur only when secondary is supplying load

(*b*) core losses are always more than copper losses

(*c*) core losses may destroy the insulation

(*d*) core losses will heat up the oil of the transformer rapidly

**105.** The tapping in the transformer is always provided in the low voltage side.

(*a*) true (*b*) false

**106.** Enumerate the conditions for successful parallel operation of single-phase transformers.

(*i*) The percentage impedance should be equal

(*ii*) The transformers should be properly connected with regards to polarity

(*iii*) The primary windings of the transformers should be suitable for the supply system voltage and frequency

(*iv*) The voltage ratings of transformers of primary and secondary windings should be identical

**107.** What will happen if transformers working in parallel are not connected with regards to polarity?

(*a*) Incorrect polarity will result in dead short-circuit

(*b*) The transformers will not share load in proportion to their KVA ratings

(*c*) The power factors of two transformers will be different from the power factor of common load

(*d*) None of the above

**108.** What will happen if the percentage impedances of the two transformers working in parallel are different?

(*a*) Parallel operation will not be possible

(*b*) Parallel operation will still be possible, but the power factors at which the two transformers operate will be different from the power factor of the common load

(*c*) Transformers will be over-heated

(*d*) Power factors of both transformers will be same

**109.** Which of the following connections is most suitable and economical for small, high-voltage transformers?

(*a*) Delta-delta connection (*b*) Star-star connection
(*c*) Star-delta connection (*d*) Delta-star connection

**110.** Delta-delta connection is economical for large, low-voltage transformers in which insulation problems are not urgent.

(*a*) true (*b*) false

**111.** The average power factor at which an open-delta bank of single-phase transformers operates is less than that of load.

(*a*) true (*b*) false

**112.** The Scott connection is used

(*a*) to accomplish three-phase to three-phase transformation only
(*b*) to accomplish three-phase to two-phase transformation only
(*c*) to accomplish three-phase to three-phase and three-phase to two-phase transformation
(*d*) none of the above

**113.** Under balanced load conditions, the main transformer rating in the Scott connection is

(*a*) 10% greater than the teaser transformer
(*b*) 15% greater than the teaser transformer
(*c*) 57.7% greater than the teaser transformer
(*d*) 66.6% greater than the teaser transformer

**114.** If the load is balanced on one side of the transformer in the Scott connection, the load is balanced on the other side as well.

(*a*) true (*b*) false

**115.** If $K$ is the transformation ratio of the main transformer in the Scott connection then the transformation ratio of the teaser will be

(*a*) $K/\sqrt{3}$ (*b*) $\sqrt{3/2K}$ (*c*) $2K/\sqrt{3}$ (*d*) $\sqrt{K/2}$

**116.** The rotor slots are usually given slight skew in the squirrel case indication motor

(*a*) to increase the tensile strength of the rotor bars and hence strength
(*b*) to reduce the magnetic hum and locking tendency of the rotor
(*c*) to see the copper used
(*d*) because of ease in fabrication

**117.** The starting torque of the slip-ring induction motor can be increased by

(*a*) adding external resistance to the rotor

(*b*) adding external inductance to the rotor

(*c*) adding both resistance and inductance to the rotor

(*d*) adding external capacitance to the rotor

**118.** What will happen if the relative speed between the rotating flux of stator and rotor of the induction motor is zero?

(*a*) The rotor will not run

(*b*) The rotor will run at very high speed

(*c*) The slip of the motor will be zero

(*d*) The torque produced will be very large

**119.** When the rotor starts rotating the frequency of the rotor of the induction motor will depend on relative speed of the stator and the rotor.

(*a*) true (*b*) false

**120.** A 400 KW, 3 Phase, 440 volts, 50 Hz A.C. induction motor has a speed of 950 R.P.M. on full load. The machine has 6 poles. The slip of machine will be

(*a*) 0.06 (*b*) 0.10 (*c*) 0.04 (*d*) 0.05

**121.** If the rotor of the induction motor is assumed non-inductive, the torque acting on each conductor will be positive or undirectional.

(*a*) true (*b*) false

**122.** Which of the following statements is most appropriate if $T$ is the starting torque developed in the rotor and $V$ is the supply voltage to the stator?

(*a*) $T$ is proportional to $V^2$

(*b*) $T$ is proportional to $V$

(*c*) $T$ is proportional to $\sqrt{V}$

(*d*) $T$ is proportional to $V^{1/4}$

**123.** A change of 5% in supply voltage to an induction motor will produce a change of approximately

(*a*) 5% in the rotor torque

(*b*) 7% in the rotor torque

(*c*) 25% in the rotor torque

(*d*) 10% in the rotor torque

**124.** The torque of a rotor in an induction motor under running condition is maximum

(*a*) at the value of the slip which makes rotor reactance per phase equal to the resistance per phase

(*b*) at the value of the slip which makes the rotor reactance half of the rotor resistance

(*c*) at the unit value of the slip

(*d*) at the zero value of the slip

**125.** By varying the rotor resistance in the slip-ring induction motor the maximum torque can be achieved at any desired slip or speed of the motor.

(*a*) true (*b*) false

**126.** The maximum torque of an induction motor varies directly as applied voltage.

(*a*) true (*b*) false

**127.** The shape of the torque/slip curve of induction motor is

(*a*) hyperbola (*b*) parabola

(*c*) straight line (*d*) rectangular parabola

**128.** Which of the following statements is correct when referred to an induction motor?

(*a*) The maximum torque will depend on rotor resistance

(*b*) Although the maximum torque does not depend on rotor resistance, the exact location of maximum torque is dependent on it

(*c*) The maximum torque will depend on the standstill reactance of the rotor

(*d*) The slip of the induction motor decreases as the torque increases

**129.** If an induction motor has a slip of 2% at normal voltage, what will be the approximate slip when developing the same torque at 10% above normal voltage?

(*a*) 1.6% (*b*) 2% (*c*) 1.65% (*d*) 1.1%

**130.** The slip of the induction motor can be measured by comparing the rotor and stator supply frequencies.

(*a*) true (*b*) false

**131.** When the frequency of the rotor of an induction motor is small, it can be measured by a

(*a*) galvanometer

(*b*) D.C. moving coil millivoltmeter

(*c*) D.C. moving coil ammeter

(*d*) A.C. voltmeter

**132.** The rotor efficiency of induction motor is called

(*a*) I.H.P. (*b*) F.H.P.

(*c*) B.H.P. (*d*) none of the above

**133.** The rotor efficiency of an induction motor is defined as the ratio of the actual speed of the rotor to the synchronous speed of the rotor.

(*a*) true (*b*) false

**134.** The synchronous watt can be defined as

(*a*) the unit of rating of a synchronous machine

(*b*) the unit of torque defined at radius unit

(*c*) the torque which, at the synchronous speed of the machine under consideration, would develop a power of 1 watt

(*d*) the unit of the power when the power factor in the power equation is omitted

**135.** The synchronous wattage of an induction motor equals the power transferred across the air gap to the rotor in the induction motor.

(*a*) true (*b*) false

**136.** When it is said that an induction motor is developing a torque of 900 synchronous watts, it means that the rotor input is 900 watts, and that torque is such that the power developed would be 900 watts, provided the rotor was running synchronously and developing the same torque.

(*a*) true (*b*) false

**137.** The power output of an induction motor will be maximum when

(*a*) the equivalent load resistance is equal to the standstill reactance of the motor

(*b*) the equivalent load resistance is equal to the resistance of the rotor

(*c*) the equivalent resistance is equal to the standstill leakage impedance of the motor

(*d*) the slip is zero

**138.** The complete circle diagram of an induction motor can be drawn with the help of data found from

(*a*) no load test

(*b*) blocked rotor test

(*c*) (*a*) and (*d*) both

(*d*) (*a*), (*b*), and stator resistance test

**139.** The transformation ratio of the induction motor cannot be defined in terms of stator and rotor currents.

(*a*) true (*b*) false

**140.** The maximum torque of an induction motor varies directly as standstill reactance of the rotor.

(*a*) true (*b*) false

**141.** The value of the transformation ratio of an induction motor can be found by

(*a*) short circuit test only (*b*) open circuit test only

(*c*) slip test (*d*) stator resistance test

**142.** The power scale of the circle diagram of an induction motor can be found from

(*a*) no load test only (*b*) short circuit test only

(*c*) stator resistance test (*d*) none of the above

**143.** The starting torque of an induction motor cannot be determined from the circle diagram.

(*a*) true (*b*) false

**144.** It is advisable to avoid line-starting of an induction motor and use the starter because

(*a*) starting torque is very high

(*b*) the motor takes five to seven times its full load current

(*c*) it will pick up very high speed and may go out of step

(*d*) it will run in reverse direction

**145.** The induced E.M.F. in the rotor of an induction motor is proportional to

(*a*) supply voltage only

(*b*) relative velocity between flux and rotor conductors

(*c*) (*a*) and (*b*) both

(*d*) slip

**146.** The relation between maximum torque and full load torque ($T_{max}$, $T_f$ respectively) when referred to an induction motor is given by

(*a*) $\dfrac{T_f}{T_{max}} = \dfrac{2a}{(a^2 + s^2)}$ (*b*) $\dfrac{T_f}{T_{max}} = \dfrac{2}{(a^2 + s^2)}$

(*c*) $\dfrac{T_f}{T_{max}} = \dfrac{2as}{(a^2 + s^2)}$ (*d*) $\dfrac{T_f}{T_{max}} = \dfrac{a}{(a^2 + s^2)}$

where $s$ is the slip and

$$a = \frac{R^2}{X^2} = \frac{\text{Resistance of the rotor}}{\text{Reactance of the rotor}}$$

**147.** In the above question the relation between standstill torque ($T_s$) and maximum torque ($T_{max}$) is given by

(*a*) $\dfrac{T_s}{T_{max}} = \dfrac{2a}{1 + a^2}$ (*b*) $\dfrac{T_s}{T_{max}} = \dfrac{2a}{s^2 + a^2}$

(*c*) $\dfrac{T_s}{T_{max}} = \dfrac{2}{1 + s^2}$ (*d*) $\dfrac{T_s}{T_{max}} = \dfrac{2a}{s^2 + 1}$

**148.** The slip of the induction motor can be calculated if the rotor copper losses and rotor input are known.

(*a*) true (*b*) false

**149.** The auto-starters (using three auto-transformers) can be used to start cage-induction motors of the following type:

(*a*) star connected only (*b*) delta connected only

(*c*) (*a*) and (*b*) both (*d*) none of the above

**150.** The torque developed in the cage induction motor with auto-starter is

(*a*) $K \times$ torque with direct switching

(*b*) $K$/torque with direct switching

(*c*) $K^2 \times$ torque with direct switching

(*d*) $K^2$/torque with direct switching

where tapping of transformation ratio $K$ is used in case of auto-transformer.

**151.** Percentage tapping required of an auto-transformer for a cage motor to start the motor against $\dfrac{1}{4}$ of full load will be

(*a*) 70% (*b*) 71%

(*c*) 71.5% (*d*) 72.2%

when the short-circuit current on normal voltage is 4 times the full load and full load slip is 30%.

**152.** The start-delta switch is equivalent to the auto-transformer of ratio (when applied to delta-connected cage-induction motor)

(*a*) 57% (*b*) 56.5%

(*c*) 86.6% (*d*) 58% approximately

**153.** The rotor current can be reduced by introducing a star-connected resistance starter in the rotor circuit of the cage motor and slip ring motor as well.

(*a*) true (*b*) false

**154.** The slip-ring motor can be started under load conditions.

(*a*) true (*b*) false

**155.** The crawling in the induction motor is caused by

(*a*) improper design of the machine

(*b*) low voltage supply

(*c*) high loads

(*d*) harmonics developed in the motor

**156.** Cogging in the induction motor usually occurs at high voltage.

(*a*) true (*b*) false

**157.** The outer cage in the double squirrel cage motor has low-resistance copper bars.

(*a*) true (*b*) false

**158.** The torque/speed characteristics of a double squirrel cage-induction motor may be taken to be sum of two motors, one having a high resistance rotor and other a low resistance one.

(*a*) true (*b*) false

**159.** When the equivalent circuit diagram of double squirrel cage-induction motor is constructed the two rotor cages can be considered

(*a*) in parallel (*b*) in series parallel

(*c*) in series (*d*) in parallel with stator

**160.** The speed of the cage-induction motor cannot be controlled from the rotor side.

(*a*) true (*b*) false

**161.** Which of the following methods is easily applicable to control the speed of the squirrel cage-induction motor?

(*a*) Rotor rheostat control

(*b*) Operating two motors in cascade

(*c*) Injecting an E.M.F. in the rotor circuit

(*d*) Changing the number of stator poles

**162.** Rotor rheostat control to control the speed of the induction motor is only applicable to slip-ring induction motors.

(*a*) true (*b*) false

**163.** The injected E.M.F. in the rotor of an induction motor must have

(*a*) the same frequency as the slip frequency

(*b*) the same phase as the rotor E.M.F.

(*c*) high value for satisfactory speed control

(*d*) zero frequency

**164.** The additional stator winding is used in the compensated repulsion motor

(*a*) to improve power factor and provide better speed regulation

(*b*) to eliminate armature reaction

(*c*) to prevent hunting in the motor

(*d*) to provide mechanical balance

**165.** Repulsion start induction-run motors can be applicable to commercial refrigerators.

(*a*) true (*b*) false

**166.** The rotation of the repulsion induction motor can be reversed by the usual brush shifting arrangement.

(*a*) true (*b*) false

**167.** The power factor improvement of an A.C. series motor is possible by

(*a*) increasing the magnitude of inductance and armature winding

(*b*) decreasing the magnitude of reactance and armature winding

(*c*) equalizing the armature resistance to armature reactance

(*d*) none of the above

**168.** If the number of the turns on the field winding in an A.C. series motor is decreased, the speed of the motor increases but torque decreases.

The same torque can be achieved by

(*a*) increasing the number of turns on armature winding proportionately
(*b*) decreasing the number of turns on armature winding
(*c*) increasing armature resistance
(*d*) equalizing the armature resistance to the armature reactance

**169.** In conductively-compensated A.C. series motors, the compensating winding is

(*a*) connected in parallel with the armature
(*b*) short circuited and has no interconnection with the motor circuit
(*c*) connected in series with the armature
(*d*) none of the above

**170.** The current in inductively compensated winding of the A.C. series motor is proportional to the armature current and 180 degrees out of phase.

(*a*) true (*b*) false

**171.** The huge voltage, induced in the short-circuited coil (by transformer action) of an A.C. series motor when commutation takes place is neutralized by

(*a*) increasing inductance of the compensating winding
(*b*) increasing resistance of the compensating winding
(*c*) decreasing the number of turns in the compensating winding
(*d*) shunting the winding of each commutating pole with non-inductive resistance

**172.** A universal motor is defined as a motor which may be operated either on D.C. or single-phase A.C. supply at

(*a*) same output but different speeds
(*b*) same speed and different output
(*c*) approximately same output and same speed
(*d*) synchronous speed

**173.** It is preferred to use single turn coil in the armature of the single-phase A.C. series motors

(*a*) to facilitate commutation and avoid sparking at the brushes
(*b*) to reduce the resistance of the armature
(*c*) to reduce the reactance of the armature
(*d*) to reduce the weight of the armature

**174.** Which of the following motors is an unexcited single-phase synchronous motor?

(*a*) A.C. series motor
(*b*) Universal motor
(*c*) Repulsion motor
(*d*) Reluctance motor

**175.** Which of the following motors is most suitable for signalling devices and many kinds of timers?

(*a*) D.C. series motor
(*b*) A.C. series motor
(*c*) Induction motor
(*d*) Reluctance motor

**176.** Wide-open type slots in the design of the stator of an alternator will present which of the following disadvantages?

(*a*) The size of the machine will increase
(*b*) The size of the stator will increase
(*c*) Air gap flux is distributed in the tufts and produce ripples in the wave of generated E.M.F.
(*d*) None of the above

**177.** What kind of rotor is most suitable for turbo-alternators which are designed to run at high speed?

(*a*) Salient pole type
(*b*) Non-salient pole type
(*c*) (*a*) or (*b*)
(*d*) None of the above

**178.** The power developed in the alternator having a salient type rotor is less than that of having a non-salient pole.

(*a*) true
(*b*) false

**179.** The damping winding in synchronous motors is often used

(*a*) to prevent hunting only
(*b*) to prevent hunting and provide the starting torque
(*c*) to maintain proper synchronism
(*d*) to provide the starting torque only

**180.** Turbo-alternators are seldom characterized by small diameters and very long axial or rotor length.

(*a*) true
(*b*) false

**181.** The maximum speed of an alternator at power frequency of 50 Hz will be

(*a*) 3600 R.P.M.
(*b*) 3300 R.P.M.
(*c*) 3000 R.P.M.
(*d*) 1500 R.P.M.

**182.** Which of following statements is correct?

(*a*) Short pitched coils in the alternators are used to reduce the size of the machines

(*b*) Short pitched coils are used to reduce the harmonics or to eliminate the harmonics from the generated E.M.F.

(*c*) Short pitched coils are used to provide accurate phase difference of 120 degree to one phase to other

(*d*) Short pitched coils are used to reduce copper losses

**183.** The disadvantage of using short pitched coils in the alternator is that

(*a*) total induced E.M.F. is increased

(*b*) total induced voltage is reduced

(*c*) total induced voltage is distorted

(*d*) total induced voltage is more and hence more insulation is required

**184.** The coil span factor is defined as

(*a*) $\dfrac{\text{vector sum of induced E.M.Fs. per coil}}{\text{terminal voltage of the generator}}$

(*b*) $\dfrac{\text{arithmetic sum of induced E.M.Fs. per coil}}{\text{vector sum of induced E.M.Fs. per coil}}$

(*c*) $\dfrac{\text{vector sum of induced E.M.Fs. per coil}}{\text{arithmetic sum of induced E.M.Fs. per coil}}$

(*d*) $\dfrac{\text{arithmetic sum of induced E.M.Fs. per coil}}{\text{terminal voltage of the generator}}$

**185.** The induced E.M.F. in an alternator with distributed winding is always more than that of one with concentrating winding.

(*a*) true (*b*) false

**186.** A three-phase, 4-pole, 24-slots alternator has its armature coil short pitched by one slot. The distribution factor of the alternator will be

(*a*) 0.96 (*b*) 0.9

(*c*) 0.933 (*d*) 0.966

**187.** In case of an alternator, the power factor of the load has a considerable effect on the armature reaction, unlike D.C. generators.

(*a*) true (*b*) false

**188.** When the power factor of load is unity, the armature flux of an alternator will be

(*a*) demagnetizing

(*b*) cross-magnetizing

(*c*) square waveform

(*d*) in phase with current

**189.** When the load has power factor zero lagging, the main flux of the alternator will decrease.

(*a*) true (*b*) false

**190.** The armature reaction of an alternator will be completely magnetizing when

(*a*) load power factor is unity

(*b*) load power factor is zero lagging

(*c*) load power factor is zero leading

(*d*) load power factor is 7.0 lagging

**191.** Synchronous reactance is defined as the

(*a*) reactance due to armature reaction of the machine

(*b*) reactance of synchronous machine

(*c*) reactance due to leakage flux

(*d*) combined reactance due to leakage of flux and armature reaction

**192.** In case of leading load power factor, the terminal voltage of alternator will fall on removing the full load.

(*a*) true (*b*) false

**193.** The rise of the voltage of alternator when the load is thrown off is same as the fall in the voltage when full load is applied.

(*a*) true (*b*) false

**194.** Give the three methods of determining the voltage regulation of the alternator.

(*i*) Synchronous Impedance Method

(*ii*) M.M.F. Method

(*iii*) Potier Triangle Method

**195.** The synchronous impedance method will not give accurate voltage regulation because

(*a*) the value of synchronous impedance found is always less than actual value

(*b*) the value of synchronous impedance found is always less than the actual value

(*c*) the value of the synchronous impedance is independent of saturation

(*d*) the reactance due to armature reaction is considered separately

**196.** The value of the voltage regulation found by the M.M.F. method is always less than the actual value.

(*a*) true (*b*) false

**197.** Which of the following methods is better to find the voltage regulation?

(*a*) M.M.F. Method

(*b*) Potier Triangle Method

(*c*) Synchronous Impedance Method

(*d*) None of the above

**198.** The operation of connecting an alternator in parallel with another alternator or with common bus bar is known as

(*a*) proper machine (*b*) mechanizing

(*c*) synchronizing (*d*) asynchronizing

**199.** Give the three conditions for the proper synchronization of an alternator.

(*i*) The terminal voltage for the incoming alternator must be same as bus bar voltage

(*ii*) The speed of the incoming machine must be such that its frequency (= $PN/120$) equals bus bar frequency

(*iii*) The phase of the alternator voltage must be identical with the phase of the bus bar voltage. It means that switch must be closed at (or very near) the instant of the two voltages have correct relationship

**200.** In three-phase alternators, it is necessary to synchronize one phase only; the other phases will be synchronized automatically.

(*a*) true (*b*) false

**201.** When the alternators are running in proper synchronism the synchronizing power will be zero.

(*a*) true (*b*) false

**202.** If the two alternators are running in proper synchronism and the voltage of one machine is suddenly increased

(*a*) the machines will burn

(*b*) both machines will stop

(*c*) the synchronization torque will be produced to restore further synchronism

(*d*) synchronization cannot be attained automatically

**203.** If the input to the prime-mover of an alternator is kept constant but the excitation is changed, then

(*a*) the reactive component of the output is changed

(*b*) the active component of the output is changed

(*c*) the power factor of the load remains constant

(*d*) (*a*) and (*b*) takes place simultaneously

**204.** The load taken up by the alternator directly depends upon the driving torque, or in other words, upon the angular advance of its rotor.

(*a*) true (*b*) false

**205.** A synchronous motor is inherently a self-starting motor.

(*a*) true (*b*) false

**206.** The working of a synchronous motor is, in many ways, similar to

(*a*) the power transformer (*b*) the hydraulic motor

(*c*) the gear train arrangement

(*d*) the transmission of mechanical power by a shaft

**207.** The coupling angle or load angle of synchronous motor is defined as

(*a*) the angle between the rotor and the stator poles of same polarity

(*b*) the angle between the rotor and the stator poles of opposite polarity

(*c*) the angle between the rotor and the stator teeth

(*d*) none of the above

**208.** The coupling angle of a synchronous motor is independent of load.

(*a*) true (*b*) false

**209.** The torque developed by the synchronous motor is independent of the coupling angle.

(*a*) true (*b*) false

**210.** The back E.M.F. set up in the stator of a synchronous motor will depend on
(*a*) the rotor excitation only
(*b*) the rotor excitation and speed both
(*c*) the rotor speed only
(*d*) the coupling angle only

**211.** If the synchronous motor (properly synchronized to the supply) is running on no load and is having negligible loss, then
(*a*) the stator current will be very high
(*b*) the stator current will be zero
(*c*) the stator current will be very small
(*d*) the back E.M.F. will be more than the supply voltage

**212.** The maximum power developed in the synchronous motor will depend on
(*a*) the supply voltage only
(*b*) the rotor excitation only
(*c*) the rotor excitation and supply voltage both
(*d*) the rotor excitation, supply voltage and maximum value of coupling angle (90 degrees)

**213.** The armature current of the synchronous motor
(*a*) has large values for low excitation only
(*b*) has large values for high excitation only
(*c*) has large values for low and high excitation
(*d*) has large current for lagging excitation

**214.** The minimum armature current of the synchronous motor
(*a*) corresponds to 0.8 power factor
(*b*) corresponds to zero power factor
(*c*) corresponds to 0.866 power factor
(*d*) corresponds to unity power factor

**215.** The synchronous motor can be used as phase advancer.
(*a*) true (*b*) false

**216.** A synchronous capacitor is nothing but a synchronous motor running on no load with over-excitation.
(*a*) true (*b*) false

**217.** If the field of the synchronous motor is left short circuited and connected to supply through an auto-transformer

(*a*) the motor will run at its normal speed

(*b*) the motor will just crawl

(*c*) the motor will run as an induction motor

(*d*) the armature will burn because there is no back E.M.F. in the armature

**218.** The synchronous motor can be operated at desired power factor by varying the excitation to the motor.

(*a*) true (*b*) false

**219.** The rotary convertor can be used to

(*a*) convert A.C. to D.C.

(*b*) convert D.C. to A.C.

(*c*) convert linear motion to rotary motion

(*d*) (*a*) and (*b*) both

**220.** A rotary convertor is used to convert A.C. to D.C. but cannot be used to convert D.C. to A.C.

(*a*) true (*b*) false

**221.** A 2-kW single-phase rotary convertor operates at full load from 230 volts A.C. source. Assuming unity power factor and 100% efficiency the D.C. current will be

(*a*) 6 A (*b*) 6.15 A

(*c*) 8.7 A (*d*) 5 A

**222.** A rotary convertor can be run as a

(*a*) induction motor

(*b*) synchronous motor

(*c*) D.C. series motor

(*d*) D.C. compound motor

**223.** In the operation of poly-phase rotary convertors, which of the following should be introduced between the A.C. sources and slip rings?

(*a*) Amplifier (*b*) Rectifier

(*c*) Transformer (*d*) Diode

**224.** Which of the following statements is true?

(*a*) A rotary convertor can be called a synchronous invertor

(*b*) A rotary convertor can be called a synchronous convertor

(*c*) A rotary convertor can be called a synchronous diverter

(*d*) A rotary convertor can be called a synchronous capacitor

**225.** Which of the following rotary convertors is used in the standard practice?

(*a*) Single-phase rotary convertor

(*b*) Three-phase rotary convertor

(*c*) Six phase rotary convertor

(*d*) Twelve phase rotary convertor

**226.** For a given temperature rise and hence output, a six-phase convertor is smaller than three- or two-phase convertor.

(*a*) true (*b*) false

**227.** Give the four methods to control D.C. voltage of rotary convertor:

(*i*) By using tap changing transformer

(*ii*) Series reactance control method

(*iii*) Induction regular

(*iv*) Synchronous booster control method

**228.** The mercury-arc rectifier is used as

(*a*) convertor only (*b*) inventor only

(*c*) (*a*) and (*b*) both (*d*) transducer

**229.** The arc between the anode and cathode of a mercury-arc rectifier will persist

(*a*) when anode is at positive potential with respect to cathode

(*b*) when anode is at negative potential with respect to cathode

(*c*) when anode will repel the electrons

(*d*) when anode is at very low temperature

**230.** The purpose of introducing a reactor in the ignition circuit of a mercury-arc rectifier is

(*a*) to limit the rate of change of flux in the circuit

(*b*) to limit the voltage of the circuit

(*c*) to limit the rate of change of the current in the circuit

(*d*) to limit the current in the circuit

**231.** The advantage of using a larger phase mercury-arc rectifier is that

(*a*) they are easily available
(*b*) they work noiselessly
(*c*) they are very cheap
(*d*) their output is much smoother

**232.** The utility factor of a mercury-arc rectifier is defined as

(*a*) $\frac{\text{actual power}}{\text{full load rating}}$
(*b*) $\frac{\text{wattless power component}}{\text{full load rating}}$
(*c*) $\frac{\text{actual power}}{\text{half load rating}}$
(*d*) $\frac{\text{total A.C. input}}{\text{total D.C. output}}$
(*e*) $\frac{\text{total D.C. output}}{\text{total A.C. input}}$

**233.** Angle of overlap is related to

(*a*) diode rectifier
(*b*) silicon-controlled rectifier
(*c*) mercury-arc rectifier
(*d*) metal rectifier

**234.** Give the three types of voltage drop when a mercury-arc rectifier is on load:

(*i*) Reactance drop
(*ii*) Mean resistance drop
(*iii*) Arc voltage drop

**235.** The utilization factor of the six-phase mercury-arc rectifier is more than that of three-phase mercury-arc rectifier.

(*a*) true
(*b*) false

**236.** The utilization factor is maximum for

(*a*) three-phase mercury-arc rectifier
(*b*) six-phase mercury-arc rectifier
(*c*) twelve-phase mercury-arc rectifier
(*d*) single-phase mercury-arc rectifier

**237.** If the air gap of the induction motor is increased

(*a*) the power factor will increase
(*b*) the power factor will decrease
(*c*) the magnetizing current of the rotor will increase
(*d*) the magnetizing current of the rotor will decrease
(*e*) the speed of the motor will decrease

**238.** The squirrel cage-induction motor has

(*a*) one slip ring (*b*) two slip rings

(*c*) three slip rings (*d*) zero slip rings

**239.** What will happen if the supply terminals of a D.C. shunt motor are interchanged?

(*a*) Motor will stop

(*b*) Motor will run at its normal speed in the same direction as it was running

(*c*) The direction of rotation will reverse

(*d*) Motor speed will increase

**240.** An amplidyne can be used as

(*a*) a D.C. series motor (*b*) a D.C. shunt motor

(*c*) a D.C. compound motor (*d*) magnetic amplifier

**241.** The torque/slip characteristic of induction motor is shown; which is the unstable region?

(*a*) *A*

(*b*) *B*

(*c*) *C*

(*d*) *D*

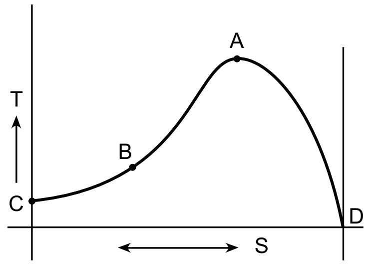


**Fig. Q. 241.**

**242.** Find the odd man out:

(*a*) tachometer (*b*) voltmeter

(*c*) ammeter (*d*) galvanometer

**243.** The mechanical load across the induction motor is equivalent to electrical load of

(*a*) $R_2\left(\frac{1}{s} + 1\right)$ (*b*) $R_2\left(\frac{1}{s} - 1\right)$

(*c*) $R_2\,(s - 1)$ (*d*) $1/R_2\,(s - 1)$

where $R_2$ is the resistance of the rotor in terms of secondary and $s$ is the slip of motor.

**244.** If the supply frequency to the transformer is increased, the iron loss

(*a*) will decrease (*b*) will increase

(*c*) will not change (*d*) will reach nearly zero

**245.** In D.C. motors, iron losses occur in
(*a*) the yoke
(*b*) the pole shoe
(*c*) the armature
(*d*) the field

**246.** With the use of high flux density in the transformer
(*a*) the size of core will decrease
(*b*) less copper will be used
(*c*) core losses will decrease
(*d*) voltage output will decrease

**247.** The induced E.M.F. in the armature of a D.C. machine rotating in the stationary field will be
(*a*) sinusoidal voltage
(*b*) direct voltage
(*c*) sinusoidal with even harmonics
(*d*) sinusoidal with old harmonics

**248.** The air gap between poles has
(*a*) no magnetic field
(*b*) no magnetic field unless the poles are far apart
(*c*) a strong magnetic field
(*d*) a magnetic field if the poles touch

**249.** Magnetic induction results in
(*a*) induced poles opposite from the original field poles
(*b*) induced poles the same as the original field
(*c*) two north poles
(*d*) an induced magnetic field but no induced pole

**250.** Which of the following statements is true?
(*a*) Iron, steel, and nickel are magnetic materials
(*b*) Copper, iron, steel, and air are magnetic materials
(*c*) Paper, wood, and steel are magnetic materials
(*d*) Iron is a magnetic material, but steel is non-magnetic

**251.** In an electromagnet
(*a*) current must flow through the coil to produce a magnetic field
(*b*) the magnetic field has the same strength with or without current
(*c*) current must flow but no voltage need be applied across the coil
(*d*) the coil must have high resistance for minimum coil current

**252.** The motor action in a wire conducting current can be produced
(*a*) without any additional magnetic field
(*b*) by moving the conductor from a weaker field towards stronger field
(*c*) by moving the conductor from stronger field towards weaker field
(*d*) by producing the motion by other than rotation

**253.** The requirement for producing induced voltage is
(*a*) magnetic flux moving across a conductor
(*b*) magnetic field moving across a dielectric
(*c*) an insulated wire free from any external magnetic field
(*d*) a bare wire moving parallel to an external magnetic field

**254.** A 5 : 1 voltage step up transformer has 120 volts across the primary and 600 ohms resistance across the secondary. Assuming 100% efficiency the primary current equals
(*a*) 1/5 amp (*b*) 500 ma
(*c*) 10 amps (*d*) 20 amps
(*e*) 5 amps

**255.** In a transformer, the voltage induced in the secondary winding must always be 90 degrees out of phase with the
(*a*) primary voltage (*b*) primary current
(*c*) secondary voltage (*d*) secondary current

**256.** A ferrite core has less eddy-current loss than an iron core because
(*a*) ferrites have low resistance (*b*) ferrites have high resistance
(*c*) ferrites have low permeability (*d*) ferrites have high hysteresis

**257.** Which of the following motors is usually used in household refrigerators?
(*a*) D.C. shunt motor
(*b*) Reluctance motor
(*c*) Single-phase induction motor (split-phase start or induction run motor)
(*d*) Synchronous motor

**258.** If the refrigerator unit runs continuously maintaining cabinet cold, the failure of the unit is attributed to
(*a*) extreme hot weather conditions (*b*) poor door seal at gasket
(*c*) defective motor (*d*) defective thermostat

**259.** The maximum temperature permitted for Class A insulation is

(*a*) 180°C (*b*) 105°C

(*c*) 120°C (*d*) 155°C

**260.** The cotton, silk, paper, and wood are

(*a*) class A insulation (*b*) class Y insulation

(*c*) class H insulation (*d*) class B insulation

**261.** Rheostatic braking gives greater braking torque than plugging.

(*a*) true (*b*) false

**262.** Which of the following rules states that the direction of an induced current is always such that the magnetic field which it produces reacts in opposition to the change of flux?

(*a*) Thumb rule (*b*) Lenz's law

(*c*) Kirchhoff's law (*d*) Faraday's law

**263.** What conditions are necessary for an induced voltage to be created by means of rotation?

(*a*) A magnetic field

(*b*) Movably placed loops conductors (turns)

(*c*) Lump conductors

(*d*) (*a*) and (*b*) both

**264.** In the following diagram of a line conductor, in which direction do the magnetic lines of force run if the observer is looking in the direction of current?

(*a*) Counter-clockwise around the conductor

(*b*) Clockwise around the conductor

(*c*) Around the conductor

(*d*) Outside the conductor

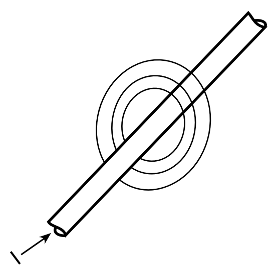


**Fig. Q. 264.**

**265.** Which of the following rules is applied to above question to find direction of magnetic lines?

(*a*) Left hand rule (*b*) Right hand rule

(*c*) Corkscrew rule (*d*) Lenz's law

**266.** In the adjacent figure, what kind of voltage is generated by linear movement of a horizontal or vertical loop in or counter to the direction of magnetic field?

(*a*) D.C. voltage

(*b*) A.C. voltage

(*c*) No voltage

(*d*) Pulse voltage

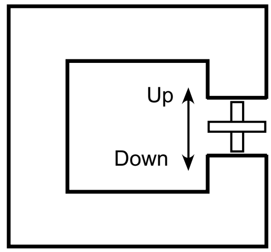


**Fig. Q. 266.**

**267.** What kind of voltage is induced in a loop conductor rotating in a homogeneous magnetic field?

(*a*) A.C.

(*b*) D.C.

(*c*) No voltage

(*d*) Pulse voltage

**268.** If a loop conductor is rotated in the magnetic field, a voltage is induced in it. This voltage increases only with the

(*a*) density of the magnetic lines of force

(*b*) active length of conductor in exciting field

(*c*) velocity of the loop

(*d*) length of conductor, velocity, and flux density

**269.** A loop conductor is rotated in a homogeneous magnetic field; the magnetic flux

(*a*) changes its intensity constantly

(*b*) changes its direction with constant density

(*c*) changes in intensity with its direction periodically

(*d*) changes its intensity with its direction randomly

**270.** The operation of the electric generator and motor is based on the interaction between

(*a*) magnetic field and electric field

(*b*) magnetic field and electric current

(*c*) electric field and law of induction

(*d*) law of induction and dynamo-electric principle

**271.** What type of current is normally used to excite synchronous and D.C. generators?

(*a*) D.C.

(*b*) A.C. single-phase

(*c*) A.C. three-phase

(*d*) A.C. two-phase

**272.** Under what conditions will an electromotive force be exerted on an electric conductor in a magnetic field?

(*a*) The conductor must have diameter

(*b*) The conductor must have current passing through it

(*c*) Magnetic field must be intensified

(*d*) The conductor must be in coil form

**273.** Which of the following statements is correct?

(*a*) A magnetic field exerts a force on-line conductor

(*b*) The cause of force effect lies in the fact that the original magnetic field and that of the line conductor affected each other

(*c*) The repulsion takes place in the direction of mutually reducing field forces

(*d*) All the above statements are correct

**274.** Which of the following transformers will have the smallest size with the same electrical specifications?

(*a*) Oil Natural Air Natural (ONAN) cooled transformer

(*b*) Dry type transformer

(*c*) Oil Natural Air Force (ONAF) cooled transformer

(*d*) Oil Forced Water Force (OFWF) cooled transformer

**275.** Which of the following includes motor and generator Standards?

(*a*) NIST

(*b*) NEMA

(*c*) T Standards

(*d*) R Standards

**276.** 1 H.P. is equivalent to

(*a*) 0.746 W

(*b*) 0.746 kW

(*c*) 7.46 W

(*d*) 7.46 kW

**277.** What kind of bushings will be used in the transformers above 33kV ratings?

(*a*) Porcelain type (*b*) Condenser type
(*c*) Oil-filled type (*d*) (*b*) or (*c*)

**278.** If the percentage reactance of a power is 5.0, what will be the per unit reactance?

(*a*) 0.05 (*b*) 0.4
(*c*) 1.0 (*d*) 0.5

**279.** The eddy current loss in the transformer occurs in the

(*a*) primary winding (*b*) secondary winding
(*c*) laminations (*d*) none of the above

**280.** A transformer with output of 250 kVA at 3300 volts, has 1000 turns on its primary winding and 100 turns on secondary winding. What will be the transformation ratio of the transformer?

(*a*) 10 (*b*) 4
(*c*) 5 (*d*) 3

**281.** In Question 280, what will be the primary rated voltage of the transformer?

(*a*) 33,000 V (*b*) 1650 V
(*c*) 16,500 V (*d*) 1500 V

**282.** The speed-torque characteristics for single-phase induction motor shown to the right

(*a*) shaded pole motor
(*b*) split-phase motor
(*c*) capacitor-start motor
(*d*) repulsion-start run motor

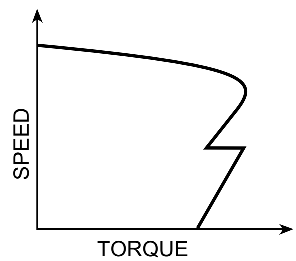


**Fig. Q. 282.**

**283.** The induced E.M.F. in one phase of the rotor winding is 120 V when the rotor is blocked and, the resistance and reactance per phase of stator winding are 0.2 Ω and 0.3 Ω respectively. What will be the rotor current?

(*a*) 330 A (*b*) 332 A
(*c*) 250 A (*d*) 200 A

**284.** A circuit for the auto transformer is shown to the right. Point *b* is located half way between terminals *a* and *c*. The resistance of the entire winding is 0.1 ohm, and the resistance of the position *bc* is 0.40 ohm. What will be the copper loss at an output of 10 A when the exciting current is neglected?

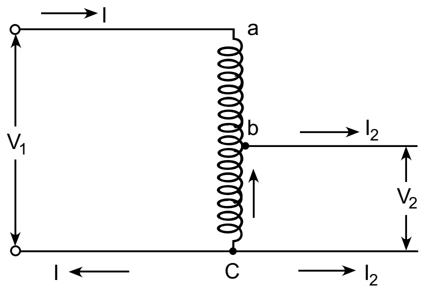


**Fig. Q. 284.**

(*a*) 6 Watts
(*b*) 2.5 Watts
(*c*) 10 Watts
(*d*) 4 Watts

**285.** In the figure of Question 284, if the reactance of part *ab* is 0.2 ohm and that of the common part is 0.1 ohm, what will be the input current if primary voltage is 20 V?

(*a*) 60 A (*b*) 33.3 A
(*c*) 63.3 A (*d*) 30 A

**286.** What will wattmeter indicate is connected across supply line in the figure of Question 284, provided $V_1$ = 20 V and reactance of *ab* is 0.2-ohm, reactance of common part is 0.1 ohm and the core loss is neglected?

(*a*) 200 Watts (*b*) 100 Watts
(*c*) 500 Watts (*d*) 400 Watts

**287.** A series motor has 2 poles and 95 turns per pole. The resistance of 2 field coils connected in series is 3.02 ohms. The voltage drop across the field is 62 V and current is 3.55 A at 60 Hz. What will be the field reactance?

(*a*) 27 ohms (*b*) 60 ohms
(*c*) 17.2 ohms (*d*) 68 ohms

**288.** The armature winding of a repulsion motor is excited

(*a*) conductively (*b*) inductively
(*c*) resistively (*d*) none of the above

**289.** The armature winding of a series motor is excited

(*a*) conductively (*b*) inductively
(*c*) resistively (*d*) none of the above

**290.** Which of the following parameters contributes to friction loss in the alternators?

(*a*) Temperature
(*b*) Lubrication of bearings
(*c*) Load variation
(*d*) Velocity of the shaft
(*e*) All of the above parameters

**291.** The difference between input and $I^2R$ loss will give the

(*a*) friction loss
(*b*) windage loss
(*c*) core loss
(*d*) sum of (*a*), (*b*), and (*c*)

**292.** The friction, windage and core losses of an alternator can easily be determined by

(*a*) running the alternator at synchronous speed
(*b*) running the alternator as a synchronous motor at rated speed at full load
(*c*) running the alternator as a synchronous motor at rated speed at no load
(*d*) none of the above

**293.** The eddy-current loss in the alternator will be minimum if the air gap

(*a*) between poles and the slots of the armature is large compared to width of the slot
(*b*) between poles and the slots of the armature is minimum compared to width of the slot
(*c*) does not exist
(*d*) none of the above

**294.** Eddy current losses in the alternator are

(*a*) dependent on the load
(*b*) independent of the load
(*c*) dependent on the excitation
(*d*) (*b*) and (*c*) both
(*e*) none of the above

**295.** The skewing of the rotor bars of the induction motor

(*a*) will reduce the induced voltage in each bar to a value less than if the bars were unskewed

(*b*) will increase the induced voltage in each bar to a value more than if the bars were unskewed

(*c*) increase the cogging

(*d*) increase the motor noise

**296.** Which of the following motors have almost constant speed over their full load range?

(*a*) D.C. series motors

(*b*) A.C. series motors

(*c*) D.C. shunt motors

(*d*) Low resistance squirrel cage motors

(*e*) (*c*) and (*d*) both

**297.** If two wound-rotor induction motors are arranged so that the stator of one is connected to an external source and its rotor output is connected to the other, what will be the input conditions for the other induction motor?

(*a*) The second motor will run at its own slip but at the voltage of the first motor

(*b*) The second motor will run at the slip frequency and voltage of the first motor

(*c*) The second motor will not run

(*d*) The second motor will act as frequency converter

**298.** In Question 297, the first motor acts as a

(*a*) voltage converter

(*b*) frequency converter

(*c*) current converter

(*d*) power converter

**299.** In Question 297, the slip frequency of the second motor

(*a*) is the difference between its applied frequency and its frequency of rotation

(*b*) is the difference between of slip-frequency first motor and its frequency of rotation

(*c*) (*a*) or (*b*)

(*d*) none of the above

**300.** Four speed-torque curves are shown below; which of the curves is drawn for repulsion start induction run?

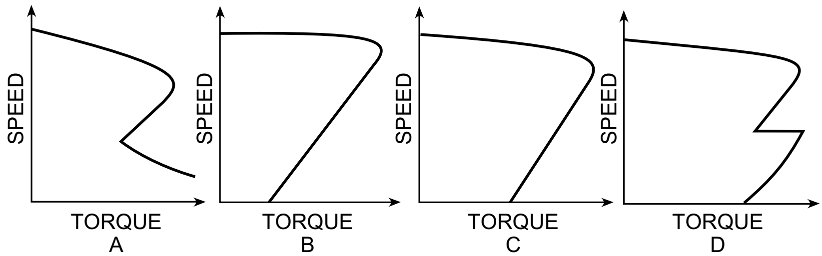


**Fig. Q. 300.**

(*a*) A (*b*) B

(*c*) C (*d*) D

**301.** The torque developed in a D.C. motor depends on

(*a*) armature current

(*b*) magnetic field

(*c*) magnetic field and armature current

(*d*) speed

**302.** The speed regulation of a D.C. motor can be ideally achieved with

(*a*) variable excitation to the field of the motor

(*b*) constant excitation to the field of the motor

(*c*) A.C. excitation to the field of the motor

(*d*) no excitation to the field of the motor

**303.** If the excitation to the field of the D.C. motor is constant, then the torque developed in the motor is proportional to

(*a*) armature current (*b*) field current

(*c*) speed (*d*) magnetic flux

**304.** For which of the following machines is residual magnetism a requirement to build up voltage output?

(*a*) Separately excited generator

(*b*) Self-excited generator

(*c*) All A.C. generators

(*d*) None of them

**305.** What will happen to the D.C. generator if the field winding attains critical resistance?

(*a*) It will generate maximum voltage

(*b*) It will generate maximum power

(*c*) It will not develop voltage at all

(*d*) None of them

**306.** Which of the following conditions hold true for paralleling two D.C. generators?

(*a*) Their polarities must match

(*b*) Their phase sequences must match

(*c*) Their polarities and voltages must match

(*d*) (*b*) and (*c*) both

**307.** The armature voltage control is suitable if the D.C. machine is driven at

(*a*) constant current

(*b*) constant torque

(*c*) constant speed

(*d*) constant magnetic field

**308.** Which of the following parameters is controlled to achieve the variable speed of a D.C. drive?

(*a*) Magnetic field
(*b*) Armature resistance

(*c*) Voltage
(*d*) None of the above

**309.** The Ward Leonard method of speed control of a D.C. machine controls the speed below or above normal speed in clockwise and counter-clockwise direction.

(*a*) true
(*b*) false

**310.** Which of the following motors will one choose to drive the rotary compressor?

(*a*) Universal motor
(*b*) Synchronous motor

(*c*) D.C. series motor
(*d*) D.C. shunt motor

**311.** The electric current in the motor generates

(*a*) heat only
(*b*) magnetic field only

(*c*) (*a*) and (*b*)
(*d*) power only

**312.** Which of the following machines will be preferred to charge batteries?

(*a*) Series generator
(*b*) Series motor
(*c*) Shunt generator
(*d*) Compound generator
(*e*) Shunt motor
(*f*) None of the above

**313.** If the speed of a D.C. shunt motor is increased, the back E.M.F. of the motor will

(*a*) decrease
(*b*) increase
(*c*) remain same
(*d*) increase then decrease

**314.** The large number of slots in an induction motor

(*a*) provides better overload capacity
(*b*) reduces overload capacity
(*c*) provides bigger size of motor
(*d*) reduces the size of motor

**315.** The good power factor of an induction motor can be achieved if the average flux density in air gap is

(*a*) large
(*b*) small
(*c*) infinity
(*d*) absent

**316.** Why are D.C. motors preferred for traction applications?

(*a*) The torque is proportional to armature current
(*b*) The torque is proportional to the square root of armature current
(*c*) The speed is inversely proportional to the torque and the torque is proportional to the square of armature current
(*d*) Torque and speed are inversely proportional to armature current

**317.** Which of the following generating machines will offer constant voltage on all loads?

(*a*) Separately excited generator
(*b*) Self-excited generator
(*c*) Level compound generator
(*d*) All the above

**318.** The D.C. generator will be preferred if it has

(*a*) 100% regulation
(*b*) reduced regulation
(*c*) 10% regulation
(*d*) infinite regulation

**319.** The number of bushings in a transformer can be reduced if the tappings are provided
(*a*) at the phase ends
(*b*) at the high voltage side
(*c*) in the middle of the transformer
(*d*) on the low voltage side

**320.** Which of the following transformers will use oil natural cooling with tubes?
(*a*) 100 kVA (*b*) 800 kVA
(*c*) All the above transformers

**321.** An induction motor with 1000 R.P.M. speed will have
(*a*) 2 poles (*b*) 6 poles
(*c*) 4 poles (*d*) 8 poles

**322.** Which of the following equipment will draw the reactive power?
(*a*) Electrical iron (*b*) Tubelight
(*c*) Three-phase motor (*d*) Rectifier

**323.** The large number of narrow slots in the stator of an A.C. motor is preferred because
(*a*) it is easier to make narrow slots than wide open slots
(*b*) large number of narrow slots reduces motor noise
(*c*) large number of narrow slots reduces noise and tooth pulsation losses
(*d*) it helps in uniform distribution of flux

**324.** The number of parallel paths in wave winding of a machine is
(*a*) 4 (*b*) 6 (*c*) 2 (*d*) 8

**325.** The alternators are normally designed for the torque angle of the order of
(*a*) 3° to 15° (*b*) 2 rad to 3 rad
(*c*) 15° to 30° (*d*) 1° to 3°

**326.** Which material is used to insulate the segments of a commutator?
(*a*) Fiberglass (*b*) Plastic
(*c*) Mica (*d*) PVC

**327.** The brushes of electrical machines are made of
(*a*) carbon (*b*) copper
(*c*) cast iron (*d*) steel

**328.** If the resistance of the field winding of a D.C. generator is increased, then the output voltage

(*a*) increases

(*b*) decreases

(*c*) remains constant

(*d*) decreases proportional to the resistance of field winding

**329.** Which of the following generators will be preferred if they are required to be run in parallel?

(*a*) Series generators (*b*) Shunt generators

(*c*) Shunt and series generators (*d*) Compound generators

**330.** Two separately excited motors have

(*a*) excitation which is independent of load current

(*b*) the advantage over a self-excited motor in that it can be utilized for zero volt to its maximum rated capacity

(*c*) *a* and *b* both

(*d*) none of them

**331.** The armature voltage control of D.C. motor provides

(*a*) constant current drive (*b*) constant voltage drive

(*c*) constant torque drive (*d*) constant torque drive

**332.** The field current control of D.C. shunt motors will provide

(*a*) constant current drive (*b*) constant voltage drive

(*c*) constant HP drive (*d*) constant torque drive

**333.** Which of the following methods of speed control of D.C. machines will offer minimum efficiency?

(*a*) Armature control method (*b*) Field control method

(*c*) Voltage control method (*d*) All above methods

**334.** In which of the following methods of speed control is computation unsatisfactory?

(*a*) Field control method

(*b*) Voltage control method

(*c*) Armature current control method

(*d*) All above methods

**335.** Dynamic braking can be used for
(*a*) series motors
(*b*) shunt motors
(*c*) compound motors
(*d*) all above motors

**336.** Plugging gives the
(*a*) smallest torque braking
(*b*) highest torque braking
(*c*) zero torque braking
(*d*) none of them

**337.** Which method of braking will be selected if the highest braking torque is required?
(*a*) Plugging
(*b*) Dynamic braking
(*c*) Counter current braking
(*d*) Regenerative braking
(*e*) (*a*) or (*c*)

**338.** If the terminals of the armature of a D.C. machine are interchanged, this action will offer following kind of braking:
(*a*) plugging
(*b*) regenerative
(*c*) dynamic braking
(*d*) any of the above

**339.** If a D.C. motor designed for 45°C ambient temperature is to be used for 55°C ambient temperature, then the motor
(*a*) is to be derated by a factor recommended by manufacturer and select next higher HP motor
(*b*) can be used for 55°C ambient also
(*c*) of lower HP should be selected
(*d*) of high speed should be selected

**340.** If we have to control the speed of a 150 HP D.C. motor from zero to 1000 R.P.M. having rated speed of 1500 R.P.M., it will be preferred to
(*a*) select a motor of 150 HP, 1500 R.P.M.
(*b*) select a motor of $1.5 \times 150$ HP, 1500 R.P.M.
(*c*) select a motor of 150 HP, 750 R.P.M.
(*d*) select a motor of 75 HP, 1500 R.P.M.

**341.** For which of the following three-phase alternators will the distribution factor be 0.96?

(*a*) 4 pole wound on 72 slots core

(*b*) 8 pole wound on 80 slots core

(*c*) 8 pole wound on 72 slots core

(*d*) 6 pole wound on 72 slots core

**342.** Which of the synchronous alternators will complete 1080 electrical degrees in one revolution?

(*a*) 8 pole synchronous alternator

(*b*) 6 pole synchronous alternator

(*c*) 4 pole synchronous alternator

(*d*) 10 pole synchronous alternator

**343.** How many cycles of alternating current will be generated in one revolution of an 8-pole synchronous alternator?

(*a*) 10 cycles (*b*) 4 cycles

(*c*) 8 cycles (*d*) 16 cycles

**344.** How many poles will be required if an alternator runs at 1500 R.P.M. and gives a frequency of 50 Hz?

(*a*) 8 poles (*b*) 6 poles

(*c*) 4 poles (*d*) 2 poles

**345.** Two generators are running in parallel. One generator may run as the motor for which of the following reasons?

(*a*) The speed of that generator is increased

(*b*) The direction that generator is reversed

(*c*) The generator takes a large share of loads

(*d*) The field of that generator is weakened

**346.** Which of the following statements is correct?

(*a*) A single-phase induction motor has a very high starting torque

(*b*) A single-phase induction motor has zero starting torque

(*c*) A single-phase starting torque is as good as that of a 3-phase induction motor

(*d*) A single-phase motor has very small torque but greater than zero

**347.** The primary applied voltage in an ideal transformer on no load is balanced by
(*a*) primary induced E.M.F. (*b*) secondary induced E.M.F.
(*c*) secondary voltage (*d*) core and copper losses

**348.** The air cores in transformers are preferred for
(*a*) low frequency transformers
(*b*) high frequency transformers
(*c*) 5 kVA, 50 Hz transformers
(*d*) none of these

**349.** The synchronous motor can be made self-starting by providing
(*a*) damper winding on rotor poles
(*b*) damper winding on stator
(*c*) (*a*) or (*b*)
(*d*) none of the above

**350.** The amplidyne is a
(*a*) fully compensated cross field machine
(*b*) half compensated cross field machine
(*c*) over-compensated cross field machine
(*d*) under-compensated cross field machine

# 3

# *MEASUREMENTS*

**1.** The torque produced in a wattmeter is proportional to

(*a*) the average value of currents in the two coils

(*b*) the R.M.S. value of currents in the two coils

(*c*) the average value of the supply voltage

(*d*) none of the above

**2.** Dielectric heating is used for heating

(*a*) wood (*b*) steel billets

(*c*) zinc cells (*d*) furnace

**3.** To measure the E.M.F. of a Weston standard cell one would use

(*a*) a moving coil voltmeter

(*b*) a hot wire voltmeter

(*c*) an electrostatic voltmeter

(*d*) galvanometer

(*e*) potentiometer

**4.** Which resistor would have a larger volume?

(*a*) 1 ohm, 54-watt resistor

(*b*) 500 ohms, 5-watt resistor

**5.** Which of the following is the best conductor?

(*a*) Copper (*b*) Aluminium

(*c*) Silver (*d*) Iron

**6.** The resonant frequency of an *R-L-C* circuit can be changed

(*a*) by changing inductance only

(*b*) by changing inductance or capacitance

(*c*) by changing resistance only

(*d*) by changing capacitance only

**7.** Dielectric loss can be measured by

(*a*) energy meter
(*b*) Wheatstone bridge
(*c*) electrostatic wattmeter
(*d*) none of the above

**8.** The design of an inductance coil is desirable for

(*a*) low time constant
(*b*) high time constant
(*c*) zero time constant
(*d*) *R-C* time constant

**9.** Three-phase four-wire energy meter is used to measure

(*a*) three-phase balanced energy

(*b*) three-phase unbalanced energy

(*c*) single-phase energy

(*d*) two-phase energy

**10.** The potentiometer can be used to measure current.

(*a*) true
(*b*) false

**11.** The ampere-hour efficiency of a cell does not take into account the varying voltage of charge and discharge.

(*a*) true
(*b*) false

**12.** Watt-hour efficiency of a cell is always less than ampere-hour efficiency because

(*a*) it accounts for the varying voltage of charge and discharge

(*b*) charge volts are constant

(*c*) discharge volts are constant

(*d*) polarization is neglected

**13.** The capacity of a cell is measured in

(*a*) amperes
(*b*) volts
(*c*) ampere-hours
(*d*) watts

**14.** The capacity of a cell increases as the temperature increases.

(*a*) true (*b*) false

**15.** Gassing is the phenomenon which occurs in

(*a*) oil transformers (*b*) cells

(*c*) mercury-arc rectifiers (*d*) oil cylinders

**16.** The ampere-hour efficiency of a lead acid cell is

(*a*) 80% (*b*) 90 to 95%

(*c*) 72 to 80% (*d*) 85%

**17.** Gravity controlled instruments have scales which are not uniform but are crowded because

(*a*) balance weight is more than control weight

(*b*) current is proportional to deflection angle

(*c*) current is proportional to sin $\theta$, where $\theta$ is deflection angle

(*d*) balance weight itself is not uniform

**18.** Which of the following instruments will be used to measure alternating current?

(*a*) Moving iron voltmeter

(*b*) Permanent magnet type ammeter

(*c*) Induction type ammeter

(*d*) Moving iron (attraction type) ammeter

**19.** Eddy current damping cannot be used for moving iron instruments because

(*a*) the size of the instrument will increase

(*b*) eddy currents will pass through the iron and thereby cause loss

(*c*) the presence of a permanent magnet required for such purpose would affect the deflection and hence the reading of the instruments

(*d*) weight of the instrument will increase

**20.** The deflection of a hot wire instrument depends on

(*a*) instantaneous value of alternating current

(*b*) average value of current

(*c*) R.M.S. value of alternating current

(*d*) voltage

**21.** Which of the following instruments will be used measure 500 kV A.C. voltage?

(*a*) Moving coil voltmeter
(*b*) Electrostatic voltmeter
(*c*) Moving iron voltmeter
(*d*) Hot wire instrument

**22.** The steady speed of the disc in the energy meter is achieved when

(*a*) operating torque is equal to braking torque
(*b*) operating torque is half of braking torque
(*c*) braking torque is zero
(*d*) braking torque is more than operating torque

**23.** Creeping is the phenomenon which occurs in a

(*a*) voltmeter
(*b*) wattmeter
(*c*) energy meter
(*d*) ammeter

**24.** The induction type single-phase energy meter is a

(*a*) ampere-hour meter
(*b*) true watt-hour meter
(*c*) wattmeter
(*d*) VAR meter

**25.** Two holes are drilled in the disc of an energy meter on the opposite side of the spindle

(*a*) to reduce the weight of the disc for easy rotation
(*b*) to eliminate creeping on no load
(*c*) for proper ventilation
(*d*) to increase the deflection torque

**26.** Give three methods of localizing the short circuit fault in the cables

(*i*) Murray loop test
(*ii*) Varley loop test
(*iii*) Fisher loop test

**27.** This induction method of testing which is used for localization of ground faults in cables can be applied successfully when the cable has metallic sheath.

(*a*) true
(*b*) false

**28.** Which of the following instruments will be used to measure the temperature above 1400 degrees centigrade?

(*a*) Simple thermometer
(*b*) Electrical resistance pyrometer
(*c*) Thermo-electric pyrometer
(*d*) None of the above

**29.** The temperature coefficient of carbon is negative.

(*a*) true (*b*) false

**30.** Give the name of three-thermo junctions.

(*i*) Copper-constantan (*ii*) Silver-constantan

(*iii*) Iron-constantan

**31.** The thermo-electric E.M.F. of platinum with platinum-rhodium (alloy) at 500 degrees centigrade is

(*a*) 7.4 millivolts (*b*) 4.4 millivolts

(*c*) 5 millivolts (*d*) 1 millivolt

**32.** Which of the following statements is true?

(*a*) Alternating current and voltage waveforms do not in general contain even harmonics

(*b*) Alternating current and voltage waveforms in general do not contain odd harmonics

(*c*) Alternating current and voltage waveforms in general contain even harmonics

(*d*) Alternating current and voltage waveforms contain even and odd harmonics in general

**33.** The shape of the waveform when an E.M.F. whose wave contains harmonics is applied to a circuit is not, in general, the same as that of an impressed E.M.F. wave but depends upon resistance, capacitance, and inductance.

(*a*) true (*b*) false

**34.** The inductance in the circuit

(*a*) reduces the amplitude of harmonics in current wave

(*b*) enlarges the amplitude of harmonics in current wave

(*c*) does not affect the wave shape at all

(*d*) reduces the amplitude of the harmonics in the current wave and causes the latter to approach more nearly to the sinusoidal wave shape than E.M.F. wave

**35.** When the E.M.F. whose wave contains harmonics is applied to a resistive circuit, the current waveform is of the same form as that of the impressed E.M.F.

(*a*) true (*b*) false

**36.** The resonance effect can be used to ascertain whether any particular harmonics exist in an E.M.F. waveform.

(*a*) true (*b*) false

**37.** The power factor of a circuit in which voltage and current waves are non-sinusoidal requires the following definition:

(*a*) It is the cosine of the angle of phase difference between the voltage and current waves

(*b*) It is the cosine of the angle of phase difference between the two complex waves

(*c*) It is the cosine of the angle of phase difference between two "equivalent sine waves" having respectively R.M.S. values equal to those of the voltage and current in the circuit

(*d*) It is the sine of the angle of phase difference between the two complex waves

**38.** The electron beam in the cathode ray oscilloscope may be deflected by

(*a*) electrostatic field only

(*b*) electromagnetic field only

(*c*) (*a*) or (*b*)

(*d*) none of the above

**39.** The temperature at which the readings of Fahrenheit and Centigrade thermometers are the same is

(*a*) zero (*b*) 25°C

(*c*) –40°C (*d*) 32°C

**40.** The alloying element which really makes steel corrosion resistant is

(*a*) chromium (*b*) magnesium

(*c*) nickel (*d*) molybdenum

**41.** The resistance of the coil of a 1000-watt, 250 V electric lamp is

(*a*) 2.5 ohms (*b*) 6.25 ohms

(*c*) 62.5 ohms (*d*) 625 ohms

**42.** The rating of batteries is given by

(*a*) KW (*b*) ampere-hours

(*c*) KVA (*d*) VARh

**43.** A moving coil instrument can be used to measure
(*a*) low frequency alternating current
(*b*) high frequency alternating current
(*c*) direct current
(*d*) direct current and alternating current both

**44.** The cost of a capacitor increases as
(*a*) the size of the capacitor increases
(*b*) voltage rating of the capacitor increases
(*c*) microfarad rating of the capacitor increases
(*d*) none of the above

**45.** A 100 microfarad, 200 V capacitor will have larger size than a 10 microfarad, 200 V capacitor.
(*a*) true (*b*) false

**46.** The thermal time constant is the time
(*a*) to reach the final steady temperature if the initial rate of increase of temperature were maintained constant
(*b*) to reach 63% of final steady temperature
(*c*) to reach 86.6% of final steady temperature
(*d*) to reach 37% of final steady temperature

**47.** The current transformer can also be used to measure high D.C. current.
(*a*) true (*b*) false

**48.** Two voltmeters are connected in series. The atomic weight of Ag and Cu are 108 and 64 respectively. If 0.5 gm of copper is deposited in one voltmeter then mass of silver deposited in the second will be
(*a*) $0.5 \times 108/64$ gm
(*b*) $0.5 \times 64/108$ gm
(*c*) $0.5 \times 108/32$ gm
(*d*) $0.5 \times 32/108$ gm

**49.** The secondary of the current transformer is always short circuited through low resistance ammeter or low resistance

(*a*) to get accurate measurement

(*b*) to avoid excessive current in the primary

(*c*) to avoid the risk of high voltage because the unopposed primary M.M.F. will set up an abnormally high flux in the core which produces excessive core loss with high heating and a high voltage across the secondary of the transformer

(*d*) because the current in the primary is not determined by load in primary

**50.** The current in the primary of the potential transformer is determined by the load in primary.

(*a*) true (*b*) false

**51.** A 100:5 transformer is used in conjunction with a 5-amp ammeter. If latter reads 2.5 amps the line current will be

(*a*) $2.5 \times 100/5$ amps

(*b*) $2.5 \times 5/100$ amps

(*c*) $2.5 \times (5/100)^2$ amps

(*d*) $2.5 \times (100/5)^2$ amps

**52.** Which of the following circuits has no transients?

(*a*) Pure resistive circuit

(*b*) *L-C* circuit

(*c*) *R-L-C* circuit

(*d*) *R-L* circuit

**53.** Which of the following statements is true?

(*a*) A galvanometer with low resistance in series is an ammeter

(*b*) A galvanometer with high resistance in series is an ammeter

(*c*) A galvanometer with high resistance in parallel is a voltmeter

(*d*) A galvanometer with low resistance in parallel is a voltmeter

**54.** A voltage source can be converted into constant current source by adding

(*a*) low resistance in parallel with the voltage source

(*b*) high resistance in parallel with the voltage source

(*c*) low resistance in series with the voltage source

(*d*) high resistance in series with the voltage source

**55.** Permeability in the magnetic circuit is analogous to

(*a*) resistance in electrical circuit
(*b*) resistivity in electrical circuit
(*c*) conductivity in electrical circuit
(*d*) current density
(*e*) none of the above

**56.** Which of the following statements is correct?

(*a*) 1 volt = 1 wb
(*b*) 1 volt = 1 wb/second
(*c*) volt has no relation with Weber
(*d*) 1 volt = 1 wb-second

**57.** A conductor of length 100 cm moves right angle to a magnetic field of flux density of 2 wb/$m^2$ with the velocity of 25 m/second. The induced E.M.F. in the conductor will be

(*a*) 25 volts (*b*) 50 volts
(*c*) 75 volts (*d*) 100 volts

**58.** The ratio error in the current transformer is attributed to the

(*a*) wattless component of the current in the primary
(*b*) exciting current
(*c*) power factor of the primary
(*d*) leakage flux

**59.** The phase angle error of current transformer is of no importance if it is feeding an ammeter.

(*a*) true (*b*) false

**60.** Wheatstone bridge is analogous to

(*a*) cantilever (*b*) simple lever system
(*c*) gear train (*d*) mechanical clutch

**61.** The bridge by which inductance is measured in terms of capacitance and resistance is called

(*a*) Maxwell-Wein bridge (*b*) Wein bridge
(*c*) Anderson bridge (*d*) Schering bridge

**62.** The dielectric loss of capacitance can be measured by

(*a*) Owen bridge (*b*) Schering bridge
(*c*) Wein bridge (*d*) Maxwell bridge

**63.** A television receiver uses 240 watts from 60 volts power source

(*a*) 2 ma (*b*) 2 amps
(*c*) 240 amps (*d*) 60 amps
(*e*) 4 amps

**64.** The difference between power and energy is that

(*a*) power is the time rate of doing work while energy does not involve time
(*b*) energy is the time rate of doing work while power does not involve time
(*c*) energy is $V \times I$ without taking time into account
(*d*) power can be measured in watt-hours where energy cannot

**65.** If a one ampere current accumulates charge for 5 seconds, the resultant charge equals

(*a*) 2 coulombs (*b*) 10 coulombs
(*c*) 5 amps (*d*) 10 amps
(*e*) 5 coulombs

**66.** A 50 micro-ampere meter movement has 500 ohms resistance; what shunt resistance is required to extend the range to 250 micro-amperes?

(*a*) 111.1 ohms (*b*) 125 ohms
(*c*) 250 ohms (*d*) 50 ohms

**67.** To connect ammeter in series

(*a*) open the circuit at one point and use the meter to the circuit
(*b*) open the circuit at the positive and the negative terminals of the voltage source
(*c*) short the resistance to be checked and connect the meter across it
(*d*) open the circuit at one end and connect the meter to one end

**68.** A voltmeter using 50 micro-ampere meter movement has a sensitivity of

(*a*) 500 ohms per volt (*b*) 5000 ohms per volt
(*c*) 2000 ohms per volt (*d*) 20,000 ohms per volt

**69.** To connect the voltmeter in parallel to read *IR* drop

(*a*) open the circuit at one end and use the meter to complete the circuit
(*b*) open the circuit at two points and connect the meter across both points
(*c*) let remain the circuit as it is and connect the meter across the resistance
(*d*) allow the circuit to remain closed but disconnect the voltage source

**70.** The shunt used in the milliammeter

(*a*) will extend the range and reduce the meter resistance
(*b*) will extend the range and increase the resistance
(*c*) will decrease the range and meter resistance
(*d*) will decrease the range but increase the inter resistance

**71.** To check the continuity of the circuit by multimeter, the best of the following ranges to use is $R \times$

(*a*) 1,000
(*b*) 10,000
(*c*) 100,000
(*d*) 1

**72.** The applied voltage to the circuit being checked is disconnected when an ohmmeter is used because

(*a*) the voltage source will increase the resistance
(*b*) the current will decrease the resistance
(*c*) the ohmmeter has its own battery
(*d*) no current is needed for matter movement

**73.** When the voltage is measured by a multimeter, the multiplier for voltage is

(*a*) a high resistance in series with the meter movement
(*b*) a high resistance in parallel with the meter movement
(*c*) less than one ohm in series with the meter movement
(*d*) less than one ohm in parallel with the meter movement

**74.** A VTVM has negligible loading effect on the circuit being checked because it has

(*a*) a high resistance range of $R \times 1$ M $\Omega$
(*b*) high input resistance of 11 M$\Omega$ or more
(*c*) low current ranges of 59 micro-ampere or less
(*d*) low input resistance equal to the lowest value on the $R \times 1$ range

**75.** The Wheatstone bridge is used to measure

(*a*) low value of current
(*b*) high value of current
(*c*) high value of voltage
(*d*) low value of voltages
(*e*) resistance value

**76.** The insulating materials are used to

(*a*) conduct very large current
(*b*) present an open circuit between the voltage source and the load
(*c*) prevent short circuit between conducting wires
(*d*) store very high currents

**77.** The internal resistance of the milliammeter must be very low for

(*a*) high sensitivity
(*b*) high accuracy
(*c*) maximum voltage drop across the meter
(*d*) minimum effect on the current in the circuit

**78.** The internal resistance of the voltmeter must be very high to have

(*a*) high voltage range
(*b*) minimum current through the meter
(*c*) maximum loading effect
(*d*) more current supplied by the voltage source

**79.** The total flux of 5000 lines equals

(*a*) 126 gilberts
(*b*) 5,000 gauss
(*c*) 5,000 maxwells
(*d*) 16,000 kilolines

**80.** The flux of 4,000 lines through 4 cm$^2$ equals a flux density of

(*a*) 1,000 gauss
(*b*) 2,000 gauss
(*c*) 4,000 gauss
(*d*) 16,000 gauss

**81.** The flux density of 2,000 gauss equals

(*a*) 2,000 lines per cm$^2$
(*b*) 2,000 lines per cm$^2$
(*c*) 2,000 kilolines per cm$^2$
(*d*) 400,000 lines per cm$^2$

**82.** In Ohm's law for magnetic circuit

(*a*) M.M.F. corresponds to current

(*b*) gilbert corresponds to volt

(*c*) reluctance corresponds to ampere

(*d*) gauss corresponds to ohm

**83.** In the given circuit how much the voltmeter will read?

(*a*) 0 volt (*b*) 10 volts

(*c*) 4 volts (*d*) 5 volts

(*e*) 3.33 volts

**84.** A voltage source and a voltmeter have

(*a*) zero and ideally infinite zero input impedances respectively

(*b*) ideally infinite and zero input impedances respectively

(*c*) high and low input impedances respectively

(*d*) none of the above

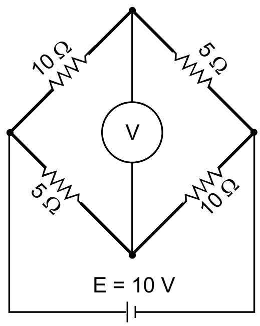


**Fig. Q. 84.**

**85.** The R.M.S. value of the following half wave with its maximum, $I_{max}$ is

(*a*) $I_{max}/2$

(*b*) $I_{max}/\sqrt{2}$

(*c*) $I_{max}$

(*d*) $I_{max}/\sqrt{3}$

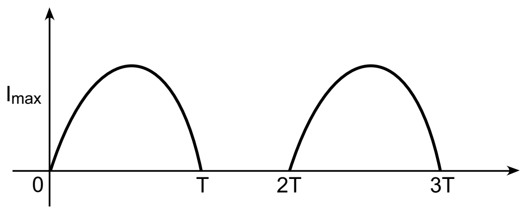


**Fig. Q. 85.**

**86.** Which of the following instruments will be used to measure a very high frequency but small current?

(*a*) Electrodynamic ammeter

(*b*) Moving coil galvanometer

(*c*) Thermocouple type instrument

(*d*) Induction type instrument

**87.** If $n$ identical cell of E.M.F. $E$ and internal resistance $r$ are connected in series, they produce a current through an external resistance $R$ equal to

(*a*) $nE/R + r$ (*b*) $nE/R$

(*c*) $nE/R + n.r$ (*d*) $E/R + r$

**88.** The hysteresis and eddy currents are used for

(*a*) dielectric heating (*b*) induction heating

(*c*) wood heating (*d*) none of the above

**89.** A dielectric between the plates of a capacitor

(*a*) decreases the capacitance

(*b*) increases the capacitance

(*c*) provides the strength to the capacitor plates

(*d*) none of the above

**90.** A rectifier type A.C. voltmeter

(*a*) generally uses the iron-vane type of A.C. movement

(*b*) has a linear scale because it uses a D.C. meter movement

(*c*) has a non-linear scale crowded at the left because it uses the dynamometer type of meter movement

(*d*) needs a thermocouple for low frequencies

**91.** The wattmeter

(*a*) has voltage and current coils to measure the real power

(*b*) has three connections, two of which are used at a time

(*c*) measures apparent power because the current is same in the voltage and current coils

(*d*) can measure D.C. power but not 60 cps A.C. power

**92.** Which of the following statements is true?

(*a*) The hysteresis loss can be determined from the area of B-H curve

(*b*) Eddy current loss is determined from the area of B-H curve

(*c*) Hysteresis and eddy current losses can be determined from the area of the B-H loop

(*d*) None of the above losses is determined from the B-H loop

**93.** The damping of the ballistic galvanometer is kept very small

(*a*) to make the system oscillating

(*b*) to get first deflection large

(*c*) to get first deflection small

(*d*) to make the system critically damped

**94.** The Grassot fluxmeter is a special type of ballistic galvanometer in which

(*a*) controlling torque is small and damping is heavy

(*b*) controlling torque and damping are large

(*c*) controlling torque is large but damping is small

(*d*) controlling torque and damping are small

**95.** Ballistic galvanometer can be used to measure the current and flux both.

(*a*) true (*b*) false

**96.** Which of the following frequency meters is suitable to measure radio frequency?

(*a*) Electrical resonance frequency meter

(*b*) Weston frequency meter

(*c*) Heterodyne frequency meter

(*d*) Either (*b*) or (*c*)

**97.** Enumerate the advantages of moving iron power factor meter over the dynamometer type power factor meter.

(*i*) Large working forces

(*ii*) A scale which extends to 360°

(*iii*) The absence of ligaments to lead in current to moving coils, all coils in the moving iron types being fixed

**98.** Enumerate the sources of errors in the moving coil instruments

(*i*) weakening of permanent magnets due to aging and temperature effect

(*ii*) weakening of spring due to aging and temperature effect

(*iii*) change of resistance of moving coil with temperature

**99.** Enumerate the errors in moving iron instruments with both A.C. and D.C.

(*i*) Hysteresis error

(*ii*) Stray magnetic fields

(*iii*) Temperature error

**100.** Enumerate the errors in moving iron ammeter with A.C. only

(*i*) frequency errors

(*ii*) reactance of instrument coil

(*iii*) eddy currents

**101.** For a good 0.5 micro-farad paper capacitor, the ohm-meter reading should

(*a*) go quickly to 100 ohms and remain there

(*b*) show low resistance momentarily and back off to a very high resistance

(*c*) not move at all

(*d*) show very high resistance first and then low

**102.** Which of the following errors may arise in wattmeter if it is not compensated for the errors?

(*a*) Voltage coil inductance
(*b*) Voltage coil capacitance
(*c*) Eddy currents
(*d*) (*a*), (*b*), and (*c*)

**103.** Which of the following methods is the commonest method of measuring three-phase balanced or unbalanced power?

(*a*) One wattmeter method
(*b*) Two wattmeter method
(*c*) Three wattmeter method
(*d*) Ammeter method

**104.** One-wattmeter method is used to measure

(*a*) the power when load is balanced in three-phase circuit

(*b*) the power when load is unbalanced in three-phase circuit

(*c*) (*a*) or (*b*)

(*d*) single-phase power with balanced load

**105.** The reactive power can be measured with wattmeter when voltage across voltage coil is adjusted to be out of phase with the current by

(*a*) 90°
(*b*) 180°
(*c*) 45°
(*d*) 0°
(*e*) 120°

**106.** The change of frequency affects the circuit parameters of wattmeter connected to measure the power of a three-phase A.C. system.

(*a*) true
(*b*) false

**107.** Which of the following devices are required to measure three-phase balanced power?

(*a*) one wattmeter

(*b*) one wattmeter and one voltage transformer of 1 : 1 ratio

(*c*) one wattmeter and two current transformers of 1 : 1 ratio

(*d*) either (*b*) or (*c*)

**108.** The total power $P$ measured in $Y$ star three-phase circuit is given by

($a$) $P = 3\,VI \cos \phi$
($b$) $P = \sqrt{I}\ \cos \phi$
($c$) $P = \sqrt{3}\,VI \cos \phi$
($d$) $P = \sqrt{2}\,VI \cos \phi$

where $V$ and $I$ are the line voltage and line current respectively.

**109.** In Question 108, the power in delta three-phase circuit is given by

($a$) $P = 3\,VI \cos \phi$
($b$) $P = \sqrt{3}\,VI \cos \phi$
($c$) $P = \sqrt{2}\,VI \cos \phi$
($d$) $P = \sqrt{3}\,VI \sin \phi$

**110.** The dynamometer wattmeter can be used to measure

($a$) A.C. power only
($b$) D.C. power only
($c$) A.C. or D.C. power
($d$) A.C. power of single-phase circuits

**111.** The pointer deflection of wattmeter is proportional to

($a$) torque produced in the wattmeter
($b$) voltage
($c$) current
($d$) power
($e$) ($a$) or ($b$)

**112.** Induction wattmeters can be used to measure

($a$) A.C. power
($b$) D.C. power
($c$) A.C. or D.C. power
($d$) A.C. power of single-phase only

**113.** Motor meters can be used to measure A.C. or D.C.

($a$) watt-hours
($b$) ampere-hours
($c$) current
($d$) voltage
($e$) ($a$) or ($b$)

**114.** Motor meters can be used to measure

($a$) A.C. energy
($b$) D.C. energy
($c$) A.C. or D.C. energy
($d$) none of the above

**115.** The one "unit" of energy measured in A.C. circuit is equivalent to

($a$) one watt-hour
($b$) one kilowatt-hour
($c$) one watt
($d$) one kilowatt
($e$) one joule

**116.** Which of the following energy meters is universally accepted to measure A.C. energy?

(*a*) Motor meter
(*b*) Induction type meter
(*c*) Mercury motor meter
(*d*) Reason electrostatic meter

**117.** Which of the following loads are dangerous for thermal heating of wattmeter even if meter reading is low?

(*a*) Loads with high value of power factor
(*b*) Loads with low value of power factor
(*c*) Chokes
(*d*) (*b*) and (*c*)

**118.** The eddy current torque on a metallic disc rotating between poles of a permanent magnet in an energy meter is directly proportional to the angular velocity of the disc.

(*a*) true
(*b*) false

**119.** If the reading of two wattmeters in two-wattmeter method of power measurement are 4 kW and 3 kW respectively and the latter reading obtained after reversing connection of the current coil of wattmeter, what will be the power?

(*a*) 6 kW
(*b*) 1 kW
(*c*) 4 kW
(*d*) 5 kW
(*e*) 7 kW

**120.** An A.C. potentiometer can be used to measure the loss in an iron ring made up of thin stampings.

(*a*) true
(*b*) false

**121.** Which thermocouple will one choose to measure the temperature of 500°C?

(*a*) Chromel Alumel (Cr Al)
(*b*) Iron Constantan (Fe K)
(*c*) Platinum-Platinum Rhodium (Pt Pt Rh)
(*d*) None of the above

**122.** Cr Al thermocouple can be used to measure the temperature up to

(*a*) 500°C
(*b*) 800°C
(*c*) 1200°C
(*d*) 1800°C

**123.** The output of thermocouple is in the range of

(*a*) volts (*b*) millivolts
(*c*) amperes (*d*) milliamperes

**124.** A resistance temperature detector (RTD) is used to sense the temperature. Which of the following converters will be used to receive a milliampere signal from RTD?

(*a*) $M_v/M_A$ converter (*b*) $A/M_A$ converter
(*c*) $R/M_A$ converter (*d*) None of the above

**125.** A moving iron instrument will not give erroneous reading up to frequency of

(*a*) 1000 Hz (*b*) 1500 Hz
(*c*) 2000 Hz (*d*) 5 kHz

**126.** Which of the following devices is used to measure the leakage resistance of a capacitor?

(*a*) Schering bridge method (*b*) Megger
(*c*) Potentiometric bridge (*d*) Loss of charge method

**127.** Eddy current error does not exist in

(*a*) D.C. moving iron instruments
(*b*) A.C. moving iron instruments
(*c*) (*a*) and (*b*) both
(*d*) none of the above

**128.** Capacitance cannot be measured with ballistic galvanometer.

(*a*) true (*b*) false

**129.** The movement of the moving element of an electrical indicator is dependent of

(*a*) restoring torque (*b*) number of turns of the coil
(*c*) resistance of the indicator circuit (*d*) (*a*) and (*c*) only
(*e*) (*a*), (*b*), and (*c*)

**130.** The ballistic galvanometer with high oscillation period and high critical resistance will be most suitable for the measurement of

(*a*) inductance (*b*) voltage
(*c*) capacitance (*d*) current

**131.** The internal resistance of an ammeter will be

(*a*) infinity (*b*) zero

(*c*) very small (*d*) large

**132.** The internal resistance of the voltmeter is

(*a*) zero (*b*) very high

(*c*) infinite (*d*) very small

**133.** Which of the following instruments will have poorest overloading capacity?

(*a*) Moving coil instruments

(*b*) Induction type instruments

(*c*) Permanent magnet instruments

(*d*) Hotwire instruments

**134.** The impulse ratio of any insulator is

(*a*) zero (*b*) unity

(*c*) less than unity (*d*) more than unity

**135.** The impulse ratio depends on the

(*a*) polarity of the impulse voltage

(*b*) steepness of the impulse wave-front

(*c*) time of decay of the impulse voltage

(*d*) all the above

**136.** "The magnetic strength is inversely proportional to the distance from the conductor in which the current flows." The above law is known as

(*a*) Lenz's Law

(*b*) Biot Law

(*c*) Biot and Savart's Law

(*d*) Ampere's Theorem

**137.** The value of magnetizing force $H = \dfrac{NI}{L}$ is true for a solenoid only when

(*a*) radius of the solenoid is more than length

(*b*) radius of the solenoid is much less than its length

(*c*) radius of the solenoid is equal to length of the solenoid

(*d*) number of turns are unlimited

**138.** The magnetization curve is shown below. The ratio of $\Delta B$ to $\Delta H$ is known as:

(*a*) Permeability

(*b*) Incremental permeability

(*c*) Flux density

(*d*) Incremental magnetization force

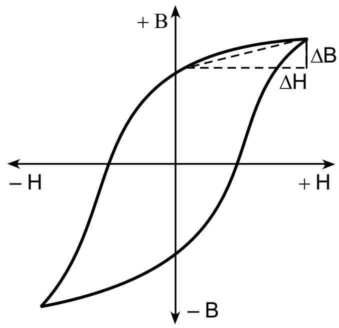


**Fig. Q. 138.**

**139.** Which of the following dimensions are for electrical charge?

(*a*) $LT^{-2}$

(*b*) $MLT^{-2}$

(*c*) $\varepsilon^{1/2} L^{3/2} M^{1/2} T^{-1}$

(*d*) $LT^{-1}$

**140.** Dimensions of the current are

(*a*) $LT^{-2}$ (*b*) $MLT^{-2}$

(*c*) $\varepsilon^{1/2} L^{3/2} M^{1/2} T^{-2}$ (*d*) $\varepsilon^{1/2} L^{2} M^{-1/2} T^{2}$

**141.** The dimensions of voltage are

(*a*) $ML^2 T^{-2}$ (*b*) $ML^2 T^{-2} Q^{-1}$

(*c*) $\varepsilon LT^{-1}$ (*d*) $M^{1/2} L^{1/2} \mu^{-1/2}$

**142.** If the dimensions of work done and time are given, will it be possible to find the dimensions of power?

(*a*) Yes (*b*) No

**143.** The dimensions of electric energy are given by

(*a*) $L^2 MT^{-2}$ (*b*) $L^2 MT^{-3}$

(*c*) $LT^{-3} \mu$ (*d*) $L\mu$

**144.** Which of the following quantities has same dimensions in electromagnetic and electrostatic systems?

(*a*) Electric power (*b*) Electric energy

(*c*) Current (*d*) (*a*) and (*b*) both

**145.** Which of the following outputs of the current transformers are commonly specified?

(*a*) 1 A, 10 A (*b*) 2 A, 20 A

(*c*) 1 A, 5 A (*d*) 0.1 A, 1 A

**146.** The power of a 6-phase circuit can be measured with minimum

(*a*) one wattmeter (*b*) three wattmeters

(*c*) five wattmeters (*d*) six wattmeters

**147.** The hot-wire instruments have more power consumption in comparison with other electrical instruments for similar instruments.

(*a*) true (*b*) false

**148.** Which of the following quantities is equivalent to one farad?

(*a*) $10^{-9}$ E.M.U. (*b*) $10^{-9}$ E.M.U.

(*c*) 10/9 E.M.U. (*d*) 9/10 E.M.U.

**149.** Most of the voltmeters for general use are designed for the power loss of

(*a*) 1 Watt (*b*) 5 Watts

(*c*) 0.2 to 0.5 Watts (*d*) 10 Watts

**150.** Which of the following quantities is equivalent to one henry?

(*a*) $10^{9}$ E.M.U. (*b*) $10^{-9}$ E.M.U.

(*c*) 10/9 E.M.U. (*d*) 9/10 E.M.U.

**151.** In moving iron instruments, the torque is proportional to

(*a*) inductance of instruments

(*b*) first derivative of inductance with respect to time

(*c*) first derivative of inductance of instruments with respect to deflection angle

(*d*) current

**152.** Which of the instruments are free from hysteresis and eddy current losses?

(*a*) Moving iron instruments

(*b*) Electrodynamometer type instruments

(*c*) Electrostatic instruments

(*d*) None of the above

**153.** Electrostatic instruments rely for their operation upon the

(*a*) current

(*b*) voltage

(*c*) fact that a force exists between the two plates having opposite charges

(*d*) power

**154.** Which of the following instruments can be used to measure only A.C. currents?

(*a*) Moving iron instruments

(*b*) Electrodynamic instruments

(*c*) Induction type instruments

(*d*) Hotwire instruments

**155.** The permeability of magnetic circuits is analogous to

(*a*) current of electrical circuits

(*b*) voltage of electrical circuits

(*c*) current density of electrical circuits

(*d*) resistance of electrical circuits

(*e*) conductivity of electrical circuits

**156.** The current ratio of current transformers is constant under all load conditions.

(*a*) true (*b*) false

**157.** The ratio error in the current transformers is largely dependent upon

(*a*) iron loss component of magnetizing current

(*b*) magnetizing component of the magnetizing current

(*c*) (*a*) and (*b*) both

(*d*) (*a*) or (*b*)

**158.** The material used for the core of a current transformer should have

(*a*) low reluctance and low iron loss

(*b*) high reluctance and high iron loss

(*c*) low reluctance and high iron loss

(*d*) high reluctance and low iron loss

**159.** What will happen if the secondary winding of the current transformer is opened when current is flowing in the primary current?

(*a*) There will be high current in the secondary winding

(*b*) There will be very high induced voltage in the secondary winding

(*c*) There will be very weak flux density in the core

(*d*) The transformer will burn immediately

**160.** When the secondary winding of the current transformer is opened, the ampere-turns of primary winding will

(*a*) increase (*b*) decrease

(*c*) remain same (*d*) be very small

**161.** Which of the following transformers have secondary current of same order as magnetizing current?

(*a*) Current transformer (*b*) Voltage transformer

(*c*) Power transformer (*d*) Distribution transformer

**162.** Turns compensation in the current transformers is used to

(*a*) eliminate phase angle error

(*b*) eliminate ratio error

(*c*) obtain a transformation ratio more nearly equal to nominal ratio of the transformer

(*d*) none of the above

**163.** The burden of the current transformer is 15 VA, and secondary current is 5 A. What will be the impedance of connected load?

(*a*) 6 ohms (*b*) 0.6 ohm

(*c*) 60 ohms (*d*) 5 ohms

**164.** What will be the secondary terminal voltage of the current transformer in Question 163?

(*a*) 4 V (*b*) 6 V

(*c*) 3 V (*d*) 12 V

(*e*) 1 V (*f*) 5 V

**165.** The inaccuracy in balancing the bridge circuit is attributed to

(*a*) temperature (*b*) thermal E.M.F.

(*c*) battery of circuit (*d*) resistance of the bridge

**166.** Which of the bridges will be used to measure the inductance in terms of the resistance and capacitance?

(*a*) Wein bridge (*b*) Schering bridge

(*c*) Anderson bridge (*d*) Maxwell bridge

**167.** The high quality factor $Q$ of the inductance can be measured by
(*a*) Hay bridge
(*b*) Anderson bridge
(*c*) Wein bridge
(*d*) Schering bridge

**168.** An additional ratio arm in the bridge circuit is used to counter-balance the
(*a*) leads resistances
(*b*) thermal E.M.F.
(*c*) observation errors
(*d*) temperature

**169.** The higher limit of the resistance measured by bridge methods is determined by contact resistances and resistance of connecting wires.
(*a*) true (*b*) false

**170.** The lower limit of the resistance measured by the bridge methods is determined by the sensitivity of the detector.
(*a*) true (*b*) false

**171.** Which of the following is used to measure low impedance components?
(*a*) Series connection $Q$-meter
(*b*) Parallel connection $Q$-meter
(*c*) (*a*) or (*b*)
(*d*) None of the above

**172.** Which of the following is used to measure the high impedance components?
(*a*) Parallel connection $Q$-meter
(*b*) Series connection $Q$-meter
(*c*) (*a*) or (*b*)
(*d*) (*a*) and (*b*) simultaneously

**173.** Ballistic galvanometer can be used to measure the mutual inductance.
(*a*) true (*b*) false

**174.** Which of the following bridges is called a Wein bridge?

(*a*) A (*b*) B

(*c*) C (*d*) D

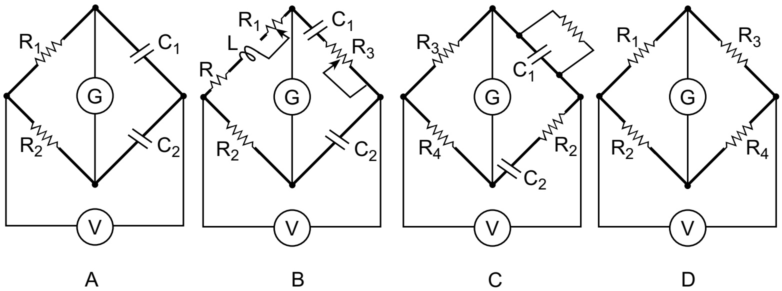


**Fig. Q. 174.**

**175.** Which of the following bridges will be used to measure low values of resistance?

(*a*) Wein bridge (*b*) Maxwell bridge

(*c*) Schering bridge (*d*) Anderson bridge

**176.** What will happen when quartz ($SiO_2$) crystal is compressed?

(*a*) The size of the crystal will be reduced

(*b*) There will be a great amount of heat because of molecule movement

(*c*) The electrical charges will be set up across the crystal ends

(*d*) The crystal will melt

**177.** The quartz ($SiO_2$) crystal is compressed to develop voltage across the ends; this phenomenon is known as:

(*a*) voltaic effect (*b*) piezo-electric effect

(*c*) Hall effect (*d*) photo-voltaic effect

**178.** A switchgear control consists of

(*a*) a main switch to isolate the apparatus from the supply

(*b*) fuses

(*c*) circuit breaker and fuses

(*d*) overvoltage relay

(*e*) interlocks and earth connections

(*f*) (*a*), (*c*), (*d*), and (*e*)

**179.** The peak factor of the sinusoidal wave is defined as:

(*a*) $\frac{\text{R.M.S. voltage}}{\text{peak voltage}}$  (*b*) $\frac{\text{peak voltage}}{\text{R.M.S. voltage}}$

(*c*) $\frac{\text{peak voltage}}{\text{average voltage}}$  (*d*) $\frac{\text{peak voltage}}{\text{D.C. voltage}}$

**180.** If the peak voltage is to be measured by "Rectified Capacitor Charging Current Method," the peak voltage is given by:

(*a*) $\frac{I_{\text{average}}}{4\text{ cf}}$  (*b*) $\frac{I_{\text{rms}}}{4\text{ cf}}$

(*c*) $\frac{I_{\text{dc}}}{4\text{ cf}}$  (*d*) $\frac{I_{\text{average}}}{\text{cf}}$

**181.** Which of the following voltmeters can indicate peak, R.M.S. alternating and D.C. high voltage?

(*a*) Electrostatic voltmeter
(*b*) Galvanometric voltmeter
(*c*) Ionic wind voltmeter
(*d*) Vacuum tube voltmeter

**182.** Following are the curves for different thermocouples. Which of the curves is drawn for platinum-platinum rhodium thermocouple?

(*a*) A  (*b*) B
(*c*) C  (*d*) D

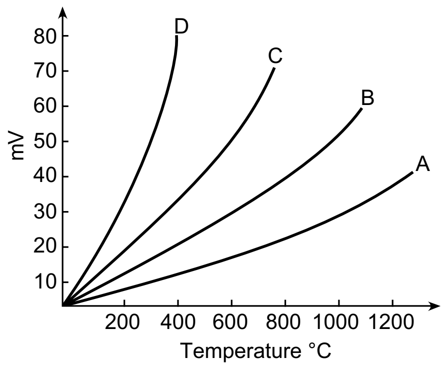

**Fig. Q. 182.**

**183.** Alundum is the name given to

(*a*) fused alumina
(*b*) fused fireclay
(*c*) fused alumina and fireclay
(*d*) fused platinum

**184.** The alternating current and voltage wave forms do not, in general, contain even harmonics.

(*a*) true  (*b*) false

**185.** If the voltage wave form having all odd harmonics is applied to the resistive circuit, then the current wave form will

(*a*) be like a voltage wave form

(*b*) be different from voltage wave form

(*c*) have even harmonics

(*d*) be sinusoidal

**186.** The primary winding of CT has

(*a*) thicker wire than secondary winding

(*b*) thinner wire than secondary winding

(*c*) same thickness as secondary winding

(*d*) more turns than secondary

**187.** The self-balancing potentiometer is used

(*a*) for experimental purpose in the laboratory

(*b*) for vibration measurements

(*c*) for industrial measurements

(*d*) in recorders

**188.** Which of the following bridges can be used to measure high frequency oscillations?

(*a*) Schering bridge (*b*) Anderson bridge

(*c*) Wein bridge (*d*) Maxwell bridge

**189.** Which of the methods will one choose for low resistance measurement?

(*a*) Schering bridge method (*b*) Maxwell bridge method

(*c*) Kelvin's double bridge method (*d*) Potentiometric method

**190.** Two voltmeters each with the range of 0–100 V and resistances 40,000 Ω and 10,000 Ω respectively are connected in series across the power supply source of 50 V. The voltmeters will indicate

(*a*) 40 V, 10 V respectively (*b*) 30 V, 20 V respectively

(*c*) 50 V, 0 V respectively (*d*) 20 V, 30 V respectively

**191.** A rectifier type instrument is used to measure D.C. voltage of 220V. What will the instrument indicate?

(*a*) 220 V (*b*) 110 V

(*c*) 178 V (*d*) 0 V

**192.** If a circuit has inductance of 20 H and 10 Ω resistance, after how many seconds will the current attain 63% of the steady state value, which is 24 A?

(*a*) 20 seconds (*b*) 2 seconds

(*c*) 1 second (*d*) 0.02 second

**193.** Which method can be used to measure the unbalance load of a three-phase system?

(*a*) One wattmeter method (*b*) Two wattmeter method

(*c*) Three voltmeter method (*d*) Three ammeter method

**194.** The one wattmeter method can only be used to measure balance load of the three-phase electric system.

(*a*) true (*b*) false

**195.** The wattmeter is connected in the three-phase balanced circuit as shown. The wattmeter will indicate

(*a*) active power

(*b*) wattless power

(*c*) reactive power

(*d*) (*b*) or (*c*)

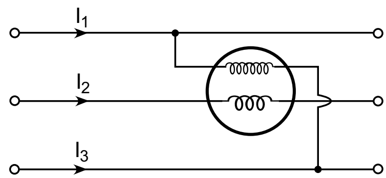


**Fig. Q. 195.**

**196.** The induction testing method is used to find which of the following faults in the cables?

(*a*) Short circuit fault (*b*) Earth fault

(*c*) Open circuit fault (*d*) (*b*) or (*c*)

**197.** The breakdown of the insulation of the cable will be termed as

(*a*) earth fault (*b*) short circuit fault

(*c*) open circuit fault (*d*) (*a*) or (*c*)

**198.** Loop tests are applied to find the

(*a*) ground fault of the cable

(*b*) open circuit fault of the cable

(*c*) short circuit fault of the cable

(*d*) (*a*) or (*c*)

**199.** The stroboscopic method can be used to measure the rotational speed of the electrical drives.

(*a*) true (*b*) false

**200.** The power factor meters have
(*a*) only current coil
(*b*) only voltage coil
(*c*) current and voltage coils both
(*d*) only inductive voltage circuit
(*e*) only inductive current circuit

**201.** Which of the following instruments have poor overload capacity?
(*a*) all electronics instruments
(*b*) galvanometric instruments
(*c*) wattmeters
(*d*) hot wire instruments

**202.** A voltmeter should have
(*a*) infinite resistance
(*b*) very high resistance
(*c*) low resistance
(*d*) zero resistance

**203.** The internal resistance of an ammeter should be
(*a*) infinite resistance
(*b*) very small resistance
(*c*) zero resistance
(*d*) high resistance

**204.** Find the odd man out.
(*a*) Copper Constantan
(*b*) Iron Constantan
(*c*) Platinum-Platinum Rhodium
(*d*) Lead Carbon
(*e*) Nickel Chromium

**205.** The quality factor meter operates on the principal of series resistance.
(*a*) true
(*b*) false

**206.** Which of the following instruments have self-balancing properties?
(*a*) Galvanometric type
(*b*) Potentiometric type
(*c*) Digital type
(*d*) Ammeters

**207.** Which of the following instruments are most susceptible to vibrations?
(*a*) Galvanometric type
(*b*) Potentiometric type
(*c*) Digital type
(*d*) Voltmeters

**208.** The source of reference voltage for A.C. potentiometers is a standard cell.
(*a*) true
(*b*) false

**209.** Which of the following transducers offer the best accuracy?
(*a*) Strain gauge type
(*b*) Diaphragm type
(*c*) Capacitance type
(*d*) Capsule type

**210.** The flow can be measured directly by
(*a*) pressure transducer
(*b*) differential pressure transducer
(*c*) differential pressure transducer and square root extractor
(*d*) pressure switch

**211.** The resolution of a digital ammeter with 3-digit display is
(*a*) 1/10000
(*b*) 1/1000
(*c*) 1/4
(*d*) 1/3

**212.** The accuracy of measuring instruments at high frequency
(*a*) decreases
(*b*) becomes zero
(*c*) increases
(*d*) does not change

**213.** How many coils are required in the megger?
(*a*) One
(*b*) Four
(*c*) Two
(*d*) Five

**214.** What will be the reading of megger if the measuring terminals are open circuited?
(*a*) Infinity
(*b*) 500 ohms
(*c*) Zero
(*d*) 10,000 ohms

**215.** Which of the following instruments will have same calibration on A.C. and D.C.?
(*a*) Moving coil instruments
(*b*) Moving iron instruments
(*c*) Induction type instruments
(*d*) Electrodynamometer instruments

**216.** The measurement of reproducibility of an instrument gives an
(*a*) resolution
(*b*) damping
(*c*) efficiency
(*d*) accuracy
(*e*) precision

**217.** The internal resistance of an instrument is normally based on the criterion that

(*a*) it draws large power

(*b*) the instrument can be connected in any circuit

(*c*) it does not change the parameters of the circuit to which this is connected

(*d*) it draws minimum power for its operation

**218.** The dynamic error of an instrument is defined as

(*a*) the difference in full scale reading and actual readings

(*b*) the difference in actual and indicated values

(*c*) the difference in two consecutive readings of the scale

(*d*) none of them

**219.** A multimeter normally employs

(*a*) the many potentiometers inside it

(*b*) only one coil with variable number of turns arrangement

(*c*) the multiple series or shunt resistance inside it

(*d*) the completely electronic circuit

**220.** Standard resistors are generally fabricated out of

(*a*) platinum (*b*) copper

(*c*) manganin (*d*) chromium

**221.** Air fraction damping is used for instruments which have

(*a*) very high magnetic field (*b*) very low magnetic field

(*c*) zero magnetic field (*d*) (*a*) or (*b*)

**222.** If the instrument scale is cramped for large values, then the scale is calibrated as per

(*a*) square scale law (*b*) uniform scale law

(*c*) logarithmic scale law (*d*) none of them

**223.** Generally, how many turns in the primary of CT are used?

(*a*) 2 (*b*) 1 to 5

(*c*) 5 to 10 (*d*) 10 to 40

**224.** Which method will be used for precision measurement of resistance?

(*a*) Voltmeter method
(*b*) Potentiometer method
(*c*) Multimeter method
(*d*) Megger test
(*e*) Bridge method
(*f*) CRO method

**225.** The major application of the self-balancing potentiometer is found in

(*a*) calibration instruments
(*b*) power systems
(*c*) electronics
(*d*) control systems

**226.** Radio frequency can be measured with

(*a*) resonance frequency meter
(*b*) Weston frequency meter
(*c*) heterodyne frequency meter
(*d*) any of the above

**227.** Rectifier instruments do not have the following errors:

(*a*) Temperature errors
(*b*) Wave shape errors
(*c*) Frequency errors
(*d*) (*a*), (*b*), and (*c*)

**228.** The sensitivity factor of strain gauges is normally of the order of

(*a*) 1 to 1.5
(*b*) 1.5 to 2
(*c*) 0.5 to 1
(*d*) 5 to 10

**229.** CT is used to

(*a*) step down the current
(*b*) step up the current
(*c*) step up the current but step down the voltage
(*d*) measure very high currents

**230.** Which of the following instruments has a poor overload capacity?

(*a*) Moving iron instrument
(*b*) Induction type instruments
(*c*) Electronic instruments
(*d*) Hot wire instruments

**231.** The pulse transformer employs

(*a*) air core
(*b*) iron core
(*c*) ferrite core
(*d*) none of these

**232.** The resolution of a potentiometer is

(*a*) zero
(*b*) very small
(*c*) very high
(*d*) proportional to its reference voltage

**233.** Which of the following potentiometers is supposed to have infinite resolution?

(*a*) Resistance potentiometer
(*b*) Deposited film potentiometer
(*c*) Kelvins potentiometer
(*d*) None of these

**234.** The LVDT can be used to measure

(*a*) level
(*b*) acceleration
(*c*) speed
(*d*) all of these

**235.** Which of the following recorders are known as null recorders?

(*a*) Strip chart recorders
(*b*) Galvanometric recorders
(*c*) Potentiometric recorders
(*d*) Any of the above

**236.** Null balance potentiometers are

(*a*) high frequency devices
(*b*) low frequency devices
(*c*) low frequency devices with frequency limit of 10 Hz
(*d*) independent of frequency

**237.** Potentiometric recorders have

(*a*) high sensitivity
(*b*) high sensitivity and independence of lead length
(*c*) low sensitivity
(*d*) none of these

**238.** The inductance of the current coil of a wattmeter is kept

(*a*) as high as possible
(*b*) as low as possible
(*c*) at 10 H
(*d*) at 1 to 10 H

**239.** The potential coil of a wattmeter is designed for

(*a*) very high inductance
(*b*) minimum inductance
(*c*) very low inductance
(*d*) 1 to 10 H

**240.** The potential coil of a wattmeter is designed for minimum inductance to

(*a*) achieve high phase difference between current and voltage
(*b*) keep current and voltage in same phase
(*c*) minimize the reactance of the coil
(*d*) increase the reactance of the coil

**241.** A lock-in amplifier

(*a*) detects a signal with a known frequency in the presence of background noise

(*b*) multiplies the input signal by reference signal with a known frequency

(*c*) is used to fix the output frequency of an amplifier

(*d*) answers (*a*) and (*b*)

**242.** A two-phase lock-in amplifier can detect in-phase and quadrature-phase components of a signal in the presence of background noise.

(*a*) true (*b*) false

**243.** Electronic noise with a $1/f^{\alpha}$ power spectral density with $\alpha \approx 1$

(*a*) $1/f$ noise (*b*) pink noise

(*c*) flicker noise (*d*) all the above

**244.** Noise with a uniform power spectral density

(*a*) flicker noise (*b*) white noise

(*c*) pink noise (*d*) all the above

**245.** Noise with a power spectral density slope close to -1 when plotted on a log-log scale

(*a*) $1/f$ noise (*b*) pink noise

(*c*) flicker noise (*d*) all the above

**246.** Pink noise is higher at low frequencies than at high frequencies

(*a*) true (*b*) false

**247.** White noise is higher at low frequencies than at high frequencies

(*a*) true (*b*) false

**248.** Magnetic shielding that more efficiently screens low frequency noise fields

(*a*) mu metal or permalloy (*b*) copper

(*c*) aluminium (*d*) brass

# 4

# *PASSIVE CIRCUITS AND ELECTROMAGNETIC FIELDS*

**1.** A 2 ohms resistor having 1 ampere current will dissipate the power of

(*a*) 2 Watts (*b*) 2 Joules

(*c*) 1 Watt (*d*) 1 Joule

**2.** When 2 volts E.M.F. is applied across a 1 farad capacitor, it will store the energy of

(*a*) 2 Joules (*b*) 2 Watts

(*c*) 4 Joules (*d*) 1 Watt

**3.** Thevenin's equivalent circuit can be used to calculate power loss in the original circuit.

(*a*) true (*b*) false

**4.** A 1 H inductance carrying the current number of amperes will store the energy of

(*a*) 2 Watts (*b*) 2 Joules

(*c*) 4 Watts (*d*) 4 Joules

**5.** An electrical circuit with 10 branches and 7 junctions will have

(*a*) 10 loop equations (*b*) 4 loop equations

(*c*) 3 loop equations (*d*) 7 loop equations

**6.** An electrical circuit with 8 independent nodes will have

(*a*) 10 node equations (*b*) 4 node equations

(*c*) 3 node equations (*d*) 7 node equations

**7.** If two windings having self-inductances $L_1$ and $L_2$ and a mutual inductance $M$ are connected in series with opposite polarity, then the total inductance of series combination will be

(*a*) $L_1 + L_2 - 2M$
(*b*) $L_1 + L_2 + 2M$
(*c*) $L_1 - L_2 + 2M$
(*d*) $L_1 + L_2 - M$

**8.** The parallel circuit resonance magnifies

(*a*) current
(*b*) voltage
(*c*) power
(*d*) none of the above

**9.** The power factor at resonance in an *R-L-C* parallel circuit is

(*a*) 0.5 lagging
(*b*) 0.5 leading
(*c*) unity
(*d*) zero

**10.** An inductive circuit of resistance 2 ohms and inductance 0.5 H is connected to a 250 volts, 50 Hz supply. What capacitance will be placed in parallel to produce resonance?

(*a*) 700 micro-farad
(*b*) 750 micro-farad
(*c*) 701 micro-farad
(*d*) 714 micro-farad
(*e*) 711 micro-farad

**11.** The current in resonance in a parallel *L-C* circuit will be

(*a*) very small
(*b*) very high
(*c*) zero
(*d*) infinity

**12.** Which of the following statements is true?

(*a*) A galvanometer with low resistance in series is an ammeter
(*b*) A galvanometer with high resistance in series is an ammeter
(*c*) A galvanometer with high resistance in parallel is a voltmeter
(*d*) A galvanometer with low resistance in parallel is a voltmeter

**13.** The time constant of the capacitance circuit is defined as the time during which voltage

(*a*) rises to 63.2% of its final steady value
(*b*) rises to 38.6% of its final steady value
(*c*) falls to 36.8% of its final steady value
(*d*) none of the above

**14.** Which of the following equations is Poisson's equation?

(*a*) $d^2V/dx^2 + d^2V/dy^2 + d^2V/dz^2 = 0$ (*b*) $d^2V/dx^2 = -\rho/\varepsilon_0$

(*c*) $d^2V/dx^2 + d^2V/dy^2 = 0$ (*d*) $d^2V/dx^2 + d^2V/dy^2 = \rho/\varepsilon_0$

**15.** The circuit whose properties are same in either direction is known as a

(*a*) reversible circuit (*b*) irreversible circuit

(*c*) unilateral (*d*) bilateral circuit

**16.** A passive network

(*a*) has no current source (*b*) has no E.M.F. source

(*c*) has neither of the above (*d*) has either of the above

**17.** If an electrical network having more than one voltage source is transformed into an equivalent electrical network with a single voltage source (which is an open circuit voltage of a previous circuit), then describe the series internal resistance of the network with all voltage sources replaced by their internal resistances.

The above statement is called

(*a*) reciprocity theorem (*b*) Thevenin's theorem

(*c*) superposition theorem (*d*) duality

**18.** In the circuit given below, the ammeter reads 0.1 ampere and voltmeter 10 volts. The internal resistance of the ammeter is 1 ohm and that of voltmeter is 500 ohms. What is the value of R?

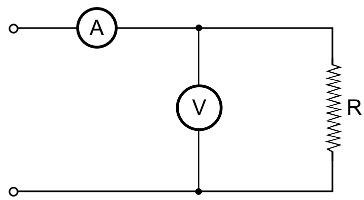


**Fig. Q. 18.**

(*a*) 110 ohms (*b*) 120 ohms

(*c*) 115 ohms (*d*) 112.5 ohms

(*e*) 125 ohms

**19.** In the circuit given below the power factor will be

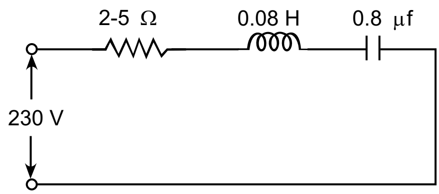


**Fig. Q. 19.**

(*a*) lagging (*b*) leading

(*c*) zero (*d*) unity

**20.** If $a = 4 \angle 20°$ and $b = 2 \angle 10°$, then the value of $a/b$, will be:

(*a*) $2 \angle 10°$ (*b*) $2 \angle 30°$

(*c*) $2 \angle -10°$ (*d*) $2 \angle 20°$

**21.** The conjugate of the complex quantity $(a + jb)$ will be

(*a*) $-a - jb$ (*b*) $-a + jb$

(*c*) $a - jb$ (*d*) $ja - b$

**22.** Mass in the MKS unit system is analogous to

(*a*) resistance (*b*) voltage

(*c*) inductance (*d*) capacitance

**23.** A damped oscillation has the equation $i = 50\, e^{-10t} \sin 628\, t$. What will be the frequency of an oscillation?

(*a*) 50 Hz (*b*) 75 Hz

(*c*) 100 Hz (*d*) 60 Hz

**24.** In a loss-free *R-L-C* circuit the transient current is

(*a*) sinusoidal (*b*) oscillating

(*c*) non-oscillating (*d*) square wave

**25.** A 0.5 meter-long conductor carrying a current of 2 amperes is placed in a magnetic field having the flux density of 0.05 wb/m$^2$. What will be the amount of force experienced by the conductor?

(*a*) 1 Nw (*b*) 2 Nw

(*c*) 0.05 Nw (*d*) 0.5 Nw

**26.** Two parallel conductors carry the same current in the same direction. What kind of mutual force they will experience?

(*a*) Repulsion (*b*) Attraction

(*c*) Zero (*d*) Either (*a*) or (*b*)

**27.** Which of the following statements is correct?

(*a*) The flow of current in the electric circuit involves discontinuous expenditure of energy

(*b*) The flow of current in the electric circuit requires energy for creating the current but not to maintain it

(*c*) In the magnetic circuit, energy is needed continuously to maintain the flux

(*d*) In the magnetic circuit, energy is needed for creating the flux initially but not to maintain it

**28.** If a coil has a resistance of 10 ohms and an inductance of 1 H, what will be the value of current 0.1 second after switching on a 500 V D.C. supply?

(*a*) 6.32 A (*b*) 3.16 A
(*c*) 3.7 A (*d*) 4.0 A

**29.** The R.M.S. value of an alternating current is given by steady (D.C.) current which, when flowing through a given circuit for a given time, produces

(*a*) the same heat as produced by A.C. when flowing through the same circuit
(*b*) less heat than produced by A.C. when flowing through the same circuit
(*c*) more heat than produced by A.C. when flowing through the same circuit
(*d*) 14.4 calories

**30.** In the case of an unsymmetrical alternating current, the average value must always be taken over

(*a*) the half cycle
(*b*) the whole cycle
(*c*) the unsymmetrical part of the waveform
(*d*) the quarter cycle

**31.** The average value of the alternating current is more than the R.M.S. value.

(*a*) true (*b*) false

**32.** The amplitude factor of sinusoidal voltage is

(*a*) 1.11 (*b*) 1.57
(*c*) 1.414 (*d*) 0.637
(*e*) 0.707

**33.** An electrical circuit is shown below, what will be the power dissipation in the circuit assuming $P$ as power across $R^2$?

(*a*) 3/4 $P$ (*b*) 2/3 $P$
(*c*) 4/3 $P$ (*d*) 3/2 $P$

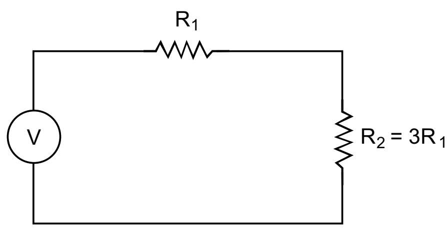


**Fig. Q. 33.**

**34.** The resistance of a few meters of wire conductor in a closed electrical circuit is

(*a*) very high (*b*) practically zero
(*c*) a few thousand ohm (*d*) close to 10,000 ohms

**35.** If two resistances are connected in parallel and each dissipates 10 watts, the total power supplied by the voltage source equals

(*a*) 5 watts (*b*) 10 watts

(*c*) 20 watts (*d*) 100 watts

**36.** If a parallel circuit is open in the main line, the current

(*a*) increases in each branch

(*b*) is zero in all branches

(*c*) is zero in the highest resistive branch

(*d*) increases in the branch of the lowest resistance

**37.** In a series parallel circuit, any two resistances in the same current path must be in

(*a*) parallel with each other

(*b*) parallel with the voltage source

(*c*) series with the voltage source

(*d*) series with each other

**38.** In a series parallel circuit with 6 resistances, if there are three in one parallel bank, these three resistances must have

(*a*) the same current as in the voltage source

(*b*) the same current

(*c*) the same *IR* drop

(*d*) an *IR* drop equal to the applied voltage

**39.** In which of the following circuits will most current be produced by the voltage source?

(*a*) 5 volts across a 5-ohm resistance

(*b*) 5 volts across two 5-ohm resistances in series

(*c*) 5 volts across two 5-ohm resistances in parallel

(*d*) 500 volts across a 1 M Ω resistance

**40.** Three 60-watt bulbs are in parallel across a 60 volt power line.
If one bulbs burns open

(*a*) The other two bulbs will not light

(*b*) All three bulbs will light

(*c*) The other two bulbs will light

(*d*) There will be heavy current in the main line

**41.** If a wire conductor of 0.1-ohm resistance is doubled in length, its resistance becomes

(*a*) 0.1 ohm (*b*) 0.02 ohm
(*c*) 0.2 ohm (*d*) 0.05 ohm

**42.** The hot resistance of a bulb filament is higher than its cold resistance because the temperature coefficient of the filament is

(*a*) negative (*b*) zero
(*c*) positive (*d*) about 5 ohms per degree

**43.** The square waveform of current has the following relation between R.M.S. value and average value:

(*a*) R.M.S. value of the current is greater than the average value
(*b*) R.M.S. value of the current is less than the average value
(*c*) R.M.S. value of the current is equal to average value
(*d*) there is no meaning of R.M.S. value and average value for square wave

**44.** There are no transient events in resistive circuits

(*a*) true (*b*) false

**45.** Transient currents are not driven by any part of the applied voltage to a circuit.

(*a*) true (*b*) false

**46.** Transient currents are associated with the

(*a*) applied voltage to the circuit
(*b*) changes in the stored energy in the inductors and capacitors
(*c*) resistance of the circuit
(*d*) impedance of the circuit

**47.** Double energy transients occur in the

(*a*) *R-L* circuit (*b*) *R-C* circuit
(*c*) pure inductive circuit (*d*) *R-L-C* circuit

**48.** A closed switch has a resistance of

(*a*) infinity
(*b*) zero
(*c*) about 500 ohms
(*d*) about 50 ohms at room temperature

**49.** The ionization current in liquids and gases results from

(*a*) protons (*b*) electrons

(*c*) neutrons (*d*) positive or negative ions

**50.** Two 500 ohms, 1-watt resistors are connected in parallel. Their combined resistance and wattage rating will be

(*a*) 5000 ohms, 1 watt (*b*) 250 ohms, 2 watts

(*c*) 1000 ohms, 2 watts (*d*) 500 ohms, 2 watts

**51.** A resistor is connected across a 45-volt battery to provide 13 mA of current. The required resistance with suitable wattage rating will be

(*a*) 4.5 ohms, 1 watt

(*b*) 45 ohms, 10 watts

(*c*) 1000 ohms, 2 watts

(*d*) 45,000 ohms, 1/3 watt

**52.** A 2.2 lead acid cell

(*a*) is a primary cell

(*b*) is a secondary cell

(*c*) has unlimited shelf life

(*d*) has a maximum current rating of about 150 mA

**53.** The formation of the hydrogen bubbles around the carbon electrode in a dry cell is

(*a*) local action caused by chemical impurities

(*b*) polarization caused by electrolysis

(*c*) depolarization caused by manganese dioxide

(*d*) an advantage because it increases the voltage output

**54.** When a lead acid battery is charged

(*a*) the battery voltage must be more than charging voltage

(*b*) connect the positive battery terminal to the negative on the charging current

(*c*) the charging current must flow in same direction as the discharging current

(*d*) connect negative to negative and positive to positive

**55.** The Edison cell

(*a*) is a primary cell
(*b*) uses sulphuric acid electrolyte
(*c*) has 2.5 volts output
(*d*) has nickel and iron electrolyte

**56.** Cells are connected in series to

(*a*) increase the current output
(*b*) increase the voltage output
(*c*) decrease the internal resistance
(*d*) decrease the amount of charging voltage required

**57.** A 45-volt source with an internal resistance of 2 ohms is connected across a wire-wound resistor. The maximum power will be dissipated in the resistor when its resistance equals

(*a*) zero
(*b*) ohms
(*c*) 45 ohms
(*d*) infinity

**58.** A magnet can pick up a nail because of

(*a*) excess charge on the nail
(*b*) magnetic induction
(*c*) declination of magnetic field
(*d*) molecular magnets in the air around the nail

**59.** A magnetic compass points to the

(*a*) geographical poles
(*b*) true north pole
(*c*) magnetic north pole
(*d*) agonic line of the earth field

**60.** If a wire which is vertical to this page has electrons flow downward, the conductor will have

(*a*) no magnetic field
(*b*) a counter-clockwise field in the plane of the paper
(*c*) a clockwise field in the plane of the paper
(*d*) a counter-clockwise field in the plane perpendicular to the paper

**61.** With lines of forces produced by two magnetic fields, the field

(*a*) is stronger where the lines of force are in the same direction
(*b*) is stronger where the lines are in opposite direction
(*c*) has the same strength as for one magnet
(*d*) is weakest where the lines are in the same direction

**62.** A solenoid is a coil which

(*a*) acts as bar magnet only when there is no current in the conductor

(*b*) acts as bar magnet only when the current flows in the coil

(*c*) is like a ring magnet because there is no air gap

(*d*) acts as bar magnet only when it has an iron core

**63.** The force tending to make a loop of wire rotate is called

(*a*) energy (*b*) power

(*c*) voltage (*d*) torque

**64.** Motor action in a wire conducting current can

(*a*) be produced without any additional magnetic field

(*b*) move the conductor from weaker field toward stronger field

(*c*) move the conductor from stronger field toward a weaker field

(*d*) produce the motion of the conductor but not rotation

**65.** The R.M.S. value of an A.C. signal is 10 volts. The peak to peak value will be

(*a*) 6.37 volts (*b*) 10 volts

(*c*) 14 volts (*d*) 28 volts

**66.** When two waves are 90° out of phase

(*a*) each has its peak value at the same time

(*b*) each has its minimum value at the same time

(*c*) one has its peak value when the other has zero value

(*d*) one has its positive peak when the other has its negative peak

**67.** Which of the following can produce maximum induced voltage?

(*a*) 1-amp. D.C. current (*b*) 50-amp. D.C. current

(*c*) 1-amp. 60 cycles A.C. current (*d*) 1-amp. 490 cycles A.C. current

**68.** When the alternating voltage reverses in polarity, the current it produces

(*a*) reverses its direction (*b*) has the same direction

(*c*) has a phase angle of 180 degrees

(*d*) alternates at 1.4 times the frequency of the applied voltage

**69.** An alternating current can induce voltage because it has

(*a*) high R.M.S. value (*b*) varying magnetic field

(*c*) stronger field than direct current (*d*) constant magnetic field

**70.** If the length, number of turns, and area of a coil are doubled, the inductance of the coil is

(*a*) the same (*b*) double

(*c*) quadruple (*d*) one-quarter

**71.** The D.C. resistance of a coil made with 100 ft of No. 30 gauge copper wire is approximately

(*a*) less than 1 ohm (*b*) 10.5 ohms

(*c*) 104 ohms (*d*) more than 1 M Ω

**72.** An open coil has

(*a*) zero resistance and high inductance

(*b*) infinite resistance and zero inductance

(*c*) infinite resistance and normal inductance

(*d*) zero resistance and inductance

**73.** Inductive reactance is measured in ohms because it

(*a*) reduces the amplitude of alternating current

(*b*) increases the amplitude of alternating current

(*c*) increases the amplitude of direct current

(*d*) has a back E.M.F. opposing the voltage output of a battery

**74.** Inductive reactance is applied to sine wave only because it

(*a*) increases with lower frequency

(*b*) increases with lower inductance

(*c*) depends on the factor $2\pi$

(*d*) decreases with the higher frequencies

**75.** In a sine wave A.C. circuit with 90 ohms $R$ in series with 90 ohms $XL$, phase angle $\theta$ equals

(*a*) 0° (*b*) 60°

(*c*) 45° (*d*) 90°

**76.** An arc across the switch opening an $R$-$L$ circuit is a result of the

(*a*) long time constant

(*b*) large self-induced voltage across the inductance

(*c*) source of the voltage caused by $IR$ drop across the resistance

(*d*) low resistance of the open switch

**77.** In a sine wave A.C. circuit with a resistive branch and inductive branch in parallel, the

(*a*) voltage across the inductor leads the voltage across the reactance by 90°

(*b*) resistance branch current is 90° out of phase with the inductive branch current

(*c*) resistive and inductive branch currents are 180° out of phase

(*d*) inductive and resistive branch currents are in phase

**78.** A D.C. voltage of 12 volts applied across an inductance in series with a switch

(*a*) can produce the induced voltage as the current decreases when the switch is opened

(*b*) cannot produce the induced voltage as the voltage applied has the one polarity

(*c*) produces more induced voltage when the switch is closed than the switch is opened

(*d*) none of the above

**79.** Alternating current in the inductance will produce maximum induced voltage when the current has

(*a*) maximum value

(*b*) maximum change in magnetic field

(*c*) minimum change in magnetic field

(*d*) 0.707 × Peak

**80.** Two 300-mh chokes connected in series will have the total inductance of

(*a*) 60 mh (*b*) 300 mh

(*c*) 150 mh (*d*) 600 mh

**81.** Which of the following statements is true?

(*a*) Iron core has the maximum eddy-current losses

(*b*) Laminated iron core has the minimum eddy-current losses

(*c*) Powered-iron core has the maximum eddy-current losses

(*d*) Air core has the minimum eddy-current

**82.** Two waves have the frequency of 500 Hz and one is set at its maximum value whereas the other is set at zero; the phase angle between them will be

(*a*) 0° (*b*) 180°

(*c*) 360° (*d*) 90°

**83.** Which of the following statements is true?
(*a*) Ceramic capacitors must be connected in the correct polarity
(*b*) Electrolytic capacitor must be connected in the correct polarity
(*c*) Mica capacitors are available in capacitance value of 1 to 10 micro-farad
(*d*) Air capacitors have a black band to indicate the outside foil

**84.** Voltage applied across a ceramic dielectric produces an electrolytic field 100 times greater than air. What will be the value of dielectric constant?
(*a*) 33.333 (*b*) 50
(*c*) 1000 (*d*) 100

**85.** If an A.C. voltage is applied to a capacitive circuit, the alternating current can flow in the circuit because
(*a*) of high peak value
(*b*) charging current can flow
(*c*) discharge current can flow
(*d*) varying voltage produces the charging and discharging currents

**86.** The amount of capacitive reactance with higher frequencies
(*a*) decreases
(*b*) increases
(*c*) remains same for frequencies
(*d*) decreases as the voltage increases

**87.** A steady D.C. voltage is applied to a capacitor; after it charges to battery voltage, the current in the circuit
(*a*) depends on the current rating of the battery
(*b*) is greater for larger values of capacitances
(*c*) is smaller for larger values of capacitances
(*d*) is zero for any value of capacitance

**88.** In sine wave A.C. circuit with $X_c$ and $R$ in series, the
(*a*) voltages across $R$ and $X_c$ are in phase
(*b*) voltages across $R$ and $X_c$ are 180° out of phase
(*c*) voltages across $R$ leads the voltages across $X_c$ by 90°
(*d*) voltages across $R$ lags the voltage across $X_c$ by 90°

**89.** A capacitor can store the charge because it has dielectric between two conductors.

(*a*) true (*b*) false

**90.** The thinner the dielectric, the more the capacitance and lower the voltage breakdown rating for a capacitor.

(*a*) true (*b*) false

**91.** In a parallel *L*-*C* circuit, at the resonant frequency

(*a*) a line current is maximum

(*b*) the total impedance is minimum

(*c*) the total impedance is maximum

(*d*) the inductive branch current is minimum

**92.** The series and parallel resonance in *L*-*C* circuit differs in that

(*a*) series resonance needs a high-resistance source for a sharp rise in current

(*b*) series resonance needs a low-resistance source for a sharp rise in current

(*c*) parallel resonance needs a low-resistance source for a sharp increase in impedance

(*d*) parallel resonance needs a low-resistance source for a sharp rise in line current

**93.** In a series *L*-*C* circuit at the resonant frequency the

(*a*) current is minimum (*b*) voltage across *C* is minimum

(*c*) impedance is maximum (*d*) current is maximum

**94.** A ferrite core has less eddy-current loss than an iron core because ferrites have

(*a*) low resistance (*b*) high resistance

(*c*) low permeability (*d*) high hysteresis

**95.** A coil with large distributed capacitance has a

(*a*) high resonant frequency (*b*) low resonant frequency

(*c*) high *Q* (*d*) low A.C. resistance

**96.** A capacitor with power factor of 0.002 has a *Q* of

(*a*) 0.002 (*b*) 20

(*c*) 200 (*d*) 500

**97.** A permalloy enclosure is the best shield against a

(*a*) static change (*b*) steady magnetic field
(*c*) varying magnetic field (*d*) stray capacitance

**98.** With stray capacitance of 10μF, the capacitive reactance at 160MHz equals

(*a*) 10 ohms (*b*) 160 ohms
(*c*) 100 ohms (*d*) 1000 ohms

**99.** The intrinsic impedance of free space is

(*a*) 500 ohms (*b*) 750 ohms
(*c*) 637 ohms (*d*) 377 ohms

**100.** The dissipation factor of a good dielectric is of the order of

(*a*) 0.02 (*b*) 0.002
(*c*) 0.2 (*d*) 0.0002

**101.** The dissipation factor of a good dielectric is practically same as power factor of the dielectric.

(*a*) true (*b*) false

**102.** The velocity of propagation of an electromagnetic wave is given by

(*a*) $\sqrt{LC}$ (*b*) $\sqrt{L/C}$
(*c*) $\sqrt{1/LC}$ (*d*) $1/\sqrt{LC}$

**103.** The total electric flux through any closed surface surrounding charges is equal to the amount of charge enclosed. The above illustration is known as

(*a*) Maxwell's First Law (*b*) Maxwell's Second Law
(*c*) Gauss's Law (*d*) Coulomb's Square Law

**104.** The magnetic flux density $B$ is analogous to

(*a*) electromotive force $V$ (*b*) displacement current $D$
(*c*) electric intensity (*d*) electric displacement

**105.** Which of the following is the continuity equation?

(*a*) $\frac{\partial \rho}{\partial t} = -\nabla \cdot \mathbf{J}$ (*b*) $\nabla \times \mathbf{H} = \mathbf{J}$
(*c*) $\rho_{\text{free}} = \nabla \cdot \mathbf{D}$ (*d*) $\nabla \cdot \mathbf{B} = 0$

**106.** The relative permeability of paramagnetic substance is

(*a*) unity (*b*) slightly more than unity

(*c*) zero (*d*) less than unity

**107.** The relative permeability of ferromagnetic material may have a value of several hundred or even several thousand.

(*a*) true (*b*) false

**108.** If $A$ is the vector, which of the following statements is true?

(*a*) div curl $A = A$ (*b*) div curl $A$ = curl $A$

(*c*) div curl $A = 0$ (*d*) div curl $A$ = curl div $A$

**109.** Which of the following statements is true?

(*a*) The magnetomotive force around a closed path is equal to the conduction current plus electric displacement through any surface bounded by the path

(*b*) The electromotive force around a closed path is equal to the time derivative of the electric displacement through any surface bounded by the path

(*c*) The total electric displacement through the surface enclosing a volume is not equal to total charge within the volume

(*d*) The net magnetic flux emerging through any closed surface is zero

**110.** Voltage across the resistance in an $R$-$L$-$C$ series circuit at resonance frequency is

(*a*) much higher than applied voltage

(*b*) much less than applied voltage

(*c*) function of value of inductance

(*d*) function of $L/C$ ratio

(*e*) equal to applied voltage

**111.** A horseshoe magnet is held vertical with its ends resting on a horizontal board. The plane passing through its poles (assumed to lie at its ends) is in magnetic meridian. If N-pole of the magnet is towards magnetic south of the earth, the neutral point will lie

(*a*) within the poles of the shoe magnet

(*b*) at points along the axial line of the magnet

(*c*) at point along the equatorial line of the magnet

(*d*) at points not lying exactly on the horizontal board

**112.** A horseshoe magnet is far removed from magnetic substances. The magnetic potential will be zero at a point

(*a*) lying on its axial line

(*b*) lying on the center of the line joining the two poles

(*c*) lying anywhere on its equatorial line

(*d*) on the center of the magnet

**113.** Three capacitors, each of capacity $C$, are given. The resultant capacity $2C/3$ can be obtained by using them

(*a*) all in parallel

(*b*) all in series

(*c*) two in series and third in parallel across this combination

(*d*) two in parallel and third in series with this combination

**114.** Two spheres of radii 10 and 20 cm have charges 100 and 200 E.S.U. respectively. These are joined by a fine wire. The loss of energy will be

(*a*) $\frac{1}{2} \times \frac{10 \times 20}{10 + 10} (200 + 100)^2$ ergs

(*b*) $\frac{1}{2} \times \frac{10 + 20}{10 \times 20} (200 - 100)$ ergs

(*c*) $\frac{1}{2} \times (200 - 100)^2$ ergs

(*d*) zero

**115.** What will be the frequency of the following wave?

(*a*) 10 KHz

(*b*) 5 KHz

(*c*) 100 KHz

(*d*) 150 Hz

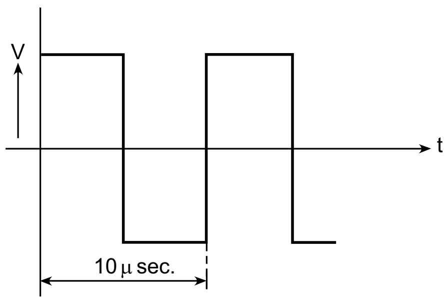


**Fig. Q. 115.**

**116.** If the pulse repetition time of a square wave is 60 microseconds, the pulse repetition rate will be

(*a*) 5 KHz

(*b*) 16 KHz

(*c*) 10 KHz

(*d*) 15 MHz

(*e*) 15 Hz

**117.** Using the following figure, find the capacitor discharge voltage when the switch is first placed in position *A* for $4.7 \times 10^{-3}$ seconds, and then when the switch is placed in position *B* for $4.7 \times 10^{-3}$ seconds. Assume that the initial charge on the capacitor is zero.

(*a*) 9.45 volts (*b*) 15 volts

(*c*) 3.5 volts (*d*) 6 volts

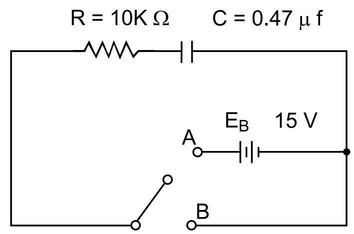


**Fig. Q. 117.**

**118.** Ohm's law states that

(*a*) *V* is proportional to *I* (*b*) *I* is proportional to *V*

(*c*) *V* is proportional to *IR* (*d*) *V* is proportional to *R*

**119.** The electromagnetic radiation that can only be emitted or absorbed by matter in small discrete units is called a

(*a*) proton (*b*) electron

(*c*) photon (*d*) neutron

**120.** If the peak voltage of a wave is 15 V and pulse repetition time is 60 microseconds, what will be the average value of voltage?

(*a*) 10 volts (*b*) 5 volts approximately

(*c*) 15 volts (*d*) 7 volts

**121.** A 100 watt, 250 V bulb will have more resistance than 60 watt, 250 V bulb.

(*a*) true (*b*) false

**122.** Kirchhoff's Laws fail in

(*a*) lumped parameters circuit (*b*) distributed parameters circuit

(*c*) nonlinear circuits (*d*) linear circuits

(*e*) bilateral circuits

**123.** When a current of 0.1 A is passed through a coil of 2000 turns, the MMF produced by the coil will be

(*a*) 100 AT (*b*) 200 AT

(*c*) 300 AT (*d*) 10 AT

**124.** Which of the following statements is correct?

(*a*) The magnetic flux inside an exciting coil is greater than its outside surface

(*b*) The magnetic flux inside an exciting coil is same as on its outside surface

(*c*) The magnetic flux inside an exciting coil is lower than its outside surface

(*d*) The magnetic flux inside an exciting coil is zero

**125.** All the lines of magnetic flux on a coil produced by a uniform magnetic field are parallel and equidistant.

(*a*) true (*b*) false

**126.** Magneto-motive force is

(*a*) the flow of an electric current

(*b*) the sum of all the currents embraced by one line of magnetic field

(*c*) the passage of magnetic field through an exciting coil

(*d*) the voltage across the two ends of exciting coil

**127.** "Ampere-Turns" are

(*a*) the product of the number of the turns and current of the coil

(*b*) the number of the turns of a coil through which current is flowing

(*c*) the currents of all turns of the coil

(*d*) the turns of transformer winding

**128.** The uniform magnetic field is

(*a*) the field of a single conductor

(*b*) the field of a set of parallel conductors

(*c*) field in which all lines of magnetic flux are parallel and equidistant

(*d*) none of the above

**129.** The reluctance of a magnetic circuit depends on the length of the magnetic flux path, the cross-sectional area presented to the magnetic field and the magnetic properties of the material in which the magnetic field is generated.

(*a*) true (*b*) false

**130.** The change of the cross-sectional area of a conductor in a magnetic field will affect

(*a*) resistance of conductor (*b*) reluctance of conductor

(*c*) (*a*) and (*b*) both in the same way (*d*) none of the above

**131.** Ferromagnetic materials have a relative permeability $\mu r$

(*a*) equal to one (*b*) less than one

(*c*) far greater than one (*d*) zero

**132.** A magnetic field can penetrate empty space.

(*a*) true (*b*) false

**133.** What will be the current passing through a ring-shaped air cored coil when number of turns is 900 and ampere-turns are 2700?

(*a*) 3 (*b*) 1.5

(*c*) 6 (*d*) 9

**134.** What will be the magnetic potential difference across an air gap of 4 cm length in a magnetic field of 400 AT/m?

(*a*) 4 AT (*b*) 8 AT

(*c*) 16 AT (*d*) 20 AT

**135.** A certain amount of current flows through a ring-shaped coil with a fixed number of turns. How does the magnetic induction *B* vary inside the coil if an iron core is threaded into the coil without dimensional change of the coil?

(*a*) It increases

(*b*) It decreases

(*c*) It remains same

(*d*) It first increases and then decreases, depending on the depth of iron core insertion

**136.** The initial permeability of an iron rod is

(*a*) the permeability at the end of the iron rod

(*b*) the permeability almost in non-magnetized state

(*c*) the lowest permeability of the iron rod

(*d*) the highest permeability of the iron rod

**137.** The magnetic reluctance of a material

(*a*) increases with increasing cross-sectional area of material

(*b*) decreases with increasing cross-sectional area of material

(*c*) does not vary with increasing cross-sectional area of material

(*d*) does vary from small increase in cross-sectional area of the material

**138.** Magnetic field strength $H$ and magnetic induction $B$ are independent of each other.

(*a*) true (*b*) false

**139.** Which part of the magnetic path requires largest MMF?

(*a*) Core (*b*) Air gap

(*c*) Coil (*d*) Inductance

**140.** The presence of a magnetic field can be determined by

(*a*) detecting the lines of magnetic flux

(*b*) deflection of a magnetic compass needle

(*c*) heating the surrounding air

(*d*) touching the magnetically affected area

**141.** How does a magnetic compass needle behave in a magnetic field?

(*a*) It starts rotating

(*b*) It assumes a position right angle to magnetic field

(*c*) It assumes a position which follows a line of magnetic flux

(*d*) None of the above

**142.** Magnetic reactance has the same unit as electric reactance.

(*a*) true (*b*) false

**143.** MMF is analogous to

(*a*) electric current in electrical circuit (*b*) electromotive force

(*c*) current density in conductor (*d*) voltage

**144.** Which of the following statements is correct?

(*a*) The strength of magnetic flux in a simple magnetic field continuously increases from initial value of final value

(*b*) The strength of magnetic flux in a simple magnetic field continuously decreases from initial value to final value

(*c*) The strength of magnetic flux in simple magnetic field is constant and has same value in every part of the magnetic field

(*d*) None of the above statements is correct

**145.** No material is completely impermeable to magnetic flux.

(*a*) true (*b*) false

**146.** The stray line of magnetic flux is defined as

(*a*) a line of magnetic flux in a non-uniform field

(*b*) a line of magnetic flux which does not follow the designed path

(*c*) the mean length of a ring-shaped coil

(*d*) a line vertical to the flux lines

**147.** In the given circuit, the voltage $V$ is reduced to half. The current $I$ will change to

(*a*) $2I$

(*b*) $I/2$

(*c*) $I/\sqrt{R^2 + (X_L - X_C)}$

(*d*) $I/\sqrt{(X_L - X_C)^2}$

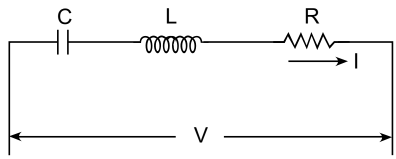


**Fig. Q. 147.**

**148.** The current in the loaded battery flows from

(*a*) + ve to –ve plate

(*b*) –ve to + ve plate

(*c*) between plates

(*d*) between terminals

**149.** In the circuit shown, the current in the resistance 1 shall be

(*a*) $3/7I$

(*b*) $3/4I$

(*c*) $I$

(*d*) $7/3I$

(*e*) $1/4I$

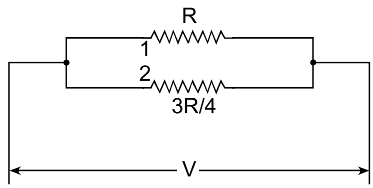


**Fig. Q. 149.**

**150.** Four bulbs of 40 watts each are connected in series with a battery across them; which of the following statements is true?

(*a*) The voltage across each bulb is same

(*b*) The power dissipation in each bulb is not same

(*c*) The current through each bulb is same

(*d*) None of the above

**151.** In the given circuit, Kirchhoff's current law is applied at point $A$. Which of the following relations is correct?

(*a*) $I_1 = I_2 - I_3$

(*b*) $I_1 - I_3 + I_3 = 0$

(*c*) $I_1 - (I_2 + I_3) = 0$

(*d*) $I_1 = -(I_2 + I_3)$

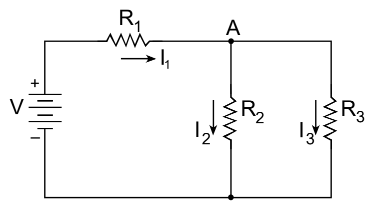


**Fig. Q. 151.**

**152.** The voltage source of 220 V shown in the figure will deliver a total current to the circuit of

(*a*) 4 A

(*b*) 2 A

(*c*) 50 A

(*d*) 100 A

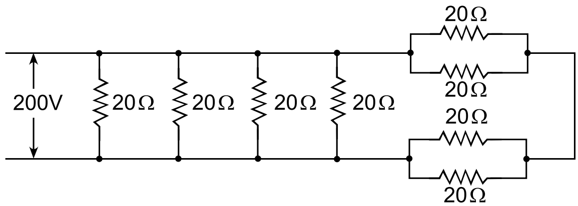


**Fig. Q. 152.**

**153.** An inductance coil of 10 H develops the counter voltage of 50 volts. What should be the rate of change of current in the coil?

(*a*) 5 A/sec (*b*) 10 A/sec

(*c*) 1 A/sec (*d*) 100 A/sec

**154.** The peak value of the sinusoidal voltage is 10 volts. What will be the effective value of voltage?

(*a*) 14.14 volts (*b*) 1.414 volts

(*c*) 0.707 volt (*d*) 7.07 volts

**155.** If the effective voltage of the sinusoidal voltage is 11 volts, what will be the average value of sinusoidal voltage?

(*a*) 5 volts (*b*) 10 volts

(*c*) 1.1 volts (*d*) 11 volts

(*e*) 121 volts

**156.** If a conductor is put in a magnetic field, at what angle should the conductor cut the magnetic field to induce maximum current in it?

(*a*) 10° (*b*) 20°

(*c*) 90° (*d*) 120°

(*e*) 180° (*f*) –90°

**157.** For which of the following parameter variations will the capacitance of the capacitor remain unaffected?

(*a*) Nature of dielectric

(*b*) Thickness of the plates

(*c*) Distance between the plates

(*d*) Area of the plates

**158.** If two capacitors with 20 μF capacitance each are connected in series, what will be the net capacitance of the circuit?

(*a*) 10 μF (*b*) 20 μF
(*c*) 40 μF (*d*) 80 μF

**159.** In the above question, if the capacitors are connected in parallel, what will be the net capacitance?

(*a*) 40 μF (*b*) 20 μF
(*c*) 10 μF (*d*) 30 μF

**160.** Three vector diagrams are shown below. Which diagram is for pure resistive circuit?

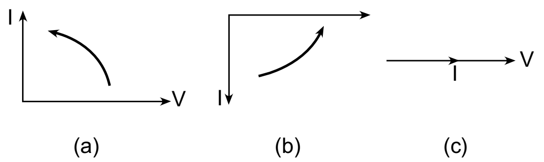


**Fig. Q. 160.**

**161.** In the vector diagrams of Question 160, diagram (*a*) corresponds to

(*a*) pure inductive circuit (*b*) pure capacitive circuit
(*c*) pure resistive circuit (*d*) none of the above

**162.** In the vector diagrams shown in Question 160, diagram (*b*) corresponds to

(*a*) pure inductive circuit (*b*) pure resistive circuit
(*c*) pure capacitive circuit

**163.** Which of the following expressions is true for apparent power in an A.C. circuit?

(*a*) $V_{\text{R.M.S.}} \times I_{\text{R.M.S.}}$ (*b*) $V_{\text{mean}} \times I_{\text{mean}}$
(*c*) $V_{\text{peak}} \times I_{\text{peak}}$ (*d*) $V I \cos \phi$

**164.** The sum of the R.M.S. potentials in the *RC* circuit does not follow Kirchhoff's law.

(*a*) true (*b*) false

**165.** The power dissipation in the pure capacitance of *RC* circuit will be

(*a*) zero (*b*) small
(*c*) higher than dissipation in resistance
(*d*) equal to dissipation in resistance

**166.** Which of the following expressions is correct for series reactance *Xcs* if three capacitors $C_1$, $C_2$, and $C_3$ are connected in a series?

(*a*) $\dfrac{1}{X_{cs}} = \dfrac{1}{X_{c1}} + \dfrac{1}{X_{c2}} + \dfrac{1}{X_{c3}}$

(*b*) $X_{cs} = X_{c1} + X_{c2} + X_{c3}$

(*c*) $X_{cs} = \dfrac{1}{X_{c1}} + \dfrac{1}{X_{c2}} + \dfrac{1}{X_{c3}}$

(*d*) $X_{cs} = \dfrac{1}{X_{c1} + X_{c2} + X_{c3}}$

**167.** The *RC* network can be used as a high pass and a low pass filter as well. For which condition does lower cut-off frequency occur as a high pass filter?

(*a*) $E_S = E_R$
(*b*) $E_S + E_C$
(*c*) $E_R = 0.707\ E_C$
(*d*) $E_R = 0.707\ E_S$

**168.** Which of the following relationships shown by curves is true for an inductive circuit?

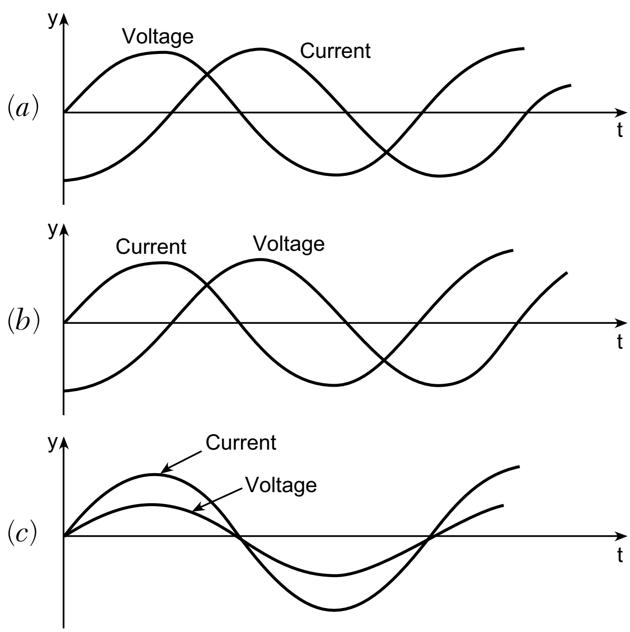


**Fig. Q. 168.**

**169.** The Laplace transform of the unit step function is given by

(*a*) $1/s$ (*b*) $1/s^2$

(*c*) $s$ (*d*) 1

**170.** The Laplace transform of the function $f(t) = e^{-at}$ is given by

(*a*) $\dfrac{1}{a^2 + s^2}$ (*b*) $\dfrac{1}{a + s}$

(*c*) $\dfrac{1}{a + s}$ (*d*) $\dfrac{s^2}{a^2 + s^2}$

**171.** The Laplace transform of the function $f(t) = \cos \beta t$ is given by

(*a*) $\dfrac{\beta}{s^2 + \beta^2}$ (*b*) $\dfrac{s}{s^2 + \beta^2}$

(*c*) $\dfrac{1}{s^2 + \beta^2}$ (*d*) $\dfrac{\beta}{s + \beta}$

**172.** The Laplace transform of the function $f(t) = \sin \beta t$ is given by

(*a*) $\dfrac{\beta}{s + \beta^2}$ (*b*) $\dfrac{\beta}{s^2 + \beta^2}$

(*c*) $\dfrac{s}{s^2 + \beta^2}$ (*d*) $\dfrac{\beta^2}{s + \beta}$

**173.** Which of the following is the Laplace transform of $f(t) = t$?

(*a*) $1/s$ (*b*) $1/s^2$

(*c*) $1/s^3$ (*d*) $s$

**174.** The expression £ $(t) = \dfrac{n^1}{s^{n+1}}$ is true for the function

(*a*) $f(t) = t^n$ (*b*) $f(t) = nt^n$

(*c*) $f(t) = t/n$ (*d*) $f(t) = tn$

**175.** Which of the following conditions is necessary for validity of the "Initial Value Theorem"

$$\lim_{s \to \infty} s\,F(s) = \lim_{t \to 0} f(t)$$

(*a*) $f(t)$ and its derivative $f(t)$ must have Laplace transform

(*b*) If the Laplace transform of $f(t)$ is $F(s)$, the lim $sF(s)$ must exist

(*c*) only $f(t)$ must have Laplace transform

(*d*) (*a*) and (*b*) both

**176.** The Laplace transform of a unit impulse at $t = 0$ is

(*a*) $s$ (*b*) $1/s$

(*c*) unity (*d*) $1/s^2$

**177.** If the Laplace transform of unit step is $1/s$ how many poles will be located at the origin of the $s$-plane?

(*a*) One (*b*) Two

(*c*) Three (*d*) None

**178.** If the Laplace transform of the function $f(t) = \exp(-\alpha t)$ is $\dfrac{1}{s+\alpha}$ then which of the following statements will be true?

(*a*) One pole will be located on the real axis of $s$-plane at $-\alpha$

(*b*) One pole will be located on the imaginary axis of $s$-plane at $\pm j\omega$

(*c*) One complex pole will be located at the origin of $s$-plane

(*d*) One complex pole will be in the $s$-plane at $-\alpha \pm j\omega$

**179.** For which of the following functions will the Laplace transform be $2/s^2$

(*a*) $f(t) = t$ (*b*) $f(t) = 1$

(*c*) $f(t) = \delta t$ (*d*) $f(t) = 2t$

(*e*) $f(t) = t^2$

**180.** Which of the following operations is to be carried out to get ramp function from unit impulse at $t = 0$?

(*a*) Integrate unit impulse function once

(*b*) Integrate unit impulse function twice

(*c*) Integrate unit impulse function thrice

(*d*) Differentiate unit impulse function twice

(*e*) Differentiate unit impulse once as a function of time

**181.** Which of the following functions represents parabolic characteristics?

(*a*) $f(t) = t$ (*b*) $f(t) = t^2$

(*c*) $f(t) = e - \alpha^t$ (*d*) $f(t) = Ut$

**182.** The power factor of a purely resistive circuit will be

(*a*) unity (*b*) zero

(*c*) infinite (*d*) 0.5

**183.** The quality factor of *RCL* circuit will increase if the

(*a*) *R* decreases (*b*) *R* increases

(*c*) voltage increases (*d*) impedance increases

**184.** If the diameter of a current carrying conductor is doubled, the resistance will

(*a*) be reduced to half (*b*) to reduced to one-fourth

(*c*) remain same (*d*) be doubled

**185.** The inductance across the points *AB* in the circuit shown is given by

(*a*) 1

(*b*) 2

(*c*) 3

(*d*) 5

(*e*) 4

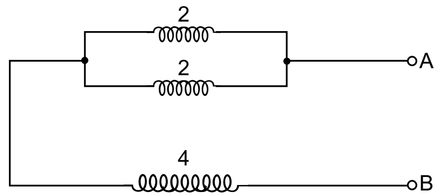


**Fig. Q. 185.**

**186.** A pure inductance is connected with a D.C. source as shown. The inductance will behave as

(*a*) open circuit

(*b*) closed circuit

(*c*) short circuit

(*d*) none of the above


**Fig. Q. 186.**

**187.** A voltage divider and its Thevenin's equivalent circuit is shown below. What will be the value of voltage source *V* and resistance *R*?

(*a*) 10 V, 80 Ω (*b*) 10 V, 120 Ω

(*c*) 4 V, 48 Ω (*d*) 5 V, 50 Ω

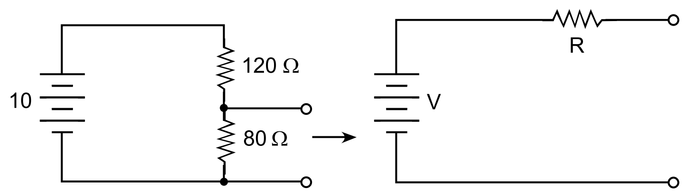


**Fig. Q. 187.**

**188.** In the circuit shown below, what will be the voltage $vR$ at $t$ = 0?

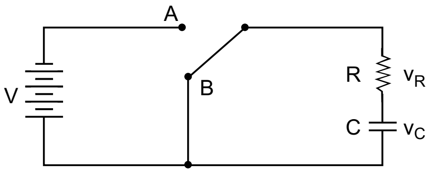


**Fig. Q. 188.**

(*a*) *0*

(*b*) *V*

(*c*) *V/2*

(*d*) *0.37 V*

(*e*) *0.63 V*

**189.** In the figure of Question 188, what will be the voltage $vR$ at $t = \infty$?

(*a*) 0 (*b*) V

(*c*) 0.37 V (*d*) 0.63 V

(*e*) $V/\sqrt{3}$

**190.** In the figure of Question 188, what will be the voltage $vC$ at $t$ = 0?

(*a*) 0 (*b*) V

(*c*) 0.37 V (*d*) 0.63 V

**191.** In the figure of Question 188, what will be the voltage $vC$ at $t = \infty$?

(*a*) V (*b*) 0

(*c*) $V/\sqrt{3}$ (*d*) 0.63 V

**192.** A pulse of width $T$ seconds is applied to an $RC$ circuit. The response of the circuit is shown below. Which kind of filter circuit will produce this response?

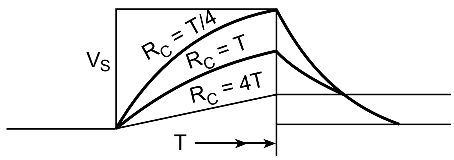


**Fig. Q. 192.**

(*a*) Low pass filter

(*b*) High pass filter

(*c*) Medium pass filter

(*d*) None of the above

**193.** If the output signal of a circuit appropriates the time integral of the input signal, such circuit is called

(*a*) differentiator

(*b*) integrator

(*c*) multiplier

(*d*) divider

**194.** A pulse of $T$ seconds width applied to an $RC$ circuit produces the following response. What kind of filter will generate such response?

(*a*) Low pass filter (*b*) High pass filter

(*c*) Medium pass filter (*d*) None of the above

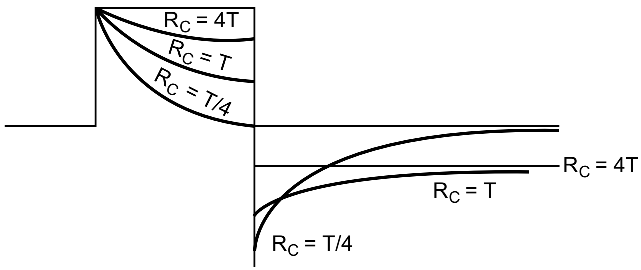


**Fig. Q. 194.**

**195.** A pulse of $T$ seconds width is applied to an $RC$ circuit. What kind of circuit will be required to produce a ramp response?

(*a*) Low pass filter with low time constant

(*b*) Low pass filter with high time constant

(*c*) An integrator

(*d*) A differentiator

(*e*) (*b*) or (*c*)

**196.** Two resistances $R_1$ and $R_2$ are connected in series across the voltage source where $R_1 > R_2$. The largest voltage drop will be across

(*a*) $R_1$ (*b*) $R_2$

(*c*) either $R_1$ or $R_2$ (*d*) none of them

**197.** Which of the following statements is true?

(*a*) A Norton equivalent is series circuit

(*b*) A Thevenin equivalent is a parallel circuit

(*c*) A resistive circuit is a dual pair

(*d*) An *R-L* circuit is a dual pair

(*e*) An *L-C* circuit is a dual pair

**198.** The time constant of a series $RC$ circuit is given by

(*a*) $RC$ (*b*) $R/C$

(*c*) $R^2C$ (*d*) $RC^2$

**199.** If resistance is 10 Ω and inductance is 1 H in an *RL* series circuit, what will be the time constant of this series *RL* circuit?

(*a*) 10 seconds (*b*) 0.1 second
(*c*) 100 seconds (*d*) 0.001 second

**200.** The magnitude of the impedance 20 – 15*j* is given by

(*a*) 5 Ω (*b*) 15 Ω
(*c*) 25 Ω (*d*) 625 Ω

**201.** If an inductive coil has 50 Ω resistance and 500 Ω inductive reactance, what will be the quality of factor *Q*?

(*a*) 5 (*b*) 50
(*c*) 100 (*d*) 10

**202.** The impedances $Z_1 = 4 + 3j$ and $Z_2 = 4 - 3j$ are added. What will be the resultant impedance $Z_1 + Z_2$?

(*a*) $5 \angle 90°$ (*b*) $8 \angle 0°$
(*c*) $8 \angle 180°$ (*d*) none of the above

**203.** The phasors for which of the following pairs are 180° out of phase for *VL*, *VC*, and *VR*?

(*a*) $V_L$ and $V_R$ (*b*) $V_C$ and $V_R$
(*c*) $V_C$ and $V_L$ (*d*) none of the above

**204.** If impedance $Z_1 = 10 \angle 10°$ and $Z_2 = 10 \angle 5°$, what will be the value of $Z_1 \times Z_2$?

(*a*) $100 \angle 15°$ (*b*) $10 \angle 5°$
(*c*) $100 \angle 50°$ (*d*) $20 \angle 15°$

**205.** In Question 204, what will be the value of $Z_1/Z_2$?

(*a*) $1 \angle 5°$ (*b*) $10 \angle 2°$
(*c*) $1 \angle 20°$ (*d*) $100 \angle 2°$

**206.** The Fourier series expansion of an odd periodic function contains

(*a*) cosine terms (*b*) constant terms only
(*c*) sine terms (*d*) cosec terms only

**207.** The Fourier series expansion of an even periodic function contains

(*a*) sine terms (*b*) constant terms
(*c*) cosine terms (*d*) harmonics

**208.** Which of the following conditions is true for even function?

(*a*) $f(t) = -f(n + T/2)$ (*b*) $f(t) = -f(t)$

(*c*) $f(t) = f(-t)$ (*d*) $f(t) = f(T)$

**209.** What will be the equivalent conductance $G$ of the circuit shown below? $G_1$, $G_2$ and $G_3$ are the conductance of individual circuit branch.

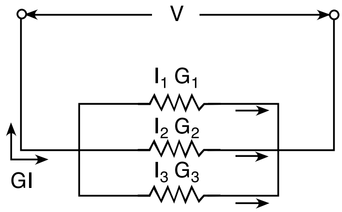


**Fig. Q. 209.**

(*a*) $G = G_1 + G_2 + G_3$

(*b*) $1/G = G_1 + G_2 + G_3$

(*c*) $\dfrac{1}{G} = \dfrac{1}{G_1} + \dfrac{1}{G_2} + \dfrac{1}{G_3}$

(*d*) $G = \dfrac{1}{G_1 + G_2 + G_3}$

**210.** If electrical current is compared to the flow of water through a pipe, which part of the pipe system is analogous to conductance?

(*a*) The cross-section of the pipe (*b*) The length of the pipe

(*c*) The pipe gradient (*d*) The pipe material

**211.** The electrical circuits $A$ and $B$ are shown below. Which battery of the flowing circuits will be loaded more and by what amount of current, provided resistances of bulbs are same?

(*a*) $A$, $I_A = 4I_B$ (*b*) $B$, $I_A = I_B$

(*c*) $A$, $I_B = 4I_A$ (*d*) $B$, $I_A = 2I_B$

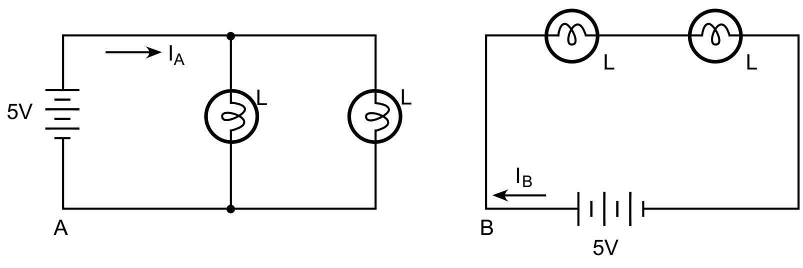


**Fig. Q. 211.**

**212.** If one cycle of A.C. waveform occurs every second, what will be the frequency of this waveform?

(*a*) 0.2 Hz (*b*) 0.5 Hz

(*c*) 1 Hz (*d*) 2 Hz

**213.** A circuit is shown below. What will be the steady state value of the current?

(*a*) 1 amp

(*b*) 2 amps

(*c*) 4 amps

(*d*) 5 amps

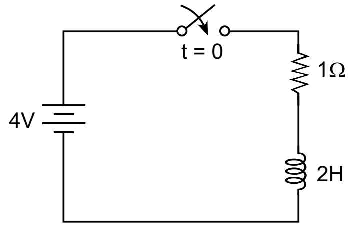


**Fig. Q. 213.**

**214.** There are two circuits shown below. Which of the following statements is true?

(*a*) The lamp will be brightest when contact *K* moves to *A* in circuit (*a*)

(*b*) The lamp will be brightest when the contact *K* moves to *B* in circuit (*a*)

(*c*) The lamp will be brightest when contact *K* is moved to *A* the circuit (*b*)

(*d*) Circuit (*a*) is a potential divider

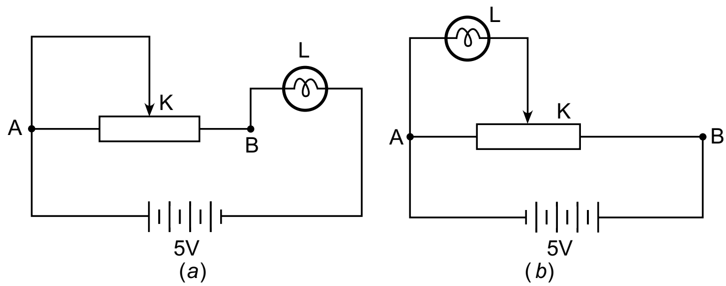


**Fig. Q. 214.**

**215.** In Question 214, circuit (*a*) behaves as a

(*a*) current limiting source

(*b*) potential divider

(*c*) light limiting source

(*d*) none of the above

**216.** In Question 214, circuit (*b*) behaves as a

(*a*) current limiting source (*b*) potential divider

(*c*) light limiting source (*d*) none of the above

**217.** Wheatstone bridge is used to measure

(*a*) current (*b*) voltage

(*c*) resistance (*d*) power

**218.** What will be the energy used by the battery if the battery has to drive 625 × $10^{16}$ electrons with potential difference of 10 V across the terminals?

(*a*) 5 joules (*b*) 10 joules

(*c*) 6.25 joules (*d*) 1.6 joules

**219.** If a light bulb is used at less brightness than a rated one, which of the following methods would one choose to achieve the required brightness?

(*a*) Current-limiting resistor (*b*) Potential divider

(*c*) Source Voltage Reduction (*d*) Either (*a*) or (*b*)

**220.** A sine wave of 220 V, 50 Hz A.C. will achieve its negative maximum value in

(*a*) 10 m sec (*b*) 15 m sec

(*c*) 20 m sec (*d*) 50 m sec

**221.** If a neon bulb of 60 watts is connected across 220 V, A.C. source and draws 272 mA current, what will be the resistance of the bulb filament?

(*a*) 1000 Ω (*b*) 808 Ω

(*c*) 800 Ω (*d*) 60 Ω

(*e*) 272 Ω

**222.** An inductive circuit is shown below; which of the equations represents the circuit correctly?

(*a*) $V = Ldi/dt$

(*b*) $V = IR + Ldi/dt$

(*c*) $V = IR$

(*d*) $V = IR + 1/L\ di/dt$

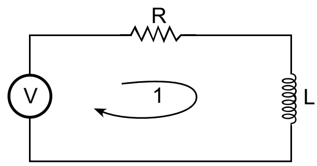


**Fig. Q. 222.**

**223.** Which of the following conditions is true for maximum transfer of power if the internal impedance of the voltage source is $Zs = R + jx$?

(*a*) $Z_L = Z_s$

(*b*) $Z_L = R - jx$

(*c*) $Z_L = R + jx$

(*d*) $Z_L = Zs/2$


**Fig. Q. 223.**

**224.** In Question 223, what will be the maximum transfer of power to $ZL$?

(*a*) $V^2/R$ (*b*) $V^2/2R$

(*c*) $V^2/R^2$ (*d*) $V^2/4R$

**225.** An *RC* circuit is shown below; the current will reach its maximum value

(*a*) after 1000 μ sec of turning on the switch

(*b*) after 500 μ sec of turning on the switch

(*c*) after 50 μ sec of turning on the switch

(*d*) immediately after turning on the switch

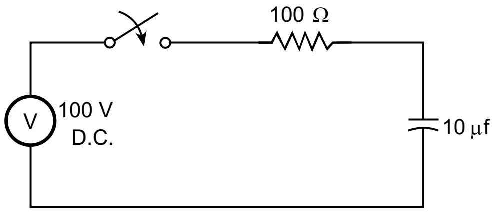


**Fig. Q. 225.**

**226.** The maximum current in the circuit of Question 225 will be

(*a*) 1 A

(*b*) 100 A

(*c*) 2 A

(*d*) 5 A

**227.** If *D* is the electric displacement density and *E* is the electric field strength, then *D* and *E* can be related by

(*a*) $D = E^2/\varepsilon$

(*b*) $D = E/\varepsilon$

(*c*) $D = \varepsilon E^2$

(*d*) $D = \varepsilon E$

(*e*) none of the above

**228.** If $\mu_r$ is the relative permeability of a given medium, μ is a permeability and $\mu_0$ is the permeability of the free space, then the expression for $\mu_r$ is given by

(*a*) $\mu_r = \mu_0/\mu$

(*b*) $\mu_r = \mu/\mu_0$

(*c*) $\mu_r = \mu_0/\mu^2$

(*d*) $\mu_r = \mu_0/\mu$

(*e*) none of the above

**229.** Which of the following statements is true?

(*a*) The current in a discharging capacitor grows exponentially

(*b*) The current in a discharging capacitor decays exponentially

(*c*) The current in the discharging capacitor grows linearly

(*d*) The current in the discharging capacitor decreases constantly

**230.** Which of the following indicates units of displacement density?

(*a*) Ampere-meter (*b*) Coulomb-meter
(*c*) Coulomb/$m^2$ (*d*) Volt $m^2$

**231.** If $RC$ is the time constant of the $R$-$C$ circuit, how much time will the capacitor take to get fully charged?

(*a*) $RC$ seconds (*b*) 4 $RC$ seconds
(*c*) 3 $RC$ seconds (*d*) 5 $RC$ seconds

**232.** Find the change in potential energy of a system where charge $Q_0$ is carried to the charge $Q_1$ at a distance of 10 meters with a 10 N force.

(*a*) 10 N/meter (*b*) 100 N-meter
(*c*) 10 joules (*d*) 50 N/meter

**233.** Which of the following phenomena takes place when an electromagnetic wave propagates through free space?

(*a*) Reflection (*b*) Phase shift
(*c*) Attenuation (*d*) Distortion

**234.** Which of the following values is the intrinsic impedance of free space?

(*a*) 100 Ω (*b*) 50 Ω
(*c*) 317 Ω (*d*) 377 Ω
(*e*) 370 Ω (*f*) 277 Ω

**235.** The resultant magnetic flux generated in a closed surface will be

(*a*) zero (*b*) continuous
(*c*) constant (*d*) unity

**236.** If the current in an induction coil varies from 10 A to 20 A in one second and induces a voltage of 100 V, what will be the inductance of the coil?

(*a*) 10 H (*b*) 10 μH
(*c*) 5 H (*d*) 1 H
(*e*) 10 mH (*f*) 100 H

**237.** What will happen if an electromagnetic wave is falling on a perfect dielectric?

(*a*) The wave will be transmitted completely
(*b*) The wave will be partially reflected and partly transmitted
(*c*) The wave will be completely refracted
(*d*) The wave will be partially absorbed

**238.** Which of the following gives the rate of energy flow?

(*a*) Maxwell equation (*b*) Poynting vector
(*c*) Poisson vector (*d*) Newton's laws

**239.** The quality factor of an induction coil can be increased if

(*a*) the length of the wire is increased
(*b*) the diameter of wire decreased
(*c*) the length of the wire is decreased

**240.** Which of the following is normally designed for high value of quality factor?

(*a*) Resistance (*b*) Inductance
(*c*) Capacitance (*d*) None of the above

**241.** Which of the following statements is true?

(*a*) $\nabla \cdot (\nabla \times \mathbf{B}) = \infty$ (*b*) $\nabla \cdot (\nabla \times \mathbf{A}) = 0$
(*c*) $\nabla \cdot (\nabla \times \mathbf{B}) = \nabla^2\mathbf{B}$ (*d*) $\nabla \cdot (\nabla \times \mathbf{B}) = \mathbf{B}$

**242.** If $X = q/4\pi r^2$, which of the following parameters will be $X$?

(*a*) Electric field strength
(*b*) Magnetic field strength
(*c*) Electric displacement density
(*d*) Permeability

**243.** Which of the following expressions is correct for electric field strength?

(*a*) $E = D$ (*b*) $E = \pi D$
(*c*) $E = D/\varepsilon$ (*d*) $E = r/\varepsilon$

**244.** Which of the following distances in terms of wavelength is correct if the distance is measured between the maxima and minima of a standing wave?

(*a*) $\lambda/2$ (*b*) $\lambda/8$
(*c*) $4\lambda$ (*d*) $\lambda/4$

**245.** Polarization in electromagnetic waves is attributed to the

(*a*) absorptive nature of waves
(*b*) reflection of waves
(*c*) longitudinal nature of waves
(*d*) transverse nature of waves
(*e*) electric field of waves

**246.** Which equation represents the following waveform?

(*a*) $y = \sin x/3$
(*b*) $x = 2 \sin 3x/2$
(*c*) $y = 2 \sin 3x$
(*d*) $y = 2 \sin 2x$
(*e*) $y = 2 \sin x$

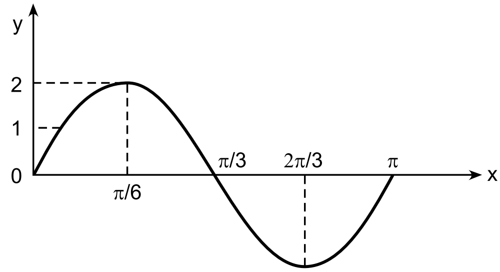


**Fig. Q. 246.**

**247.** If $0 < \theta_1 < \theta_2 < \pi/2$, which of the following statements is true?

(*a*) $\sin \theta_1 < \sin \theta_2$
(*b*) $\cos \theta_1 < \cos \theta_2$
(*c*) $\tan \theta_1 < \tan \theta_2$
(*d*) (*a*) and (*c*) only
(*e*) (*b*) and (*c*) only
(*f*) (*a*) and (*b*) only

**248.** Which of the following statements is true?

(*a*) The magnetic field inside the conductor is zero
(*b*) The magnetic field inside the semiconductor is zero
(*c*) The magnetic field inside the superconductor is zero
(*d*) The magnetic field inside the dielectric is zero

**249.** Wein Bridge may be used for

(*a*) resistance determination
(*b*) frequency measurements
(*c*) power factor measurements
(*d*) harmonic distortion analysis
(*e*) both (*b*) and (*d*)

**250.** D'Arsonval/Weston type galvanometers work on the principle of

(*a*) moving coil instruments
(*b*) moving iron instruments
(*c*) potentiometric instruments
(*d*) permanent magnet moving coil instruments
(*e*) induction instruments

**251.** When any material has negative magnetism, the material is called
(*a*) paramagnetic
(*b*) diamagnetic
(*c*) ferromagnetic
(*d*) antiferromagnetic

**252.** A bar magnet has
(*a*) the dipole movement
(*b*) monopole movement
(*c*) (*a*) and (*c*) both
(*d*) none of the above

**253.** There is no material that has properties of a magnetic monopole.
(*a*) true
(*b*) false

**254.** Which of the following materials are diamagnetic?
(*a*) Copper
(*b*) Silver
(*c*) Copper and silver
(*d*) Iron

**255.** When of the following materials fall in the category of paramagnetic materials?
(*a*) Copper
(*b*) Iron
(*c*) Copper and iron
(*d*) Nickel
(*e*) None of the above

**256.** Which of the following types of material are not very important for engineering applications?
(*a*) Paramagnetic
(*b*) Ferromagnetic
(*c*) Diamagnetic
(*d*) None of the above

**257.** The solids which have small but positive magnetic susceptibility are called
(*a*) ferromagnetic
(*b*) paramagnetic
(*c*) diamagnetic
(*d*) anti-ferromagnetic

**258.** The susceptibility of paramagnetic materials generally lies between
(*a*) $10^{-3}$ and $10^{-7}$
(*b*) $10^{-3}$ and $10^{-5}$
(*c*) $10^{-4}$ and $10^{-8}$
(*d*) $10^{-2}$ and $10^{-5}$

**259.** For which of the following materials is the saturation value the highest?
(*a*) Ferrites
(*b*) Ferromagnetic materials
(*c*) Paramagnetic materials
(*d*) Diamagnetic materials

**260.** For which of the following materials is the relative permeability less than one?

(*a*) Ferromagnetic materials
(*b*) Diamagnetic materials
(*c*) Paramagnetic materials
(*d*) Ferrites

**261.** The temperature above which an anti-ferromagnetic material becomes paramagnetic is called

(*a*) peak temperature
(*b*) critical temperature
(*c*) Neel temperature
(*d*) Weiss temperature

**262.** The inductance of the following circuit across *A* and *B* will be

(*a*) $L_1 + L_2 + M$
(*b*) $L_1 + L_2 + 2M$
(*c*) $L_1 + L_2 - 2M$
(*d*) $L_1 + L_2 - M$

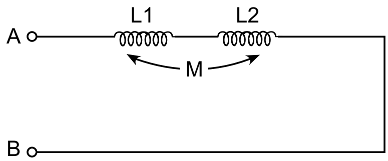


**Fig. Q. 262.**

**263.** The inductance of the following circuit across *A* and *B* will be

(*a*) $L_1 + L_2 - M$
(*b*) $L_1 + L_2 + 2M$
(*c*) $L_1 + L_2 + M^2 - L_1L_2$
(*d*) $\dfrac{(L_1L_2 - M^2)}{(L_1 + L_2 + 2M)}$

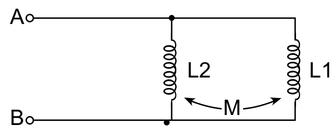


**Fig. Q. 263.**

**264.** Transient currents may occur in the following circuits:

(*a*) Pure resistive circuits
(*b*) Capacitive circuits
(*c*) *RL* circuits
(*d*) *RLC* circuits
(*e*) (*b*) or (*c*) or (*d*)

**265.** Which of the following coils will have large resonant frequency?

(*a*) A coil with large distributed capacitance
(*b*) A coil with low distributed capacitance
(*c*) A coil with large resistance
(*d*) A coil with low resistance

**266.** The transfer matrix $\begin{vmatrix} 1 & 0 \\ Y & 1 \end{vmatrix}$ belongs to which of a following circuits?

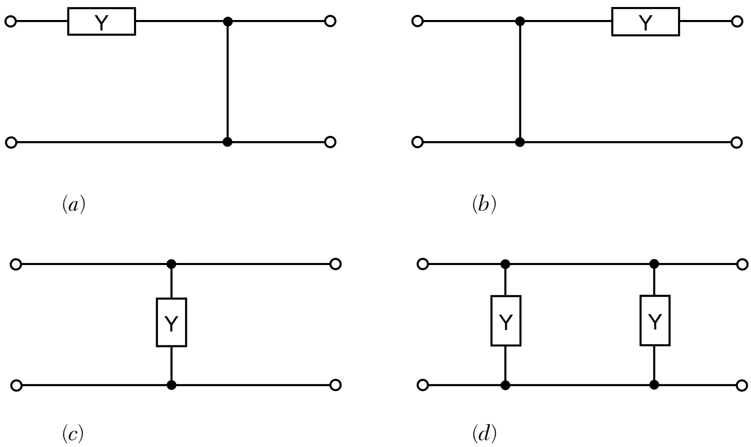


**Fig. Q. 266.**

**267.** What will be the magnetic field in a toroid having $N$ number of turns, diameter $d$ and current $I$?

(*a*) $\frac{1}{2\pi}\frac{NI}{d}$ (*b*) $\frac{1}{\pi}\frac{NI}{d}$ (*c*) $\frac{\mu_0}{\pi}\frac{NI}{d}$ (*d*) $\frac{\mu_0 NI}{\pi d_2}$

**268.** A variable A.C. source is connected across the resistor. Which of the following curves represents the correct relationship between $W$ and voltage $V$, if voltage is increased gradually.

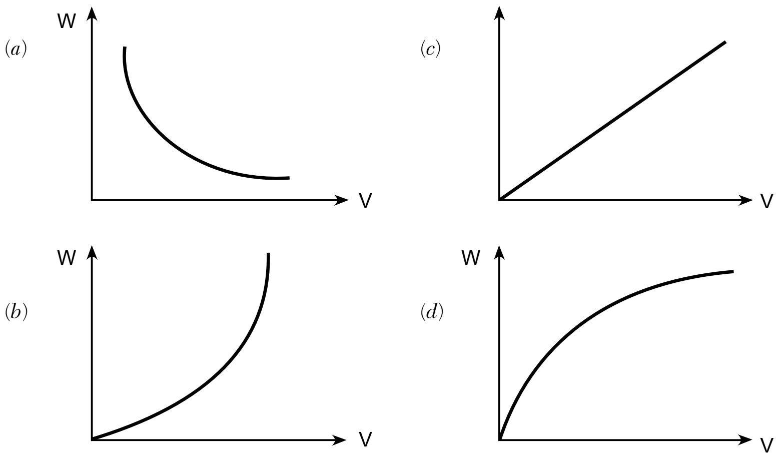


**Fig. Q. 268.**

**269.** A typical radar antenna will have a bandwidth of

(*a*) 4° (*b*) 6°
(*c*) 1° (*d*) 2°

**270.** Which of the following antennas is non-resonant?

(*a*) Broadside array (*b*) Marconi
(*c*) Discone (*d*) Rhombic

**271.** Ferrimagnetic materials are generally classified as

(*a*) conductors (*b*) semiconductors
(*c*) dielectric (*d*) insulators

**272.** Which of the materials will one choose for a transformer core if the transformer has to work at microwave frequency?

(*a*) Supermalloy (*b*) Silicon
(*c*) Ferrites (*d*) Iron

**273.** Magnetic materials exhibit the property of magnetization because of

(*a*) orbital motion of electrons (*b*) spin of electrons
(*c*) spin of nucleus (*d*) any of these
(*e*) all of the above

**274.** A coil of 0.04 mH is carrying current of 1 A. If this current is reversed in 0.02 seconds, the induced E.M.F. in the coil will be

(*a*) 0.16 V (*b*) 0.008 V
(*c*) 0.004 V (*d*) 0.04 V

**275.** A coil is wound on an iron core which carries current $I$. The self-induced voltage in the coil is not affected by

(*a*) change of the number of turns of the coil
(*b*) the resistance of the magnetic path
(*c*) variation in voltage to the coil
(*d*) variation in coil current

**276.** How much energy will be stored in the magnetic field of a coil which has self-inductance of 10 mH and current of 20 A?

(*a*) 1 joule (*b*) 10 joules
(*c*) 2 joules (*d*) 20 joules

**277.** Which of the following statements is correct?

(*a*) Inductance of the coil carrying a constant D.C. current will increase the current

(*b*) The inductance of the coil carrying a constant D.C. current will not affect the current

(*c*) The inductance of the coil carrying a constant D.C. current will decrease the current

(*d*) The inductance of the coil carrying a constant D.C. current will change the current into pulses

**278.** If the frequency of power supply is 60 Hz, what will be the period of one cycle?

(*a*) 0.02 sec (*b*) 0.015 sec

(*c*) 0.017 sec (*d*) 0.03 sec

**279.** If a sinusoidal wave has frequency of 50 Hz with 15 A R.M.S. current, which of the following equations represents this wave?

(*a*) 15 sin 50 $t$ (*b*) 30 sin 25 $t$

(*c*) 42.42 sin 25 $t$ (*d*) 21.21 sin 314 $t$

**280.** What will happen if the frequency of power supply in a pure capacitive circuit is doubled?

(*a*) The current will be reduced to half

(*b*) The current will also be doubled

(*c*) The current will remain same

(*d*) The current will increase fourfold

**281.** The safest value of current the human body can carry more than 3 seconds is

(*a*) 5 mA (*b*) 15 mA

(*c*) 25 mA (*d*) 35 mA

(*e*) 9 mA

**282.** Which of the following precautions should be taken first if a man suffers from electric shock?

(*a*) Switch off the power supply (*b*) Call the doctor

(*c*) Make him lie on the ground (*d*) Provide him glucose

(*e*) Lie down on the ground and give him artificial respiration

**283.** A transformer is designed to achieve 240 V A.C. 50 Hz supply with input of 3.3 kV, 50 Hz and output of 415 V 50 Hz. The secondary of the transformer will have

(*a*) three-phase 3 wire system

(*b*) three-phase 2 wire system

(*c*) three-phase 6 wire system

(*d*) three-phase 4 wire system

**284.** Hysteresis losses do not depend on

(*a*) volume of material

(*b*) magnetic field

(*c*) frequency

(*d*) any of these

(*e*) none of these

**285.** For which of the following materials is the net magnetic moment zero?

(*a*) Ferrimagnetic materials

(*b*) Diamagnetic materials

(*c*) Anti-ferrimagnetic materials

(*d*) Anti-ferromagnetic materials

**286.** What will happen if a strong magnetic field is applied to a ferromagnetic field?

(*a*) The domain wall motion varies

(*b*) The domain wall motion becomes constant

(*c*) The domain wall motion becomes reversible

(*d*) The domain wall motion becomes irreversible

**287.** The attraction capacity of electromagnet will

(*a*) increase if the flux density decreases

(*b*) increase if the flux density increases

(*c*) increase if the core area increases

(*d*) increase if the core length increases

**288.** Which of the following statements is correct?

(*a*) The conductivity of ferromagnetic material is better than ferrites

(*b*) The conductivity of ferrites is better than ferromagnetic materials

(*c*) The conductivity of ferrites is same as that of ferromagnetic materials

(*d*) The conductivity of ferrites is very high

**289.** The magnetization and applied field in ferromagnetic materials are related

(*a*) linearly (*b*) non-linearly

(*c*) parabolically (*d*) sinusoidally

**290.** The effective power in a pure capacitive circuit shall be

(*a*) energy stored by capacitor (*b*) positive

(*c*) half of the energy stored (*d*) zero

**291.** A pure inductance connected across 230 V 50 Hz supply consumes 50 W. This consumption can be attributed to

(*a*) the reactance of the inductor

(*b*) the current flowing in the inductor

(*c*) the big size of the inductor

(*d*) the false statement made in this question

**292.** The heat generated by an electric iron is

(*a*) reactive power (*b*) true power

(*c*) apparent power (*d*) reactive and true power

**293.** In which of these materials are the spin moments associated with two sets of atoms aligned antiparallel to each other?

(*a*) Ferrimagnetic materials (*b*) Anti-ferromagnetic materials

(*c*) Ferrites (*d*) Ferromagnetic materials

**294.** Which of the following statements is correct?

(*a*) Polarizer converts the produced hydrogen in the water in the carbon zinc battery

(*b*) Depolarizer converts the produced hydrogen in the water in the carbon zinc battery

(*c*) Carbon power converts the produced hydrogen in the water in the carbon zinc battery

(*d*) Zinc chloride converts the produced hydrogen in the water in the carbon zinc battery

**295.** Manganese dioxide acts as depolarizer in a

(*a*) lead acid battery (*b*) carbon zinc cell

(*c*) dry cell (*d*) zinc electrolyte cell

**296.** Which of the following acts as a depolarizer in carbon zinc cell?
(*a*) Carbon powder (*b*) Zinc chloride
(*c*) Iron ore and carbon powder (*d*) Ammonia chloride

**297.** If current is passed through a conductor, which of the following phenomena will be observed?
(*a*) A magnetic field will be developed in the conductor
(*b*) A magnetic field and heat are developed in the conductor
(*c*) Only heat is developed in the conductor
(*d*) The molecules of the conductor attract each other

**298.** The standing wave ratio of 4 will be applicable to
(*a*) 80 ohms transmission line feeding to a load of 320 ohms
(*b*) 20 ohms transmission line feeding to a load of 100 ohms
(*c*) 100 ohms transmission line feeding to a load of 300 ohms
(*d*) 50 ohms transmission line feeding to a load of 500 ohms

**299.** A network which does not have either voltage source or current source is called a
(*a*) active network (*b*) passive network
(*c*) resistive network (*d*) resistive and inductive network

**300**. $\nabla \cdot \mathbf{D}$ is equal to
(*a*) free charge density (*b*) total charge density
(*c*) bound charge density (*d*) zero

**301.** The product of fundamental constants $\mu_0\varepsilon_0$ is equal to
(*a*) $c$ (*b*) $c^2$
(*c*) $1 / c$ (*d*) $1 / c^2$

**302**. The differential form of Gauss's law for electric fields states that the divergence of the electric displacement is proportional to (or equal to)
(*a*) the free charge density (*b*) the total charge density
(*c*) the bound charge density (*d*) zero

**303**. The differential form of Gauss's law for magnetic fields states that the divergence of the magnetic field is proportional to (or equal to)
(*a*) the free current density (*b*) the total current density
(*c*) the bound current density (*d*) zero

**304**. Given the time dependent charge $Q(t) = Q_0 e^{-\lambda t}$ the current $I(t)$ is equal to

(*a*) $-\lambda Q_0 e^{-\lambda t}$
(*b*) $\lambda t Q_0 e^{-\lambda t}$
(*c*) $\dfrac{Q_0}{\lambda} e^{-\lambda t}$
(*d*) $\dfrac{Q_0}{\lambda}\left(1 - e^{-\lambda t}\right)$

**305**. The MKS units of resistivity are

(*a*) $\Omega \cdot \mathrm{m}$
(*b*) $\dfrac{\mathrm{m}}{\mathrm{S}}$
(*c*) $\Omega / \mathrm{m}$
(*d*) $\mathrm{S} \cdot \mathrm{m}$
(*e*) Answers (*a*) and (*b*)

**306**. The MKS units of conductivity are

(*a*) $\dfrac{1}{\Omega \cdot \mathrm{m}}$
(*b*) $\dfrac{\mathrm{S}}{\mathrm{m}}$
(*c*) $\Omega / \mathrm{m}$
(*d*) $\mathrm{S} \cdot \mathrm{m}$
(*e*) answers (*a*) and (*b*)

**307**. The electrical skin depth in good conductors with electrical conductivity $\sigma$, permeability $\mu = \mu_r \mu_0$ and permittivity $\varepsilon = \varepsilon_r \varepsilon_0$ at a frequency $\omega = 2\pi f$ is

(*a*) $\delta = \sqrt{\dfrac{2}{\mu\omega\sigma}}$
(*b*) $\delta = \sqrt{\dfrac{\mu\omega\sigma}{2}}$
(*c*) $\delta = \sqrt{\dfrac{2}{\varepsilon\omega\sigma}}$
(*d*) $\delta = \sqrt{\dfrac{\varepsilon\omega\sigma}{2}}$

**308**. The electrical skin depth in a conductor at 5 kHz is found to be 1.0 cm. What is the skin depth at 20 kHz

(*a*) 2.0 cm
(*b*) 1.7 cm
(*c*) 0.25 cm
(*d*) 0.50 cm

**309**. The discontinuity in the electric displacement at a surface is numerically equal to the

(*a*) surface charge density
(*b*) surface current density
(*c*) electric potential
(*d*) vector potential

**310**. Specified potential values on exterior boundaries or edges within a solution region

(*a*) Dirichlet boundary conditions
(*b*) Neumann boundary conditions
(*c*) mixed boundary conditions
(*d*) open boundary conditions

**311**. Specified normal derivative of the potential on exterior boundaries or edges within a solution region

(*a*) Dirichlet boundary conditions

(*b*) Neumann boundary conditions

(*c*) mixed boundary conditions

(*d*) open boundary conditions

**312**. Specified normal derivative of the potential and potential values on exterior boundaries or edges within a solution region

(*a*) Dirichlet boundary conditions

(*b*) Neumann boundary conditions

(*c*) mixed boundary conditions

(*d*) open boundary conditions

**313**. An expression for the capacitance of a conductor with total charge $Q$ electrostatic energy $W$ and surface potential $V$?

(*a*) $C = \dfrac{Q}{V}$. (*b*) $C = \dfrac{2W}{V^2}$,

(*c*) $C = \dfrac{Q^2}{2W}$, (*d*) all the above

**314**. The Biot-Savart Law

(*a*) relates current density and magnetic field

(*b*) relates vector potential and current density

(*c*) is an empirical law

(*d*) relates electric and magnetic fields

(*e*) answers (*a*) and (*c*)

**315**. The relation between vector potential **A** and magnetic field **B**

(*a*) $\mathbf{B} = -\dfrac{d\mathbf{A}}{dt}$ (*b*) $\mathbf{B} = \nabla^2\mathbf{A}$

(*c*) $\mathbf{B} = \nabla \times \mathbf{A}$ (*d*) $\mathbf{B} = \int \nabla \cdot \mathbf{A}\, dv$

**316**. The torque acting on a magnetic dipole with moment $\boldsymbol{\mu}$ in a uniform magnetic field **B**

(*a*) $\boldsymbol{\mu} \times \mathbf{B}$ (*b*) $-\boldsymbol{\mu} \cdot \mathbf{B}$

(*c*) $(\boldsymbol{\mu} \cdot \nabla)\mathbf{B}$ (*d*) zero

**317**. The energy of a magnetic dipole with moment $\boldsymbol{\mu}$ in a uniform magnetic field $\mathbf{B}$

(*a*) $\boldsymbol{\mu} \times \mathbf{B}$ (*b*) $-\boldsymbol{\mu} \cdot \mathbf{B}$

(*c*) $(\boldsymbol{\mu} \cdot \nabla)\mathbf{B}$ (*d*) zero

**318**. The force acting on a magnetic dipole with moment $\boldsymbol{\mu}$ in a nonuniform magnetic field $\mathbf{B}$

(*a*) $\boldsymbol{\mu} \times \mathbf{B}$ (*b*) $-\boldsymbol{\mu} \cdot \mathbf{B}$

(*c*) $(\boldsymbol{\mu} \cdot \nabla)\mathbf{B}$ (*d*) zero

**319**. The force acting on a magnetic dipole with moment $\boldsymbol{\mu}$ in a uniform magnetic field $\mathbf{B}$

(*a*) $\boldsymbol{\mu} \times \mathbf{B}$ (*b*) $-\boldsymbol{\mu} \cdot \mathbf{B}$

(*c*) $(\boldsymbol{\mu} \cdot \nabla)\mathbf{B}$ (*d*) zero

**320**. The torque acting on an electric dipole with moment $\mathbf{p}$ in a uniform electric field $\mathbf{E}$

(*a*) $\mathbf{p} \times \mathbf{E}$ (*b*) $-\mathbf{p} \cdot \mathbf{E}$

(*c*) $(\mathbf{p} \cdot \nabla)\mathbf{E}$ (*d*) zero

**321**. The energy of an electric dipole with moment $\mathbf{p}$ in a uniform electric field $\mathbf{E}$

(*a*) $\mathbf{p} \times \mathbf{E}$ (*b*) $-\mathbf{p} \cdot \mathbf{E}$

(*c*) $(\mathbf{p} \cdot \nabla)\mathbf{E}$ (*d*) zero

**322**. The force on an electric dipole with moment $\mathbf{p}$ in a nonuniform electric field $\mathbf{E}$

(*a*) $\mathbf{p} \times \mathbf{E}$ (*b*) $-\mathbf{p} \cdot \mathbf{E}$

(*c*) $(\mathbf{p} \cdot \nabla)\mathbf{E}$ (*d*) zero

**323**. The force on an electric dipole with moment $\mathbf{p}$ in a uniform electric field $\mathbf{E}$

(*a*) $\mathbf{p} \times \mathbf{E}$ (*b*) $-\mathbf{p} \cdot \mathbf{E}$

(*c*) $(\mathbf{p} \cdot \nabla)\mathbf{E}$ (*d*) zero

**324**. The magnetic flux through a sphere in a nonuniform magnetic field is

(*a*) zero

(*b*) the average value of magnetic field integrated over the sphere

(*c*) $\dfrac{\mu_0}{4\pi}$

(*d*) equal to the average time rate of change of $\mathbf{E}$ on the surface

**325**. The force per unit length between two parallel line wires each with a current $I$ separated by a distance $r$.

(*a*) $\dfrac{F}{L} = \dfrac{\mu_0 I^2}{2\pi r}$ (attractive)

(*b*) $\dfrac{F}{L} = \dfrac{\mu_0 I^2}{2\pi r}$ (repulsive)

(*c*) $\dfrac{F}{L} = \dfrac{\mu_0 I^2}{4\pi r^2}$ (attractive)

(*d*) $\dfrac{F}{L} = \dfrac{\mu_0 I^2}{4\pi r^2}$ (repulsive)

**326**. The differential form of Faraday's law for time harmonic fields

(*a*) $\nabla \times \mathbf{B} = j\dfrac{\omega}{c^2}\mathbf{E}$

(*b*) $\nabla \times \mathbf{E} = -j\omega\mathbf{B}$

(*c*) $\nabla \times \mathbf{B} = \mu\mathbf{J} + \mu\varepsilon\dfrac{\partial \mathbf{E}}{\partial t}$

(*d*) $\nabla \times \mathbf{B} = \dfrac{1}{c^2}\dfrac{\partial \mathbf{E}}{\partial t}$

**327**. Maxwell's equation in matter $\nabla \times \mathbf{H} = \mathbf{J} + \dfrac{\partial \mathbf{D}}{\partial t}$ where

(*a*) $\mathbf{B} = \mu\mathbf{H}$

(*b*) $\mathbf{D} = \varepsilon\mathbf{E}$

(*c*) $\partial\mathbf{D} / \partial t$ is Maxwell's displacement current

(*d*) all the above

**328**. Given Maxwell's equation for in material media with time harmonic fields $\nabla \times \mathbf{B} = \mu\sigma\mathbf{E} + j\omega\mu\varepsilon\mathbf{E}$ the conduction current will be much greater than the displacement current for frequencies

(*a*) $\omega \ll \sigma / \varepsilon$

(*b*) $\omega \gg \sigma / \varepsilon$

(*c*) answers (*a*) and (*b*)

(*d*) neither (*a*) nor (*b*)

**329**. Taking the curl of the relation $\mathbf{E} + \dfrac{\partial \mathbf{A}}{\partial t} = -\nabla V$ gives

(*a*) $\nabla^2 V = -\dfrac{\rho}{\varepsilon_0}$

(*b*) $\nabla \times \mathbf{E} = -\dfrac{\partial \mathbf{B}}{\partial t}$

(*c*) $\nabla \cdot \mathbf{E} = \dfrac{\rho}{\varepsilon_0}$

(*d*) $\nabla \times \mathbf{B} = \dfrac{1}{c}\dfrac{\partial \mathbf{E}}{\partial t}$

**330**. Taking the divergence of the relation $\mathbf{E}+\dfrac{\partial \mathbf{A}}{\partial t}=-\nabla V$ gives

(*a*) $\nabla^2 V=-\dfrac{\rho}{\varepsilon_0}$ if $\nabla\cdot\mathbf{A}=0$

(*b*) $\nabla\times\mathbf{E}=-\dfrac{\partial \mathbf{B}}{\partial t}$

(*c*) $\nabla\cdot\mathbf{E}=\dfrac{\rho}{\varepsilon_0}$

(*d*) $\nabla\times\mathbf{B}=\dfrac{1}{c}\dfrac{\partial \mathbf{E}}{\partial t}$

**331**. If the electric potential is constant, as in a conductor, then the relation between eddy current $\mathbf{J}_{\text{eddy}}$ and vector potential $\mathbf{A}$ is

(*a*) $\mathbf{J}_{\text{eddy}}=-j\omega\sigma\mathbf{A}$ for A.C. fields

(*b*) $\mathbf{J}_{\text{eddy}}=-\sigma\dfrac{d\mathbf{A}}{dt}$ for transient fields

(*c*) $\mathbf{J}_{\text{eddy}}=-\omega\sigma\nabla\times\mathbf{A}$

(*d*) both (*a*) and (*b*)

**332**. The active and reactive components of the current density $\mathbf{J}=\sigma\mathbf{E}+j\omega\varepsilon\mathbf{E}$

(*a*) $\mathbf{J}_{\text{active}}=\sigma\omega\mathbf{E}$ $\mathbf{J}_{\text{reactive}}=\varepsilon\mathbf{E}$

(*b*) $\mathbf{J}_{\text{active}}=\sigma\mathbf{E}$ $\mathbf{J}_{\text{reactive}}=\omega\varepsilon\mathbf{E}$

(*c*) $\mathbf{J}_{\text{reactive}}=\sigma\mathbf{E}$ $\mathbf{J}_{\text{active}}=\omega\varepsilon\mathbf{E}$

(*d*) $\mathbf{J}_{\text{active}}=\sigma\mathbf{E}+\omega\varepsilon\mathbf{E}$ $\mathbf{J}_{\text{reactive}}=\sigma\mathbf{E}-\omega\varepsilon\mathbf{E}$

**333**. The loss tangent (or loss factor) is defined as

(*a*) $\tan\delta=\dfrac{J_{\text{active}}}{J_{\text{reactive}}}$.

(*b*) $\tan\delta=\dfrac{\sigma}{\omega\varepsilon}$

(*c*) answers (*a*) and (*b*)

(*d*) neither (*a*) nor (*b*)

**334**. The loss angle $\delta=\tan^{-1}\dfrac{\sigma}{\omega\varepsilon}$ is a measure of

(*a*) the energy lost divided by the energy stored per cycle

(*b*) the energy stored divided by the energy lost per cycle

(*c*) the energy stored times the energy lost per cycle

**335**. The Lorentz force law states that the force acting on a charge $q$ moving with velocity $\mathbf{v}$ in electric $\mathbf{E}$ and magnetic $\mathbf{B}$ fields points

($a$) in the direction of $\mathbf{E}$ only

($b$) perpendicular to both $\mathbf{E}$ and $\mathbf{B}$

($c$) parallel to $\mathbf{B}$ only

($d$) in the direction $\mathbf{E} + \mathbf{v} \times \mathbf{B}$

**336**. The magnetic field in a region of space is given by $\mathbf{B} = B_0 \sin(kx - \omega t)\hat{\mathbf{k}}$. Find the curl of the electric field $\nabla \times \mathbf{E}$

($a$) $B_0 k \cos(kx - \omega t)\hat{\mathbf{k}}$

($b$) $B_0 \omega \cos(kx - \omega t)\hat{\mathbf{k}}$

($c$) $-B_0 \omega \sin(kx - \omega t)\hat{\mathbf{i}}$

($d$) $-\dfrac{B_0}{\omega}\cos(kx - \omega t)\hat{\mathbf{i}}$

**337**. The electric field in a region of space is given by $\mathbf{E} = E_0 \dfrac{x}{a}\cos(\omega t)\hat{\mathbf{j}}$. Find the curl of the magnetic field $\nabla \times \mathbf{B}$

($a$) $\mathbf{E} = -E_0 \dfrac{\omega}{a}\sin(\omega t)\hat{\mathbf{j}}$

($b$) $\mathbf{E} = E_0 \dfrac{x\omega}{a}\cos(\omega t)\hat{\mathbf{i}}$

($c$) $\mathbf{E} = -\dfrac{\omega}{c^2} E_0 \dfrac{x}{a}\sin(\omega t)\hat{\mathbf{j}}$

($d$) $\mathbf{E} = -\dfrac{\omega}{ca} E_0 \cos(\omega t)\hat{\mathbf{j}}$

**338**. Given a static electric current density $\mathbf{J}$ the curl of the magnetic field $\nabla \times \mathbf{B}$ is

($a$) $\dfrac{d\mathbf{J}}{dt}$

($b$) $\nabla \times \mathbf{J}$

($c$) $\mu_0 \mathbf{J}$

($d$) $\dfrac{1}{\mu_0}\mathbf{J}$

**339**. The total magnetic flux through any open surface is zero

($a$) true

($b$) false

**340**. Numerical algorithm that solves Maxwell's first order equations

($a$) Yee's algorithm

($b$) The Boris algorithm

($c$) Poisson's algorithm

($d$) The metropolis algorithm

**341**. Numerical algorithm for the calculation of particle trajectories in electric and magnetic fields

($a$) Yee's algorithm

($b$) The Boris algorithm

($c$) Poisson's algorithm

($d$) The metropolis algorithm

# 5

# POWER SYSTEMS

**1.** If a fixed amount of power is to be transmitted over a certain length with fixed power loss, it can be said

(*a*) the volume of conductor required is inversely proportional to the square of voltage and that of the power factor of load

(*b*) the volume of the conductor is inversely proportional to voltage and that of power factor of load

(*c*) the volume of the conductor is proportional to square of the voltage and directly proportional to power factor of load

(*d*) the volume of the conductor required in proportional to voltage only

**2.** There is no skin effect in D.C. transmission.

(*a*) true (*b*) false

**3.** Assuming constant efficiency transmission, if the voltage is increased $n$ times, the size of conductor would be

(*a*) reduced to $1/n^2$ that of the original

(*b*) increased to $n^2$ that of the original

(*c*) reduced to $1/n$ that of the original

(*d*) increased to $n$ times that of the original

**4.** The percentage regulation of the transmission line is inversely proportional to the square of the voltage.

(*a*) true (*b*) false

**5.** In a distribution system, if the synchronous capacitors are to be used for improving the power factor, the correct location would be

(*a*) at the sending end (*b*) at the receiving end

(*c*) in middle of the transmission line

(*d*) none of the above

**6.** In limiting case, the maximum cost of the phase advancing plant that would justify its installation is when its working cost is

(*a*) equal to the working cost of the generating plant to give the same increase in power

(*b*) equal to working cost of the generating plant to give less increase in power

(*c*) less than the working cost of the generating plant to give the same increase in power

(*d*) greater than the working cost of the generating plant to give more increase in power

**7.** For successful parallel operation of the alternators, which of the following is necessity?

(*a*) reactance (*b*) resistance

(*c*) impedance (*d*) reluctance

**8.** The synchronizing power in the parallel operation of the alternators will be maximum when

(*a*) the armatures have more reactances then their resistances

(*b*) the armatures have less reactances than their resistances

(*c*) the armature reactances equal to their resistances

(*d*) the resistances of armatures are zero

**9.** The synchronizing power developed in one of the alternators when two alternators are running in parallel will load the same alternator in which it is developed and reduce its speed.

(*a*) true (*b*) false

**10.** When two alternators are running in parallel and the excitation of one alternator is more than the other, the alternator having more excitation will transfer the real power to other alternator.

(*a*) true (*b*) false

**11.** When a single machine supplies a local load, a change in excitation of the machine changes terminal voltage; likewise it is true for infinite busbars.

(*a*) true (*b*) false

**12.** The actual division of the total kW load between alternators running in parallel depends upon the

(*a*) speed-load characteristic (*b*) voltage-load characteristic

(*c*) (*a*) and (*b*) both (*d*) (*a*) or (*b*)

**13.** The division of the total reactive KVA between alternators will depend upon the voltage-load characteristic.

(*a*) true (*b*) false

**14.** The critical value of surge impedance of a large transmission line is

(*a*) 50 ohms (*b*) 500 ohms

(*c*) 75 ohms (*d*) 1000 ohms

**15.** The surge impedance of a telephone line is

(*a*) 75 ohms (*b*) 600 ohms

(*c*) 500 ohms (*d*) 50 ohms

(*e*) 60 ohms

**16.** The approximate surge impedance of a transmission line is

(*a*) $L/C$ (*b*) $LC$

(*c*) $\sqrt{L/C}$ (*d*) $\sqrt{LC}$

**17.** Natural uranium contains

(*a*) 0.7% $U_{235}$ (*b*) 0.7% $U_{238}$

(*c*) 100% $U_{238}$ (*d*) 50% $U_{235}$

**18.** Which of the following will affect the transfer of real power between stations if they are interconnected?

(*a*) Quadrature voltage

(*b*) In-phase voltage boost

(*c*) Reactance

(*d*) Angular displacement between stations

**19.** The synchronous capacity of an interconnector is defined as the change of kW transmitted per radian change of angular displacement of the two voltages of two stations and is independent of reactance.

(*a*) true (*b*) false

**20.** The transmission of power by overhead lines is much costlier than underground cable transmission.

(*a*) true (*b*) false

**21.** Shunt conductance in power transmission in due to

(*a*) leakage over the insulator

(*b*) leakage over the conductors

(*c*) leakage over the poles

(*d*) leakage between ground and conductors

**22.** The string efficiency of the insulator can be increased by

(*a*) increasing the number of strings in the insulator

(*b*) increasing ratio, capacity to earth/capacity per insulator

(*c*) correct grading of the various capacitances

(*d*) reducing the number of strings

**23.** The dielectric strength of the air barometric pressure of 76 cm and 25°C is

(*a*) 30 KV per meter (*b*) 21.1 KV R.M.S. per cm

(*c*) 21.1 KV R.M.S. per cm (*d*) 21.1 KV per cm

**24.** In case of parallel wires the visual corona begins

(*a*) at disruptive critical voltage

(*b*) at visual critical voltage which is higher than disruptive critical voltage

(*c*) at lower voltage than disruptive critical voltage

(*d*) none of the above

**25.** Corona helps in avoiding the effect of lightning or surges on the transmission line.

(*a*) true (*b*) false

**26.** Corona will not involve energy loss when the transmission is D.C.

(*a*) true (*b*) false

**27.** High tension cables can be used up to

(*a*) 22 kV (*b*) 11 kV

(*c*) 44 kV (*d*) 33 kV

**28.** Sheath is used in cables to

(*a*) prevent moisture from entering the cable

(*b*) provide strength to the cable

(*c*) avoid the chance of rust on the strands

(*d*) provide proper insulation

**29.** The extra high-tension cables are usually filled with thin oil under pressure of gas because

(*a*) the pressure of oil or gas will avoid the formation of voids

(*b*) the pressure will provide strength to the cable

(*c*) the pressure will enable the cable to withstand high voltage

(*d*) the gas and oil at high pressure will work as an insulator

**30.** The voltage stress is maximum in the cable

(*a*) at the surface of the sheath

(*b*) at the surface of the conductor

(*c*) at the surface of the insulator

(*d*) at the surface of the armoring

**31.** The intersheaths in cables are used

(*a*) to provide uniform stress distribution

(*b*) to avoid the requirement of good insulation

(*c*) to minimize stress

(*d*) to avoid moisture

**32.** Graded cables use the dielectric of different

(*a*) permitivities (*b*) permeabilities

(*c*) (*a*) and (*b*) both (*d*) (*a*) or (*b*)

**33.** The charging current in cables

(*a*) lags the voltage by 90° (*b*) leads the voltage by 90°

(*c*) leads the voltage by 180° (*d*) lags the voltage by 45°

**34.** Dielectric losses increase with the increase of temperature.

(*a*) true (*b*) false

**35.** If *A*, *B*, *C*, and *D* are the constants of a medium transmission line, which of the following relations is correct?

(*a*) $AB - CD = -1$ (*b*) $AD + BD = 1$

(*c*) $BC - AD = -1$ (*d*) $AC - BD = 1$

**36.** What is the unit of constant *D*?

(*a*) ohm (*b*) mho

(*c*) henry (*d*) none of the above

**37.** While finding out the relation between $V_S$ and $V_R$, capacitance is neglected in

(*a*) a short transmission line

(*b*) a long transmission line

(*c*) a medium transmission line

(*d*) all the above

**38.** The capacitance in the a medium transmission line is

(*a*) lumped

(*b*) distributed over the entire length of line

(*c*) (*a*) or (*b*) depending on the transmission voltage

(*d*) variable non-linearity over line

**39.** The surge impedance of the underground cable is more than the surge impedance of the overhead transmission line.

(*a*) true (*b*) false

**40.** The surge impedance for an underground cable is

(*a*) 60 to 100 ohms

(*b*) 40 to 60 ohms

(*c*) 40 to 600 ohms

(*d*) 30 to 75 ohms

**41.** The surge impedance of a long transmission line is given by

(*a*) $Z_c = \sqrt{L/C}$ (*b*) $Z_c = \sqrt{Z/Y}$

(*c*) $Z_c = \sqrt{Y/Z}$ (*d*) $Z_c = \sqrt{R/Y}$

**42.** Surge impedance cannot be determined in terms of the $A$, $B$, $C$ and $D$ constants of the line.

(*a*) true (*b*) false

**43.** The Ferranti Effect states that under certain conditions the sending end voltage is

(*a*) less than the receiving end voltage

(*b*) greater than the receiving end voltage

(*c*) equal to the receiving end voltage

(*d*) abnormally high

**44.** The surge impedance of a line having negligible resistance and no shunt leakage is pure resistance, *i.e.*, $Zc = \sqrt{L/C}$.

(*a*) true (*b*) false

**45.** The use of transformers does not affect the performance of the transmission line.

(*a*) true (*b*) false

**46.** The entire line performance can be determined by

(*a*) sending end power circle diagram

(*b*) receiving end power circle diagram

(*c*) universal power circle diagram

(*d*) (*a*) or (*c*)

**47.** Transducer type regulators are electromechanical voltage regulators.

(*a*) true (*b*) false

**48.** If the shunt admittance of a transmission line is neglected, the maximum power will occur when torque angle is

(*a*) 45° (*b*) – 90°

(*c*) 90° (*d*) 180°

**49.** If the receiving end voltage is assumed to be the same as the sending end voltage, and the impedance of the line is the resistance of the line, what will be the maximum steady state power transmitted over the line?

(*a*) $\dfrac{V_R^2}{Z}$ (*b*) $\dfrac{V_S^2}{Z}$

(*c*) zero (*d*) very high

**50.** If the reactance of the line is varied and resistance is kept constant, the maximum steady state power that could be transmitted over the line would be greater when

(*a*) $X = \frac{R}{\sqrt{3}}$ (*b*) $X = 3R$

(*c*) $X = \sqrt{3}R$ (*d*) $X = \frac{R}{3}$

**51.** The equal area criterion of stability is applicable to

(*a*) two machine system and infinite busbars

(*b*) one machine system and infinite busbars

(*c*) multi-machine system only

(*d*) none of the above

**52.** If the torque angle δ increases infinitely, the system will show

(*a*) stability (*b*) instability

(*c*) steady state stability (*d*) none of the above

**53.** If $V_S = V_R = 33$ kV for three phase transmission and reactance is 13 ohms per phase, what will be the maximum power transmission per phase?

(*a*) 29 MW (*b*) 28 MW

(*c*) 30 MW (*d*) 60 MW

**54.** Switching operations will not affect the transient stability of the system.

(*a*) true (*b*) false

**55.** The size of the feeder is determined primarily by

(*a*) the current it is required to carry

(*b*) the percentage variation of voltage in the feeder

(*c*) the voltage across the feeder

(*d*) the distance over which the transmission is made

**56.** If the voltage is increased $n$ times, the current in the feeder is reduced to (for a given power delivered)

(*a*) $1/n$ times the original (*b*) $1/n^2$ times the original

(*c*) $1/\sqrt{n}$ times the original (*d*) $\sqrt{n}$ times the original

**57.** In the D.C. three wire transmission system, the cross-section of the neutral is generally

(*a*) $\frac{1}{4}$ of the outer conductors (*b*) $\frac{1}{2}$ of the outer conductors

(*c*) $\frac{1}{3}$ of the outer conductors (*d*) equal to the outer conductors

**58.** The radial system of distribution is better than the ring main system.

(*a*) true (*b*) false

**59.** The metal clad is related to

(*a*) amplidyne (*b*) switchgear system

(*c*) synchros (*d*) relays

**60.** As the transmission voltage increases, the percentage resistance drop

(*a*) increases (*b*) decreases

(*c*) will not change

(*d*) will increase in a random manner

**61.** As the transmission voltage increases, the volume of the conductor

(*a*) increases (*b*) decreases

(*c*) will not change (*d*) will increase proportionately

**62.** The power transmission capacity of the transmission line is

(*a*) proportional to the square of the operating voltage

(*b*) inversely proportional to the voltage

(*c*) proportional to the voltage

(*d*) inversely proportional to the square of the voltage

**63.** As the overall capital cost of transmission decreases, the voltage of transmission increases.

(*a*) true (*b*) false

**64.** Which of the following power plants has the maximum efficiency?

(*a*) Thermal power plant (*b*) Hydro-electric power plant

(*c*) Atomic reactor (*d*) MHD

**65.** The corona loss in a transmission line can be reduced by increasing spacing between the conductors or the diameter of the conductors.

(*a*) true (*b*) false

**66.** Bundle conductors are preferred for EHV transmission line because

(*a*) it is easy to fabricate thin conductors and combine them to make a bundle

(*b*) overall inductance of the line is reduced and corona loss and radio influences are minimum

(*c*) height of the tower is reduced, hence cheap transmission

(*d*) fabrication of the conductor is cheap

(*e*) of erection difficulties

**67.** EHV D.C. transmission over large distances is cheaper than EHV A.C. transmission.

(*a*) true (*b*) false

**68.** Percentage reactance is defined as

(*a*) the percentage of the ratio of change in reactance in transient condition to the total reactance of the machine

(*b*) the percentage of the ratio of change in reactance in transient condition of the total resistance of the machine

(*c*) the percentage of the ratio of voltage drop due to reactance synchronous machine to the rated voltage when full load rating current is flowing

(*d*) either (*a*) or (*c*)

**69.** If the secondary of the transformer having a reactance of 4% is short circuited with normal voltage applied to the primary, the symmetrical short circuit current will be

(*a*) 4 times the full load current

(*b*) 25 times the full load current

(*c*) 2 times the full load current

(*d*) 8 times the full load current

(*e*) 40 times the full load current

**70.** If the base kVA is 25,000, then a 5000 kVA alternator with 8% reactance will have a

(*a*) 4% reactance

(*b*) 40% reactance

(*c*) 16% reactance

(*d*) 20% reactance

**71.** The percentage reactance can be converted into ohmic value with the following formula:

(*a*) $X_{\text{ohms}} = \dfrac{X(\%) \times 100\ (\text{kV})^2}{\text{kVA}}$ (*b*) $X_{\text{ohms}} = \dfrac{X(\%) \times 1000\ (\text{kV})^2}{\text{kVA}}$

(*c*) $X_{\text{ohms}} = \dfrac{X(\%) \times (\text{kV})^2}{1000\ \text{kVA}}$ (*d*) $X_{\text{ohms}} = \dfrac{X(\%) \times 10\ (\text{kV})^2}{\text{kVA}}$

**72.** When an alternator is short circuited on three phases, it settles down to the steady short circuit value and is limited by

(*a*) sub-transient reactance (*b*) transient reactance

(*c*) synchronous reactance (*d*) either (*a*) or (*c*)

**73.** The short circuit current of an alternator when short circuited on three phases will be

(*a*) zero as time goes to infinity

(*b*) maximum when time goes to infinity

(*c*) infinite when time goes to infinity

(*d*) small as time goes to infinity but not zero

(*e*) none of the above

**74.** The reactors used to limit the short circuit current in the alternators have very small resistance in comparison to reactance

(*a*) because the high resistance will not help to limit the short circuit current

(*b*) to avoid the energy waste

(*c*) because the high resistance will raise the temperature and the insulation of reactor will be spoiled

(*d*) to improve power factor

**75.** "*a*" is an operator used for symmetrical component analysis

(*a*) which rotates the vector it operates upon through an angle 90° in the clockwise direction

(*b*) which rotates the vector it operates upon through an angle 120° in the counter-clockwise direction

(*c*) which rotates the vector it operates upon through an angle 120° in the clockwise direction

(*d*) which rotates the vector it operates upon through an angle 240° in the clockwise direction

**76.** Which of the following statements is true?

(*a*) $a = 0.5 - j\,0.866$ (*b*) $a = 0.5 + j\,0.866$

(*c*) $a^4 = -a$ (*d*) $a^2 = -(1 + a)$

**77.** The arc voltage produced in a circuit breaker is always

(*a*) in phase with the arc current (*b*) lagging the arc current by 90°

(*c*) leading the arc current by 90° (*d*) leading the arc current by 180°

**78.** The fusing factor of the fuse is always greater than one.

(*a*) true (*b*) false

**79.** The material used for a fuse must have

(*a*) low melting point and low specific resistance

(*b*) low melting point and high specific resistance

(*c*) high melting point and low specific resistance

(*d*) low melting point with any specific resistance

**80.** The Buchholz relay is used to protect

(*a*) alternators against all internal faults

(*b*) oil immersed transformers against all internal faults

(*c*) synchronous motors against all internal faults

(*d*) transmission lines against all short circuit faults

**81.** The torque produced in induction type relay (shaded pole structure) is

(*a*) proportional to the square of the current

(*b*) proportional to the current

(*c*) inversely proportional to the square of the current

(*d*) inversely proportional to the current

**82.** In an impedance relay the torque produced by the current element is balanced against the torque of a voltage element.

(*a*) true (*b*) false

**83.** If the fault occurs near the impedance relay, the $V/I$ ratio will be

(*a*) lower than if the fault occurs away from the relay

(*b*) higher than if the fault occurs away from the relay

(*c*) constant for all distances

(*d*) none of the above

**84.** Admittance relay is

(*a*) the directional relay (*b*) the non-directional relay

(*c*) the impedance relay (*d*) none of the above

**85.** The impedance relay can be used for earth faults and phase faults too.

(*a*) true (*b*) false

**86.** A saturable reactor can be used to realize the relay action.

(*a*) true (*b*) false

**87.** A 132 kV three phase, 50 Hz overhead line is 50 km long and has a capacitance to earth for each line of 0.0157 microfarad/km. What will be the inductance of the arc suppression coil suitable for the system?

(*a*) 4 henrys (*b*) 4.3 henrys

(*c*) 5 henrys (*d*) 2 henrys

**88.** An earthing transformer is used

(*a*) to avoid harmonics in the transformers

(*b*) to provide artificial neutral earthing where the neutral points of the three-phase system are not accessible

(*c*) to improve the current capacity of the neutral wire

(*d*) none of the above

**89.** The third harmonics current flowing from the generator line terminals through the system and returning by way of a comparatively low zero-sequence reactance path to the neutral terminals will give rise to

(*a*) overheating of the generator only

(*b*) overheating of the generator and neutral resistors of the earthing transformer

(*c*) overheating of the earthing transformer only

(*d*) none of the above

**90.** The safe value current (R.M.S.) which a human body can tolerate for greater than 3 seconds is

(*a*) 15 mA (*b*) 25 mA

(*c*) 5 mA (*d*) 9 mA

**91.** The effect of shock in the human body will depend on

(*a*) line voltage (*b*) line current

(*c*) current flowing in the body (*d*) none of the above

**92.** To protect the power transformer (*Y*-*Y*, with neutral earthed) against fault, the current transformer will have

(*a*) delta-delta connection (*b*) delta-star connection

(*c*) star-delta connection (*d*) star-star connection

**93.** To protect the power transformer (delta-delta) against fault current transformer will have

(*a*) delta-delta connection (*b*) delta-star connection

(*c*) star-delta connection (*d*) star-star connection

**94.** Which of the following alloys is used for the core of the transformer?

(*a*) Invar (*b*) Nichrome

(*c*) Elinvar (*d*) Perminvar

**95.** The requirement of insulation in a transformer or electrical machine design is determined by

(*a*) current (*b*) voltage

(*c*) rate of the change of the current (*d*) rate of the change of voltage

(*e*) power

**96.** Class C insulation can withstand

(*a*) 180°C (*b*) 150°C

(*c*) 200°C (*d*) 105°C

**97.** If a star connected circuit is transformed into a delta connected circuit, which of the following statements is true?

(*a*) $R_a = \dfrac{R_1R_2 + R_2R_3 + R_1R_3}{R_3}$ (*b*) $R_a = \dfrac{R_3}{R_1 + R_2}$

(*c*) $R_a = \dfrac{R_3}{R_1R_2 + R_2R_3 + R_1R_3}$ (*d*) $R_a = \dfrac{R_1 + R_2 + R_3}{R_1 + R_2}$

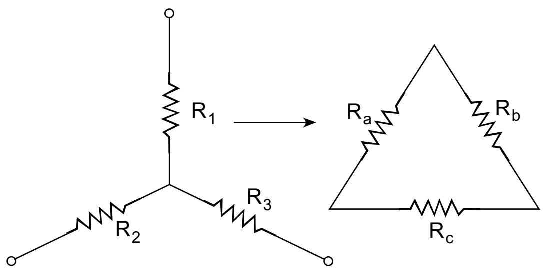


**Fig. Q. 97.**

**98.** The location of lightning arresters is

(*a*) near the transformer

(*b*) away from the transformer

(*c*) near the circuit breaker

(*d*) away from the circuit breaker

**99.** The steady state stability of a power system can be increased by

(*a*) using machines of high impedance

(*b*) connecting lines in series

(*c*) connecting lines in parallel

(*d*) reducing the excitation of the machines

**100.** With single frequency transients, the ratio of peak restriking voltage/time between voltage zero and peak voltage is known as

(*a*) recovery voltage

(*b*) restriking voltage

(*c*) rate of rise restriking voltage

(*d*) active recovery voltage

**101.** Which of the following power system distributions gives greater reliability?

(*a*) radial system of distribution

(*b*) ring system of distribution

(*c*) D.C. three wire system of distribution

(*d*) A.C. three phase four wire system

**102.** The diversity factor is defined as the

(*a*) $\dfrac{\text{Average demand}}{\text{Maximum demand}}$

(*b*) $\dfrac{\text{Sum of consumers maximum demand}}{\text{Maximum load on the station}}$

(*c*) $\dfrac{\text{Maximum demand}}{\text{Sum of consumers maximum demand}}$

(*d*) $\dfrac{\text{Average demand}}{\text{Maximum load on the station}}$

**103.** In transformers

(*a*) high tension winding is used near the core

(*b*) high tension winding is used away from the core

(*c*) low tension winding is used near the core

(*d*) low tension winding is used away from the core

**104.** For the system shown below the base voltage is

(*a*) 11 kV for whole system

(*b*) 132 kV for the whole system

(*c*) 11 kV for the generator side and 132 kV for the transmission side

(*d*) cannot be determined from the given data

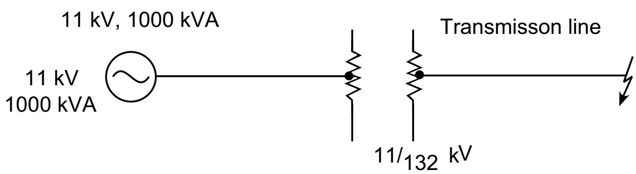


**Fig. Q. 104.**

**105.** The efficiency of the transformer lies between

(*a*) 70 to 80%

(*b*) 80 to 90%

(*c*) 90 to 98%

(*d*) none of the above

**106.** For the three-phase transformer, which of the following statements is true?

(*a*) turn ratio = line voltage ratio

(*b*) turn ratio = phase voltage ratio

(*c*) turn ratio = $\sqrt{3}$ phase voltage ratio

(*d*) turn ratio = $\sqrt{3}$ lines voltage ratio

**107.** A distribution transformer usually is a
(*a*) star-delta transformer
(*b*) delta-star transformer
(*c*) star-star transformer
(*d*) delta-delta transformer

**108.** From a resistance test carried out on a transformer, it was found that the resistance of primary and secondary windings are 8 ohms and 16 ohms respectively. The primary will be
(*a*) H.V. side (*b*) L.V. side
(*c*) cannot be determined from the test
(*d*) either of two may be L.V. side

**109.** The effect of a series capacitor on a transmission line is to improve
(*a*) steady stability (*b*) transient stability
(*c*) (*a*) and (*b*) both (*d*) none of the above

**110.** The power intended to be available even under emergency condition is called
(*a*) firm power (*b*) hot reserve
(*c*) cold reserve (*d*) spinning reserve

**111.** Which of the following generating stations has the minimum running cost?
(*a*) Hydro-electric station
(*b*) Nuclear power station
(*c*) Thermal power station
(*d*) Diesel power plant

**112.** Which of the following motors is used for locomotive drive?
(*a*) D.C. shunt motor (*b*) D.C. series motor
(*c*) A.C. series motor (*d*) Synchronous motors

**113.** The rating of the circuit breaker used for a system whose capacity has been increased from 10,000 to 20,000 kVA will
(*a*) increase
(*b*) decrease
(*c*) remain constant
(*d*) remain same but the size of the circuit breaker increases

**114.** The inductive interference between the power and the communication line can be minimized by

(*a*) increasing the distance between the conductors

(*b*) transposition of the power line

(*c*) transposition of the communication line

(*d*) (*b*) and (*c*) both

**115.** Two transmission lines of a surge impedance of 600 ohms each are linked by a cable. What should be the surge impedance of the cable if there were no reflection at the junction?

(*a*) 300 ohms (*b*) 30 ohms

(*c*) 600 ohms (*d*) 60 ohms

**116.** A delta and star capacitances configurations are shown. Find $C_Y$ in terms of $C_D$, so that the capacitances between any corresponding points are in the star circuit

(*a*) $C_Y = 2C_L$ (*b*) $C_Y = 3C_D$

(*c*) $C_Y = C_D$ (*d*) $C_Y = C_D/2$

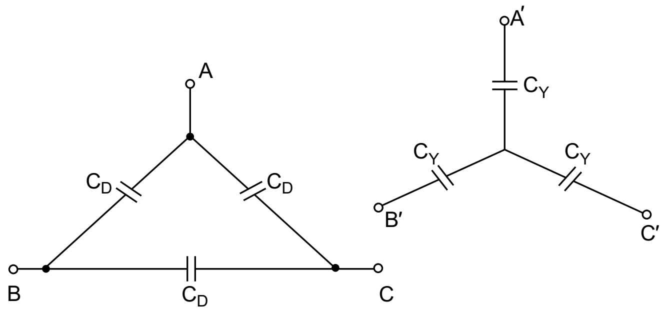


**Fig. Q. 116.**

**117.** For 11 kV underground system, it is possible to work upon a length of

(*a*) 800 miles (*b*) 100 miles

(*c*) 400 miles (*d*) none of the above

**118.** The magnetizing inrush current while energizing a transformer will be

(*a*) larger than full load current

(*b*) less than full load current

(*c*) equal to full load current

(*d*) approximately equal to full load current

**119.** Overfluxing protection is recommended for the
(*a*) generator transformer of the power plant
(*b*) auto-transformer of the power plant
(*c*) station transformer of the power plant
(*d*) distribution transformer

**120.** Harmonic restraint in differential protection for a transformer is provided to prevent the mal-operation caused by
(*a*) magnetizing inrush current (*b*) unmatched VTs
(*c*) unmatched CTs (*d*) demagnetizing flux

**121.** Which of the following statements is true if restricted earth fault protection is provided to star winding of the generator transformer?
(*a*) One CT in each phase and fourth in the neutral are provided and their secondaries are connected in parallel
(*b*) One CT is provided in the neutral
(*c*) Two CTs are provided, one in *R*-phase and other in *Y*-phase with a CT in neutral
(*d*) CTs are not required at all as the fault current is not very high

**122.** Series capacitors are used to
(*a*) improve line voltage
(*b*) compensate for line inductive reactance
(*c*) compensate for line capacitive reactance
(*d*) none of the above

**123.** Air blast circuit breakers for a 400-kV power system are designed to operate in
(*a*) 5 sec (*b*) 0.5 sec
(*c*) 0.1 sec (*d*) 50 millisecond
(*e*) 100 micro-second

**124.** Carrier transfer-trip schemes do not operate faster than carrier blocking schemes.
(*a*) true (*b*) false

**125.** The auxiliary power supply system in any kind of power station is arranged such that the power supplies are

(*a*) redundant only
(*b*) redundant and independent only
(*c*) reliable
(*d*) independent only
(*e*) none of the above

**126.** High water level of a boiler drum can damage

(*a*) boiler tubes only
(*b*) turbine and steam line
(*c*) turbine only
(*d*) none of the above

**127.** Which of the following statements is true?

(*a*) The zero-sequence reactance of a transformer is approximately equal to negative sequence reactance
(*b*) The zero-sequence reactance of a transformer is approximately equal to positive sequence reactance
(*c*) The zero-sequence reactance depends on the connection and winding of the transformer
(*d*) The zero-sequence reactance is larger than negative sequence reactance but less than positive sequence reactance in the transformer

**128.** The capacitor voltage transformer is used

(*a*) up to 11 kV
(*b*) up to 33 kV
(*c*) above 220 kV
(*d*) above 132 kV
(*e*) above 110 kV

**129.** The MHO relay is inherently a

(*a*) directional unit
(*b*) non-directional unit
(*c*) none of the above

**130.** The operating time of instantaneous relay is usually

(*a*) of an order of a few seconds
(*b*) without any time delay
(*c*) one second
(*d*) 0.01 second

**131.** For which of the following ratings of the transformer differential is protection recommended?

(*a*) Above 50 kVA
(*b*) Equal to and above 5 MVA
(*c*) Equal to and above 20 MVA
(*d*) Any of the above cases

**132.** When the stator neutral of a generator is grounded through a resistor, the stator ground fault is detected through

(*a*) an under-voltage relay connected across the resistor

(*b*) an over-voltage relay connected across the resistor

(*c*) an over-current relay connected to the current CT

(*d*) any ground fault relay

**133.** The longitudinal differential relaying system responds in faults between turns of winding of a transformer.

(*a*) true (*b*) false

**134.** Over voltage protection is recommended for

(*a*) steam turbine generators (*b*) hydro-electric generators

(*c*) gas turbine generators (*d*) all the above

(*e*) none of the above

**135.** Distance relays are generally

(*a*) MHO relays (*b*) reactance relays

(*c*) impedance relays (*d*) split-phase relays

**136.** Which of the following relays is preferred for phase fault on a short transmission line?

(*a*) Reactance relay (*b*) Impedance relay

(*c*) MHO relay (*d*) Induction type relay

**137.** In a multi-terminal line, the first zone of the distance relay is set to reach 80 to 90% of the distance from the nearest terminal.

(*a*) true (*b*) false

**138.** The knee-point in the magnetizing characteristics of a CT is a point where 10% increase in the secondary voltage increases

(*a*) the exciting current by 10% (*b*) the exciting current by 30%

(*c*) the exciting current by 50% (*d*) the exciting current by 14.4%

(*e*) the primary voltage by 10%

**139.** Fuses are used where relays and circuit breakers

(*a*) fail to interrupt heavy short circuit currents

(*b*) are not economically justified (*c*) are not available

(*d*) require more care and maintenance (*e*) take more time to clear the fault

**140.** The impedance relay does not have directional features.

(*a*) true (*b*) false

**141.** A short circuit in any windings of the transformer is the result of

(*a*) impulse voltage (*b*) insulation failure

(*c*) mechanical vibration (*d*) magnetostriction force

(*e*) loose connection

**142.** Percentage differential protection in a transformer is recommended to prevent mal-operation due to

(*a*) external fault currents (*b*) internal fault currents

(*c*) magnetizing currents (*d*) none of the above

**143.** Harmonic restraint in a differential relay is provided so that the relay operates when the harmonic current in the transformer

(*a*) does not exceed 15% of fundamental

(*b*) exceeds 15% of fundamental

(*c*) exceeds 14.4% of fundamental

(*d*) exceeds 17.3% of fundamental

**144.** Inverse definite mean time relays are used for over-current and earth fault protection of transformer against

(*a*) external short circuits

(*b*) internal short circuits

(*c*) heavy overloads

(*d*) all the above

**145.** Which of the following statements is true?

(*a*) Shunt reactors are used for power factor improvement

(*b*) Shunt reactors are used to control the line voltage

(*c*) Shunt reactors are used to reduce the line impedance

(*d*) Shunt reactors are used to eliminate line to ground capacitance

**146.** When a stator neutral of a generator is earthed through a distribution transformer, the stator earth fault is detected through

(*a*) an over-voltage relay connected across the secondary of the transformer

(*b*) an over-current relay connected across the secondary of the transformer

(*c*) an under-voltage relay connected across the secondary of the transformer

(*d*) none of the above

**147.** Split-phase relaying responds to faults between turns of a transformer.

(*a*) true (*b*) false

**148.** A single ground fault in the field circuit of a large generator causes damage to the rotor.

(*a*) true (*b*) false

**149.** Which of the following relays are used for phase fault on a long line?

(*a*) Impedance relays (*b*) Reactance relays

(*c*) MHO relays (*d*) None of the above

**150.** For detection of severe synchronizing power surges

(*a*) impedance relays are best suited

(*b*) MHO relays are best suited

(*c*) reactance relays are best suited

(*d*) split-phase relays are best suited

**151.** Protection from negative sequence currents is provided for

(*a*) transformers (*b*) generators

(*c*) transmission lines (*d*) motors

**152.** Phase comparison relays require voltage transformers

(*a*) true (*b*) false

**153.** If high pressure heaters of the steam cycle in a power plant have a high-water level, what precaution shall be taken?

(*a*) Trip the turbine

(*b*) Trip the boiler

(*c*) Trip the boiler feed pump

(*d*) Bypass the heater from waterside and close the extraction valve

**154.** Which of the following devices is used to measure the stator winding temperature of the generator?

(*a*) Thermometer (*b*) Resistance thermometer

(*c*) Pyrometer (*d*) Thermocouple

**155.** How many relays are used to detect inter-phases fault of a three line?

(*a*) one (*b*) two

(*c*) three (*d*) six

**156.** What is the value of current $I$ shown in the following circuit?

(*a*) Zero (*b*) 10 A

(*c*) 100 A (*d*) 1 A

(*e*) None of the above

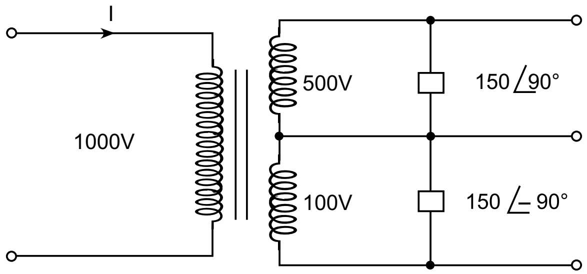


**Fig. Q. 156.**

**157.** If the transmission voltage is increased from 11 kV to 33 kV, then diameter of the conductor will be

(*a*) increased (*b*) decreased

(*c*) same as for 11 kV system (*d*) none of the above

**158.** Which relation is correct if the transmission voltage of a power line is $V$ and regulation is $R$ where $K$ is constant?

(*a*) $RV = K$ (*b*) $R/V = K$

(*c*) $R = KV^2$ (*d*) $R = KV^3$

(*e*) $R = K/V^2$

**159.** The characteristic impedance of a power line is the same as surge impedance.

(*a*) true (*b*) false

**160.** Power line resistance is concerned with

(*a*) surge impedance

(*b*) characteristic impedance

(*c*) (*a*) and (*b*) both

(*d*) none of the above

**161.** If the height of the transmission tower is decreased, the inductance of the line will

(*a*) increase (*b*) decrease

(*c*) remain same (*d*) increase exponentially

**162.** If the height of the transmission tower is decreased, the capacitance of the line will

(*a*) increase (*b*) decrease
(*c*) remain same (*d*) decrease exponentially

**163.** An A.C. system has the following disadvantages over a D.C. system:

(i) skin effect exists
(ii) line regulation is more
(iii) charging current exists

**164.** Power loss is important for the design of a

(*a*) generator (*b*) motor
(*c*) feeder (*d*) transmission line

**165.** Voltage regulation is an important factor for the design of a

(*a*) generator (*b*) motor
(*c*) feeder (*d*) transmission line

**166.** A booster transformer is used to increase the voltage at

(*a*) intermediate points
(*b*) receiving end of transmission line
(*c*) sending end of transmission line
(*d*) any point desired

**167.** Which of the statements is true?

(*a*) The fault current in an impedance relay will be maximum when fault occurs near the relay
(*b*) The fault current in an impedance relay will be minimum when fault occurs near the relay
(*c*) The fault current in an impedance relay will be maximum when fault occurs away from the relay
(*d*) The fault current in an impedance relay will be maximum when fault occurs near the transmitting end

**168.** The lightning arrester acts as a

(*a*) surge diverter (*b*) surge coil
(*c*) surge absorber (*d*) surge reflector

**169.** Air blast circuit-breakers are preferred for intermittent duty.

(*a*) true (*b*) false

**170.** The under-voltage relay can be used for

(*a*) busbars (*b*) motor

(*c*) transformers (*d*) generators

(*e*) all the above

**171.** The capital cost of a thermal power plant will depend on

(*a*) the size of the plant (*b*) the fuel cost

(*c*) (*a*) and (*b*) both (*d*) none of the above

**172.** A fixed tariff consists of the interest on the capital cost, depreciation, insurance, and other taxes.

(*a*) true (*b*) false

**173.** The running cost of a plant comprises cost of fuel, consumable materials and operation, and maintenance cost.

(*a*) true (*b*) false

**174.** Which of the following plants has highest capital cost?

(*a*) Diesel power plant (*b*) Thermal power plant

(*c*) Hydro-power plant (*d*) Nuclear power plant

**175.** The running cost, among conventional power plants, is minimum for hydro-plants.

(*a*) true (*b*) false

**176.** A hydro-power plant operates at higher load factor than a thermal power plant.

(*a*) true (*b*) false

**177.** Which of the following frequency ranges is suitable for an A.C. network analyser?

(*a*) 400 Hz to 500 Hz (*b*) 50 Hz to 100 Hz

(*c*) 40 Hz to 50 Hz (*d*) D.C. to 50 Hz

**178.** Distance relay basically measures

(*a*) current (*b*) voltage

(*c*) impedance (*d*) either of the above

**179.** A relay with inverse time characteristic will operate within

(*a*) 2 secs
(*b*) 5 to 10 secs
(*c*) 5 to 20 secs
(*d*) 20 to 30 secs

**180.** The disruptive critical voltage will

(*a*) increase if the moisture content in the air increases
(*b*) decrease if the moisture content in the air decreases
(*c*) decrease if the moisture content in the air increases
(*d*) decrease if the moisture content in the air increases

**181.** Corona loss in power lines is greater in the winter than the summer.

(*a*) true
(*b*) false

**182.** Single phasing relays are used for the protection of

(*a*) single phase motor only
(*b*) two phase motors only
(*c*) two single phase motors running in parallel
(*d*) three phase motors

**183.** Two protective zones in an electrical transmission system are decided by

(*a*) location of PT
(*b*) location of CT
(*c*) relay's size
(*d*) relay's sensitivity

**184.** Which of the following devices will receive voltage surge first traveling on the transmission line

(*a*) step-down transformer
(*b*) relays
(*c*) switchgear
(*d*) lightning arresters

**185.** The fault impedance of a line is

(*a*) less than the impedance of a healthy line
(*b*) more than the impedance of a healthy line
(*c*) equal to the impedance of a healthy line
(*d*) none of the above

**186.** Which of the following parameters can be neglected for a short line?

(*a*) Resistance
(*b*) Inductance
(*c*) Reactance
(*d*) Capacitance

**187.** The stability of a salient pole alternator is better than the stability of a non-salient pole alternator.

(*a*) true (*b*) false

**188.** Series reactors should have

(*a*) high resistance (*b*) low resistance
(*c*) high impedance (*d*) low impedance

**189.** Which of the following frequency variations for power frequency is as per IS?

(*a*) 2.5% (*b*) 5%
(*c*) ± 5% (*d*) ± 2.5%

**190.** Which of the following devices will be preferred to control the power system voltage?

(*a*) Transformers
(*b*) Shunt capacitors
(*c*) Series capacitors
(*d*) Electronic amplifiers
(*e*) Synchronous conductors

**191.** Back-up protection is provided with time delay, during which main protection to the power system must operate when a fault occurs. If the main protection fails to operate, the back-up protection will operate.

(*a*) true (*b*) false

**192.** What kind of insulator will be used if the direction of the transmission line is changed?

(*a*) Suspension type insulators
(*b*) Pin type insulators
(*c*) Rubber insulators
(*d*) Strain type insulators

**193.** Which of the insulator discs will be exposed to maximum electrical stress?

(*a*) One which is near to the conductor
(*b*) One which is away from the conductor
(*c*) One which is at the bottom of a string
(*d*) One which is in the center of a string

**194.** If an ACSR conductor has a specification of 48/7, which of the following explanations is correct for the conductor?

(*a*) The conductor has 48 strands of steel and 7 strands of aluminium

(*b*) The conductor has 7 strands of steel and 48 strands of aluminium

(*c*) The conductor has 48 strands

(*d*) The conductor has 55 strands

**195.** The skin effect in the conductor increases the effective value of resistance of the conductor.

(*a*) true (*b*) false

**196.** The inductance in a transmission line is caused by the

(*a*) current flowing in the conductor

(*b*) current flowing in the other conductor

(*c*) voltage difference among the conductors

(*d*) none of the above

**197.** Which parameters can be neglected while calculating transmission line faults?

(*a*) Reactance (*b*) Resistance

(*c*) Capacitance (*d*) Inductance

**198.** Which of the following systems are more prone to faults?

(*a*) Motors (*b*) Generators

(*c*) Underground cables (*d*) Overhead lines

(*e*) Transformers (*f*) Reactors

**199.** The power loss due to the corona effect depends on

(*a*) the surface condition of the conductor

(*b*) the material density of the conductor

(*c*) (*a*) and (*b*) (*d*) none of the above

**200.** The dielectric losses of an electrical system are 50 Watts. What will be the dielectric losses if the voltage of the system is doubled?

(*a*) 50 Watts (*b*) 100 Watts

(*c*) 300 Watts (*d*) 200 Watts

**201.** The capacitance of a transmission line will be affected if the distance between conductors and earth is varied.

(*a*) true (*b*) false

**202.** The inductance of a transmission line will be affected if the distance between conductors and earth is varied.

(*a*) true (*b*) false

**203.** The sending end voltage of a transmission line controls the

(*a*) active power

(*b*) reactive power

(*c*) (*a*) and (*b*) both

(*d*) none of them

**204.** The frequency of a power system controls the

(*a*) active power (*b*) reactive power

(*c*) (*a*) and (*b*) both (*d*) none of them

**205.** Enumerate three conditions which have a transient state instability in the power system.

(*i*) switching operations on the transmission line

(*ii*) any short circuits

(*iii*) excitation loss in the generator

**206.** Which of the following equipment will one choose to study the stability of an A.C. power system?

(*a*) energy meter

(*b*) network analyser

(*c*) network synthesizer

(*d*) (*b*) or (*c*)

**207.** The braking torque while plugging a machine at zero speed will be

(*a*) zero (*b*) high

(*c*) small (*d*) none of the above

**208.** The dynamic braking of a machine offers the highest braking torque in comparison to other braking methods.

(*a*) true (*b*) false

**209.** The drop in the terminal voltage of a shunt generator on load may be attributed to

(*a*) increase in armature resistance

(*b*) drop in field current due to armature reaction

(*c*) drop in field current due to drop in armature resistance

(*d*) (*b*) and (*c*) both

**210.** If load is not connected to the D.C. series motor then

(*a*) it will not build up the voltage

(*b*) it will build up very high voltage

(*c*) it will have very low speed

(*d*) none of the above

**211.** The power factor of an alternator depends on load.

(*a*) true (*b*) false

**212.** Which of the following transmission lines has a reflection coefficient of one?

(*a*) Open circuit transmission line

(*b*) Short circuit transmission line

(*c*) Either (*a*) or (*b*)

(*d*) Long transmission line

**213.** Which of the following transmission lines has a reflection coefficient of minus one?

(*a*) Open circuit transmission line

(*b*) Short circuit transmission line

(*c*) Long transmission line

(*d*) Short transmission line

**214.** Which of the following circuit breakers has high reliability and minimum maintenance?

(*a*) Oil circuit breakers

(*b*) Air blast circuit breakers

(*c*) Vacuum circuit breakers

(*d*) Circuit breakers with SF6 gas

**215.** The insulation resistance of HV circuit breakers should be of the order of

(*a*) 50 ohms to 100 ohms
(*b*) 100 K ohms to 1000 K ohms
(*c*) 10 Mega ohms
(*d*) 50 Mega ohms to 100 Mega ohms
(*e*) 100 Mega ohms and above

**216.** If the capacitance of a transmission line is increased, the transmitted power will

(*a*) remain same
(*b*) increase
(*c*) decrease
(*d*) tend to zero at the receiving end

**217.** If the inductance of a transmission line is decreased, the power transmitted will

(*a*) increase
(*b*) decrease
(*c*) not change
(*d*) tend to be very high at the receiving end

**218.** The installation of a synchronous motor at the receiving end of a transmission line will

(*a*) only improve the P.F. of the line under large loads
(*b*) keep same voltage at sending and receiving ends
(*c*) help in transmitting larger power
(*d*) decrease the inductance of the line
(*e*) (*a*), (*b*), and (*c*) only

**219.** The difference between the sending end voltage and receiving end voltage of a transmission line controls

(*a*) active power
(*b*) reactive power
(*c*) frequency
(*d*) none of these

**220.** What will be the reflection coefficient of the wave of load connected to a transmission line if surge impedance of the line is equal to load?

(*a*) Unity
(*b*) Infinity
(*c*) Zero
(*d*) 10

**221.** What will be the reflection coefficient in the above question if surge impedance is half of the load?

(*a*) 2/3 (*b*) 1/3

(*c*) 3 (*d*) 1/6

**222.** Which of the following statements is correct?

(*a*) Arc in a circuit breaker is interrupted at maximum current

(*b*) Arc in a circuit breaker is interrupted at zero current

(*c*) Arc in a circuit breaker is interrupted at maximum voltage

(*d*) Arc in a circuit breaker is interrupted at minimum voltage

**223.** The sag of a transmission line with a 50 M span is 1 M. What will be the sag if the height of the transmission line is increased by 20%?

(*a*) 1.2 M (*b*) 2 M

(*c*) 1.25 M (*d*) 1 M

**224.** For which of the following increased values of horizontal tension there will be an increase of 20% in tension of the line for a certain span?

(*a*) 50% (*b*) 10%

(*c*) 5% (*d*) 20%

**225.** The method of image cannot be used to find out the

(*a*) line capacitance (*b*) line inductance

(*c*) line resistance (*d*) (*b*) and (*c*)

**226.** Which of the following insulators will be selected for a high voltage application?

(*a*) Strain type (*b*) Disc type

(*c*) Suspension type (*d*) Pin type

**227.** Strain type insulators are used when

(*a*) the transmission line is dead ended

(*b*) the direction of transmission line changes

(*c*) the transmission line is short

(*d*) (*a*) or (*b*)

**228.** Voltage regulation is the main criterion for designing the

(*a*) transmission line (*b*) feeder

(*c*) motor (*d*) generator

**229.** Power loss is a very important factor for designing the

(*a*) feeder (*b*) transmission line
(*c*) motor (*d*) generator

**230.** Which of the following methods may be used to inject reactive power in the transmission line?

(*a*) Series capacitor (*b*) Series capacitors
(*c*) Synchronous capacitors (*d*) All of the above

**231.** The waist products of alkaline fuel cells include

(*a*) water (*b*) ammonia
(*c*) heat (*d*) carbon dioxide
(*e*) answers (*a*) and (*c*)

**232.** Fuel cells with operating temperatures below 100°C

(*a*) polymer electrolyte (*b*) solid oxide
(*c*) molten carbonate (*d*) methanol
(*e*) answers (*a*) and (*d*)

**233.** Fuel cells with the operating temperatures over 500° C.

(*a*) proton exchange membrane (PEM)
(*b*) solid oxide
(*c*) molten carbonate
(*d*) direct methanol
(*e*) answers (*b*) and (*c*)

**234.** Polymer electrolyte fuel cells require a platinum catalyst.

(*a*) true (*b*) false

**235.** The separation of hydrogen gas into protons and electrons at the anode of a Proton Exchange Membrane (PEM) fuel cell is facilitated by

(*a*) gas flow channels (*b*) ambient temperature
(*c*) a platinum catalyst (*d*) bound charges

# 6

# CONTROL SYSTEM ENGINEERING

**1.** The Nyquist plot of a system is shown; what is the type of the system?

(*a*) Type 0 (*b*) Type 1

(*c*) Type 2 (*d*) Type 3

(*e*) Cannot be determined by Nyquist plot

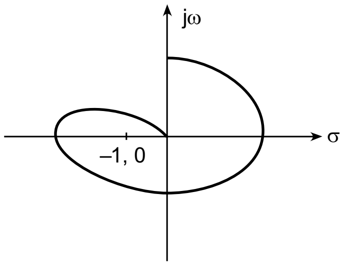


**Fig. Q. 1.**

**2.** If the poles of a system are lying on the imaginary axis in *s*-plane, the system will be

(*a*) stable

(*b*) unstable

(*c*) conditionally stable

(*d*) marginally stable

**3.** The transfer function of a system is $\dfrac{10(1 + 0.2s)}{(1 + 0.5s)}$. The corner frequencies will be

(*a*) –0.2 and –0.5 (*b*) 5 and 2

(*c*) –5 and –2 (*d*) 0.2 and 0.5

**4.** The transfer function of a system is $\dfrac{10(1 + 0.2s)}{(1 + 0.5s)}$ The phase shift at $\omega = 0$ and $\omega = \infty$ will be

(*a*) 0° and – 90° (*b*) – 180° and + 180°

(*c*) 180° and – 180° (*d*) – 90° and 90°

(*e*) 0° and 180°

**5.** The Nyquist plot of a system is shown in the figure. The system will be

(*a*) stable

(*b*) unstable

(*c*) condition

(*d*) marginally stable

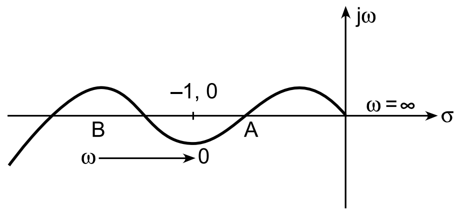


**Fig. Q. 5.**

**6.** The polar plot for negative frequencies for a given system is the conjugate of the positive portion.

(*a*) true (*b*) false

**7.** The Bode diagram approach is applied to

(*a*) a non-minimum phase network (*b*) a minimum phase network

(*c*) any network of the control system (*d*) none of the above

**8.** The Bode plot of a constant is a straight line parallel to the frequency axis and the corresponding phase is 0° or 180° depending on whether the constant is positive or negative.

(*a*) true (*b*) false

**9.** The unit circle of a Nyquist plot transforms into unity or the 0-dB line of the amplitude plot of a Bode diagram for

(*a*) low frequencies (*b*) high frequencies

(*c*) all frequencies (*d*) specific bandwidth

**10.** The negative real axis of a Nyquist diagram transforms into

(*a*) a negative 180° phase line of Bode diagram for all frequencies

(*b*) the unity or 0 dB line of Bode diagram of amplitude plot

(*c*) the unity or 0 dB line of Bode diagram of amplitude plot for low frequencies

(*d*) a negative 180° phase line of Bode diagram for high frequencies

**11.** A phase-lag-lead network shifts the phase of a control signal in order that the phase of the output

(*a*) lags at low frequencies and leads at high frequencies relative to input

(*b*) leads at low frequencies and lags at high frequencies relative to input

(*c*) lags at all frequencies relative to input

(*d*) leads at all frequencies relative to input

**12.** The table for the Routh-Hurwitz criterion is shown. How many roots will lie in right half $s$-plane?

(*a*) One
(*b*) Two
(*c*) Three
(*d*) Four

| | | |
|---|---|---|
| $s^3$ | 1 | 100 |
| $s^2$ | 4 | 500 |
| $s$ | –25 | 0 |
| $s_0$ | 500 | 0 |

**13.** A capacitance cannot be used to fabricate a lag network.

(*a*) true (*b*) false

**14.** Inductance is not used to fabricate lag networks because

(*a*) its size is big
(*b*) it has high reactance
(*c*) it produces time delay and hysteresis losses
(*d*) it does not work satisfactorily at high frequencies

**15.** The transfer function of a system is given as $\dfrac{K(s+2)^2}{(s+1)(s-2)^2}$ The system is

(*a*) stable (*b*) unstable
(*c*) critically stable (*d*) conditionally stable

**16.** The damping factor of a system is unity; the system response will be

(*a*) overdamped (*b*) underdamped
(*c*) critically damped (*d*) oscillatory

**17.** The input current of an ideal amplifier is

(*a*) very small (*b*) zero
(*c*) very large (*d*) in milliamperes
(*e*) infinity

**18.** The common emitter configuration is most commonly used for transistor amplifiers because it has

(*a*) high voltage gain only (*b*) high power gain only
(*c*) high current gain only (*d*) (*a*) and (*c*) both

**19.** The knowledge of the transfer function of a system is necessary for the calculation of

(*a*) the time constant (*b*) the order of the system
(*c*) the output for any given input (*d*) the steady state gain

**20.** An open loop control system is one in which

(*a*) output has no control on the control of the input

(*b*) neither the output nor any of the other variables in the system has any effect on input

(*c*) only system variables influence the control of the output

(*d*) none of the above

**21.** For a third order plant, which of the following may be a set of state variables?

(*a*) $y(t), \dot{y}(t), \ddot{y}(t)$

(*b*) $y(t), \dot{y}(t), \dot{y}(t) + y(t)$

(*c*) $y(t), \ddot{y}(t), y(t) + \ddot{y}(t)$

(*d*) $y(t), \dot{y}(t), \dot{y}(t) - y(t)$

**22.** With knowledge of the state variable representation of a plant, the transfer function of the plant

(*a*) cannot be determined as state variables do not relate input and output of the plant

(*b*) can be determined completely

(*c*) cannot be determined as the state variables do not have any relation with the transfer function

(*d*) none of the above

**23.** The effect of feedback on the plant is

(*a*) to make the plant simple

(*b*) to reduce the sensitivity to plant parameter variations

(*c*) the plant becomes sensitive to parameter variations

(*d*) to control system transient response

(*e*) (*b*) and (*d*) both

**24.** The linear transformation of control system variables does not change the transfer function of the system.

(*a*) true

(*b*) false

**25.** The system function $V(s)/I(s)$ is a pole at $s = -2$ and a zero at $s = -1$. For a sinusoidal current excitation, the voltage response

(*a*) leads with respect to the current

(*b*) lags with respect to the current

(*c*) is in phase with the current

(*d*) is zero

**26.** The Laplace transform of unit impulse is

(*a*) $1/s$ (*b*) $1/s^2$

(*c*) unity (*d*) $s$

**27.** Electrical resistance is analogous to

(*a*) spring (*b*) viscous damper

(*c*) fluid capacity (*d*) inertia

**28.** Electrical inductor is analogous to

(*a*) spring

(*b*) inertia

(*c*) viscous damper

(*d*) fluid resistance

**29.** Electrical capacitance is analogous to

(*a*) spring

(*b*) fluid resistance

(*c*) inertia

(*d*) viscous damper

**30.** The steady state error of a system can be minimized by

(*a*) increasing gain $K$

(*b*) decreasing gain $K$

(*c*) decreasing oscillating frequency

(*d*) increasing settling time

**31.** The time constant of a servo-mechanism can be decreased by

(*a*) increasing the inertia of the system

(*b*) decreasing the inertia of the system

(*c*) increasing the damping of the system

(*d*) decreasing torque of servo motor

**32.** In general, which of the following systems is preferred?

(*a*) Under-damped (*b*) Over-damped

(*c*) Critically damped (*d*) Undamped

**33.** The friction coefficient is usually kept low to

(*a*) maximize the velocity-lag error of the system

(*b*) minimize the velocity-lag error of the system

(*c*) minimize the time constant of the system

(*d*) maximize the speed of response of the system

**34.** If the gain of a critically damped system is increased, it will become a

(*a*) underdamped system

(*b*) overdamped system

(*c*) oscillatory system

(*d*) critically damped system

**35.** The resonance peak of a system will occur when the system gain is at the critical damping value.

(*a*) true (*b*) false

**36.** The ratio of output to input attains its greatest value at resonance and is commonly referred as the height of the resonance peak.

(*a*) true (*b*) false

**37.** The servomechanism is called a proportional error device when the output of the system is

(*a*) a function of error only

(*b*) a function of error and its first derivative of error

(*c*) a function of the first derivative of error

(*d*) none of the above

**38.** It is desirable to avoid the use of differentiators in a system design because

(*a*) it is not economical

(*b*) its size is big as it is composed of a resistance and inductance

(*c*) it develops noise and will saturate the amplifier

(*d*) integration of inductance is not possible to fabricate the differentiators

**39.** If the value of the system gain $K$ is increased, the roots of the system will

(*a*) move to higher frequencies (*b*) move to lower frequencies

(*c*) not change the original position (*d*) move to (0, 0) axis of $s$-plot

**40.** The first derivative output control, when fed back negatively, would

(*a*) increase the damping of the system

(*b*) decrease the damping of the system

(*c*) decrease the velocity-lag error

(*d*) decrease the steady state error

**41.** The first input derivative control cannot be used to make the velocity-lag error zero in servosystems.

(*a*) true (*b*) false

**42.** The second derivative output and error controls do not change the characteristic equation and can be used to change the apparent inertia of the system.

(*a*) true (*b*) false

**43.** The second-derivative input signal adjusts

(*a*) the gain of the system

(*b*) the damping of the system

(*c*) the time constant of the system

(*d*) the time constant and suppresses the oscillations

**44.** The first and second derivative control signals can be used to adjust the magnitude of errors, but do effect the roots of the system equation.

(*a*) true (*b*) false

**45.** The settling time of the second order linear system is

(*a*) 2 times the time constant of the system

(*b*) 4 times the time constant of the system

(*c*) 3 times the time constant of the system

(*d*) $\frac{1}{4}$ of the time constant

**46.** The frequency domain and the time domain are related through

(*a*) Laplace transform

(*b*) Fourier integral

(*c*) (*a*) and (*b*) both

(*d*) none of the above

**47.** The use of integral error control is superior to derivative error control as far as steady state errors are concerned.

(*a*) true (*b*) false

**48.** If initial conditions are inherently zero, physically it means

(*a*) the system is at rest but stores energy

(*b*) the system is working but does not store energy

(*c*) the system is at rest or no energy is stored in any of its parts

(*d*) the system is working with zero reference input

**49.** To define the transfer function of a system, the all initial conditions should be zero.

(*a*) true (*b*) false

**50.** A D.C. generator can be treated as an amplifier.

(*a*) true (*b*) false

**51.** Which of the following motors is suitable for servomechanism application?

(*a*) D.C. shunt motor (*b*) A.C. series motor

(*c*) Two phase induction motor (*d*) Single phase induction motor

**52.** The Bode diagram has no relation with the Nyquist plot.

(*a*) true (*b*) false

**53.** The value of 6 dB per octave is equal to

(*a*) 12 dB per decade (*b*) –6 dB per decade

(*c*) 20 dB per decade (*d*) none of the above

**54.** The phase shift of a second order system with transfer function $1/s^2$ will be

(*a*) – 90° (*b*) – 180°

(*c*) + 180° (*d*) + 90°

**55.** The form of the transfer function used in the Bode plot is

(*a*) $G(s)$ (*b*) $g(j\omega)$

(*c*) (*a*) or (*b*) (*d*) $G(s)\,H(s)$

**56.** The numerical value of the system gain constant is same for two arrangements, $(sT + 1)$ and $(s + 1/T)$ respectively, for the Bode diagram.

(*a*) true (*b*) false

**57.** The Bode diagram can be evaluated from the $s$-plane plot by laying off vectors from the poles and zeros to selected points on the imaginary axis.

(*a*) true (*b*) false

**58.** For type two systems, the lowest frequency asymptote will have a slope of

(*a*) –6 dB/octave

(*b*) –12 dB/octave

(*c*) –18 dB/octave

(*d*) 10 dB/octave

**59.** The polar plot of $G(j\omega)$ cannot be obtained from the Bode diagram.

(*a*) true (*b*) false

**60.** The closed loop frequency response cannot be obtained from open loop frequency plots.

(*a*) true (*b*) false

**61.** The desired form of the factor in the transfer function when the Bode diagram is plotted is

(*a*) $(sT + 1)$ (*b*) $(s + 1/T)$

(*c*) $(s + T)$ (*d*) $(1/s + T)$

**62.** The root loci originate at the poles of the $G(s)\ F(s)$.

(*a*) true (*b*) false

**63.** Whenever there are more poles than the zeros in the $G(s)\ F(s)$, the number of root-locus segments is

(*a*) equal to the number of zeros

(*b*) equal to the number of poles

(*c*) equal to the difference between poles and zeros

(*d*) equal to the sum of poles and zeros

**64.** What will happen if the gain of the system is increased?

(*a*) The roots move away from the zeros

(*b*) The roots move away from the poles

(*c*) Gain does not affect the positions of the roots

(*d*) The roots move towards origin of the $s$-plot

**65.** What will happen if the gain of the system is zero?

(*a*) Roots on the loci move towards the poles from which loci emerge

(*b*) The roots coincide with the poles

(*c*) The roots move away from the zero

(*d*) The roots move away from the poles

**66.** The number of root-locus segments which do not terminate on the zeros is equal to

(*a*) the number of poles

(*b*) the number of zeros

(*c*) the difference between the number of poles and the number of zeros

(*d*) the sum of the number of poles and the number of zeros

**67.** The number of the root-locus which extends to the infinity is exactly the excess of poles in $G(s)\,F(s)$.

(*a*) true (*b*) false

**68.** The algebraic sum of the angles of the vectors from all poles and zeros to the point on any root-locus segment is

(*a*) 180°

(*b*) 110° or an odd multiple thereof

(*c*) 180° or an even multiple thereof

(*d*) 90° or an odd multiple thereof

**69.** If the number of poles is $m$ and the number of zeros is $n$ to plot a root-locus, then the number of root-locus segments going to infinity is

(*a*) $m + n$ (*b*) $m - n$

(*c*) $\dfrac{m+n}{nm}$ (*d*) $mn$

(*e*) $m/n$

**70.** In the root-locus analysis, the angle between the adjacent asymptotes is

(*a*) $180°/(m - n)$ (*b*) $360°/(m - n)$

(*c*) $360°/(m + n)$ (*d*) $-360°/(m - n)$

(*e*) $180°/(m - n)$

**71.** The transient response of the system cannot be determined from the root-locus analysis.

(*a*) true (*b*) false

**72.** For the small value of gain $K$ the roots must be near the poles of the loop transfer function.

(*a*) true (*b*) false

**73.** A system is called absolutely stable if any oscillations set up in the system are

(*a*) self-sustaining and tend to last indefinitely

(*b*) eventually damped out

(*c*) not enough to change the parameters of the system

(*d*) none of the above

**74.** There is a possibility of absolute instability in any servomechanism because

(*a*) there is no feedback path in the system

(*b*) there is a feedback path and it is always possible that feedback path may become regenerative under certain conditions of adjustment

(*c*) there is separate circuitry to make the system stable

(*d*) the control motor is always a two-phase induction motor

**75.** Which of the following systems is stable?

(*a*) $As^4 + Bs^2 + Cs + D = 0$

(*b*) $As^2 + Bs + C = 0$

(*c*) $As^2 - Bs + C = 0$

(*d*) $-As^2 + Bs - C = 0$

**76.** The number of roots lying in the right-hand half of the $s$-plane is determined by using Routh's criterion.

(*a*) true (*b*) false

**77.** Which of the following methods is the strongest tool to determine the stability and the transient response of the system?

(*a*) Routh-Hurwitz criterion (*b*) Bode plot

(*c*) Nyquist plot (*d*) Root locus

**78.** A system is absolutely stable if

(*a*) all real roots are negative, and all complex roots have positive real parts

(*b*) all real roots are negative, and all complex roots have negative real parts

(*c*) all real roots are positive, and all complex roots have negative real parts

(*d*) all real roots are positive, and all complex roots have positive real parts

**79.** The primary purpose of the Nyquist test is to show the existence of any zeros in the right-hand half of the $s$-plane, since a single such zero makes the system unstable.

(*a*) true (*b*) false

**80.** The system is stable if the origin of $1 + G(s)\,F(s)$ plane is not enclosed by the Nyquist plot.

(*a*) true (*b*) false

**81.** The numerical values of the phase margin and the gain margin give some indication of the tolerance requirements for the loop parameters and allowable range of adjustment in the servo-design.

(*a*) true (*b*) false

**82.** The number of pure integrations in the system transfer function determine

(*a*) transient performance of the system (*b*) stability of the system

(*c*) degree of the stability (*d*) steady state performance

**83.** Which of the following systems is type 1?

(*a*) $G(s) = \dfrac{(s+1)(s+2)}{s(s+4)(s+3)}$ (*b*) $G(s) = \dfrac{(s+4)(s+2)}{s^2(s+1)(s+3)}$

(*c*) $G(s) = \dfrac{(s+2)(s+5)}{s(s+1)(s+6)}$ (*d*) $G(s) = \dfrac{(s+2)(s+6)}{(s+7)(s+4)}$

**84.** In which of the following classes of regulators fall?

(*a*) Type 0 system (*b*) Type 1 system

(*c*) Type 2 system (*d*) Type 3 system

**85.** The Type 0 systems have

(*a*) small steady-state error

(*b*) zero steady-state error

(*c*) high gain constant

(*d*) high steady-state error with high gain constant

**86.** A servomechanism with step-displacement input will fall in the

(*a*) type 0 system (*b*) type 1 system

(*c*) type 2 system (*d*) type 3 system

**87.** The steady-state output of the Type 1 system with step-displacement input is the integral of the error.

(*a*) true (*b*) false

**88.** For a Type 1 stable system the steady state error in response to a step-displacement input is very small.

(*a*) true (*b*) false

**89.** The steady-state error is always zero in response to step-displacement input for a

(*a*) type 3 system

(*b*) type 1 system

(*c*) type 2 system

(*d*) type ($N > 1$) system, where $N = 0, 1, 2, \ldots N$

**90.** The systems which commonly operate under a Type 1 system with step-velocity input are

(*a*) servomechanisms

(*b*) regulators

(*c*) fire-control servos and tracking radar

(*d*) none of the above

**91.** The Type 1 system can have a constant output velocity at steady-state only if there is a constant steady-state error.

(*a*) true (*b*) false

**92.** The velocity-lag error of a Type 1 system is

(*a*) proportional to the gain constant of the Type 1 system

(*b*) inversely proportional to the gain constant of Type 1 system

(*c*) independent of the gain constant

(*d*) proportional to the bandwidth of the system

**93.** For a Type 2 system the position error arises at steady-state when

(*a*) input is step-displacement (*b*) input is ramp

(*c*) input is constant acceleration (*d*) there is no input to the system

**94.** When the frequency response plots of the transfer function are used for the transient analysis of the system, the roots of the closed loop system function are available.

(*a*) true (*b*) false

**95.** The Fourier integral relates the frequency response to the transient response.

(*a*) true (*b*) false

**96.** On the Bode diagram the phase margin and gain margin do not provide a ready estimate of the closed loop frequency response.

(*a*) true (*b*) false

**97.** If the differentiator is inserted in the forward path of any control system, the type number of the system is

(*a*) increased (*b*) decreased
(*c*) not affected (*d*) zero

**98.** If the differentiator is placed in the main feedback path, this is equivalent to replacing position feedback with a tachometer.

(*a*) true (*b*) false

**99.** Which of the following analyses is more convenient to see the effect of additional zero and pole in the system on the phase margin and the gain margin?

(*a*) Root locus (*b*) Nyquist plot
(*c*) Bode plot (*d*) Routh-Hurwitz criterion

**100.** Which of the following compensators will be used to increase the damping of a pair of complex roots which are badly underdamped?

(*a*) Phase-lag
(*b*) Phase-lead
(*c*) Phase-lag-lead
(*d*) Compensator having 45° lead circuit

**101.** Tachometer feedback is used to provide damping in many instrument servomechanisms.

(*a*) true (*b*) false

**102.** Tachometer feedback does not change the algebraic form of the system transfer function but reduces the

(*a*) gain only (*b*) time constant only
(*c*) gain and time constant both (*d*) either (*a*) or (*b*)

**103.** The $s$ factor in numerator and denominator of $G(s)\,E(s)$ cannot be cancelled for

(*a*) Root locus analysis (*b*) Bode plot
(*c*) Nyquist plot (*d*) Nichols chart

**104.** The steady-state accuracy of the system may be greatly increased by introduction of

(*a*) differentiator in the main transmission channel

(*b*) integrator in the main transmission channel

(*c*) phase-lead compensation in the feedback path

(*d*) phase-lag-lead compensator in the main transmission channel

**105.** Which of the following statements is most appropriate?

(*a*) A 30 to 50% overshoot can be regarded as reasonably good performance in a well damped system

(*b*) A 30 to 50% overshoot can be regarded as reasonably good performance in a well underdamped system

(*c*) A 30 to 50% overshoot can be regarded as reasonably good performance in a well overdamped system

(*d*) A 20 to 60% overshoot desirable in all the above classes

**106.** The maximum overshoot of a system with second order differential equation can be determined precisely from the height of the resonance peak.

(*a*) true (*b*) false

**107.** The frequency range over which the response of the system is within acceptable limits is called the system

(*a*) carrier frequency

(*b*) modulation frequency

(*c*) bandwidth

(*d*) demodulation frequency

**108.** Filter networks are often used as compensation in instrument servos.

(*a*) true (*b*) false

**109.** When filter networks are designed to operate on D.C.

(*a*) the modulation of the carrier signal becomes necessary

(*b*) the demodulation of the carrier frequency becomes necessary

(*c*) (*a*) and (*b*) both

(*d*) (*a*) or (*b*) but not both

**110.** Active devices cannot be used as stabilizing devices for control systems.

(*a*) true (*b*) false

**111.** Which of the following compensators will increase the bandwidth of a given control system?

(*a*) Phase-lag network
(*b*) Phase-lead network
(*c*) Phase-lag-lead network
(*d*) Any one of the above

**112.** The lag network is used to stabilize the system while maintaining the desired velocity gain constant, but in the process the phase-lag characteristic decreases the bandwidth.

(*a*) true
(*b*) false

**113.** Hydraulic motors are preferred to electric motors for use in airplanes because

(*a*) hydraulic motors are cheaper than electric motors
(*b*) hydraulic motors are light and torque/inertia ratio is high
(*c*) electric power consumption is very small
(*d*) oil used in hydraulic motors is very cheap

**114.** The principle of the gyroscope is based on

(*a*) Newton's third law
(*b*) second law of thermodynamics
(*c*) law of conservation of momentum
(*d*) law of conservation of energy

**115.** The gyroscope is used as an error detector for angular misalignment in three-dimensional space.

(*a*) true
(*b*) false

**116.** Which of the following non-linearities is caused by gear trains in the control system?

(*a*) Saturation
(*b*) Dead-space
(*c*) Coulomb friction
(*d*) Backlash

**117.** Laplace transform is not applicable to a non-linear system because

(*a*) the time domain analysis is easier than frequency domain analysis
(*b*) the initial conditions are not zero in non-linear systems
(*c*) superposition law is not applied to non-linear systems
(*d*) non-linear systems are time varying

**118.** Which of the following characteristics can be attributed to ideal relay?

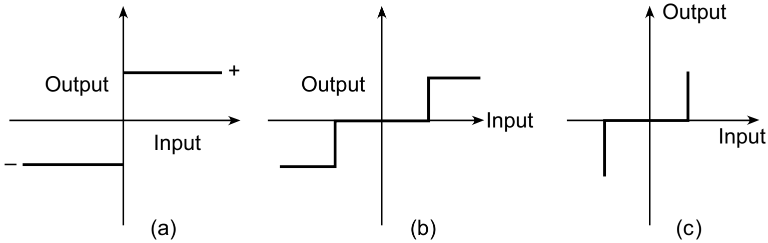


**Fig. Q. 118.**

**119.** The backlash phenomenon occurs when
(*a*) gear teeth are big
(*b*) gear teeth are small
(*c*) whenever the direction of motion of gear system reverses
(*d*) whenever the gear teeth are not lubricated

**120.** A potentiometer cannot be used as a computation device.
(*a*) true
(*b*) false

**121.** The term *conformity* is related to a
(*a*) wattmeter
(*b*) motor
(*c*) potentiometer
(*d*) transformers

**122.** The desirable resolution of a potentiometer should be
(*a*) very high
(*b*) low
(*c*) zero
(*d*) infinity

**123.** The resolution of a potentiometer is dependent on the
(*a*) length of the wire
(*b*) material of the wire
(*c*) size of the wire only
(*d*) width of the wire and wire size

**124.** The deposited film type potentiometer has
(*a*) zero resolution
(*b*) infinity resolution
(*c*) adjustable resolution
(*d*) very small resolution

**125.** To minimize the loading effect on accuracy, a potentiometer should work
(*a*) into high impedance load
(*b*) into low impedance load
(*c*) into low resistance load
(*d*) into load of 500 ohms

**126.** Which of the following devices is used to avoid the loading effect on the potentiometer?

(*a*) Rheostat (*b*) Battery

(*c*) Trimmer (*d*) Current generator

**127.** If the excitation voltage across 1000 turns in a potentiometer is 5 volts, what will be the percentage resolution of the potentiometer?

(*a*) 0.5% (*b*) 0.2%

(*c*) 0.1% (*d*) 5%

**128.** The deposited film potentiometer has the following disadvantage:

(*a*) It has continuous surface and hence resistance cannot be changed

(*b*) Its resistance varies with the temperature

(*c*) It has infinite resolution

(*d*) It cannot be used as an error detector

**129.** The loading error in a potentiometer cannot be compensated by introducing intentional non-linearity.

(*a*) true (*b*) false

**130.** A linear transformer is preferred to a potentiometer when used as an error detector because

(*a*) it is very cheap

(*b*) it eliminates the possibility of leading error

(*c*) it has high voltage sensitivity, infinite resolution and low friction level

(*d*) actuating signal is strong enough

**131.** The linear differential transformer is an

(*a*) electric device (*b*) electromechanical device

(*c*) electromagnetic device (*d*) electrostatic device

**132.** The linear differential transformer can be used to measure acceleration.

(*a*) true (*b*) false

**133.** Which of the following devices is used to indicate the angular position of rudders in an aircraft?

(*a*) Potentiometer

(*b*) Linear differential transformer

(*c*) Rotary differential type transformer

(*d*) None of the above

**134.** Induction potentiometers are recommended for use in high impedance servo-controlled systems.

(*a*) true (*b*) false

**135.** "Microsyn" is the name given to a

(*a*) potentiometer
(*b*) resolver
(*c*) rotary differential transformer
(*d*) magnetic amplifier

**136.** "Selsyn" is the trade name of

(*a*) synchros (*b*) resolver
(*c*) linear (*d*) gyroscope

**137.** The most common use of the synchros is as

(*a*) the error detector
(*b*) the transmission of angular data
(*c*) the transmission of arithmetic data
(*d*) any of the above

**138.** A synchro motor can be used as a synchro generator and the converse is also true.

(*a*) true (*b*) false

**139.** A differential is used in a synchro differential unit for

(*a*) indicating the sum of rotation angle of the synchro generators only
(*b*) indicating the difference of rotation angle of two synchro generators only
(*c*) (*a*) and (*b*) both
(*d*) none of the above

**140.** The impedances of a stator and rotor windings of the control transformer are

(*a*) considerably higher than those of equivalent sized synchros
(*b*) considerably lower than those of equivalent sized synchros
(*c*) equal to those of equivalent sized synchros
(*d*) none of the above

**141.** The control transformer (synchro) should never be used to feed a low impedance load.

(*a*) true (*b*) false

**142.** A synchro generator and motor is a

(*a*) 3-phase A.C. device
(*b*) single phase A.C. device
(*c*) two phase A.C. device
(*d*) single phase D.C. device

**143.** Which of the following devices is used for conversion of co-ordinates?

(*a*) Microsyn
(*b*) Synchros
(*c*) Synchro resolver
(*d*) Synchro transformer

**144.** The thermocouple converts the temperature

(*a*) to voltage directly
(*b*) to current directly
(*c*) to A.C. power
(*d*) to D.C. power

**145.** Pressure errors can be measured by the

(*a*) synchro unit
(*b*) potentiometer
(*c*) thermocouple
(*d*) strain-gauge alone
(*e*) combination of differential bellows strain gauge

**146.** The synchro-generator-motor combination may be used to control the water level in the tank.

(*a*) true
(*b*) false

**147.** A simple lever device can be used as a mechanical position error detector.

(*a*) true
(*b*) false

**148.** The Pitot tube is used in airborne equipment to measure the

(*a*) volume of air
(*b*) temperature of the engine
(*c*) pressure of the air and fluid
(*d*) pressure of air only

**149.** The magnetic amplifier can be used to control the speed of an induction motor.

(*a*) true
(*b*) false

**150.** The reactance of the A.C. coil in a magnetic amplifier is very large when

(*a*) there is no current in the D.C. coil
(*b*) there is very small current in the D.C. coil
(*c*) a huge amount of current flows in the D.C. coil
(*d*) a huge amount of A.C. current flows in the A.C. coil

**151.** A diode is connected in series with the A.C. source in a magnetic amplifier

(*a*) to avoid ripples from the signals

(*b*) to avoid desaturation of the core due to negative half cycle

(*c*) to convert A.C. to pure D.C.

(*d*) to suppress high frequencies of source current

**152.** D.C. output cannot be obtained from the magnetic amplifier.

(*a*) true (*b*) false

**153.** The power amplification in a magnetic amplifier can be increased

(*a*) by positive feedback

(*b*) by negative feedback

(*c*) with higher inductance of the A.C. coil

(*d*) none of the above

**154.** Bias is used in magnetic amplifiers

(*a*) to increase the D.C. current in the core

(*b*) to increase the D.C. flux in the core

(*c*) to weaken the A.C. flux in the core

(*d*) to produce an initial amount of D.C. saturation to obtain more amplification for weak signals than would be obtained without it

**155.** Which of the following would you choose for high power amplification?

(*a*) Magnetic amplifier

(*b*) Electronic amplifier

(*c*) Amplidyne

(*d*) D.C. generator

**156.** If the direct axis winding of the amplidyne is short circuited and the output is taken from the quadrature axis, the voltage output will be

(*a*) greater than that of the direct axis winding

(*b*) less than that of the direct axis winding

(*c*) equal to that when it is taken from the brushes placed on direct axis winding

(*d*) none of the above

**157.** Compensating winding is used in the amplidyne

(*a*) to increase the current output of the amplidyne
(*b*) to increase the voltage output of the amplidyne
(*c*) to counterbalance the magnetic field set up by the load current
(*d*) to reduce the flux set up by the control field

**158.** Give the five basic requirements of a servomotor:

(i) It must be able to supply the steady state power requirements of the load, plus any losses in gearing or similar associated equipment
(ii) It must be able to accelerate itself and the connected load in accordance with given acceleration specification
(iii) It must be able to supply the peak power demands during the possible transient conditions
(iv) It must operate at given velocity or over a given range of velocities
(v) It must be suitable for the specified duty cycle

**159.** The servomotor differs from standard motors principally in that it

(*a*) has entirely different construction
(*b*) has high inertia and hence high torque
(*c*) has low inertia and low torque
(*d*) has low inertia and higher starting torque

**160.** If the diameter of the armature of a servomotor is reduced to half and the length of the armature is doubled, by what factor will the torque/inertia ratio increase?

(*a*) 2 (*b*) 4
(*c*) 8 (*d*) 16

**161.** The "Drag-Cup" motor is designed to provide

(*a*) high inertia (*b*) high starting torque
(*c*) low inertia (*d*) low starting torque

**162.** If the inductance/resistance ratio is decreased in an induction motor, the maximum torque occurs at

(*a*) low speeds (*b*) high speeds
(*c*) rated speed (*d*) synchronous speed

**163.** D.C. servomotors are usually lighter for the same power output and have higher starting and reversing torques than A.C. servomotors.

(*a*) true (*b*) false

**164.** Which of the following motors is extensively used in servo applications?

(*a*) A.C. motor

(*b*) Field controlled D.C. motor

(*c*) Armature controlled D.C. motor

(*d*) None of the above

**165.** The clamping device used for sampled-data applications is called a

(*a*) clamper (*b*) clipper

(*c*) chopper (*d*) boxcar generator

**166.** When a clamper is used in the sampled-data system, there is no need to distinguish between pulse and impulse representation of the samples, since the sampled signal amplitude is held constant for the entire sampling period.

(*a*) true (*b*) false

**167.** If the synchro-transmitter shaft becomes disengaged from its driving gear it will

(*a*) run as a receiver (*b*) remain stationary at all times

(*c*) burn out (*d*) feed in false control signals

**168.** In the following figure the synchro-receiver will run

(*a*) correctly (*b*) erratically

(*c*) in reverse direction (*d*) 120° out of line

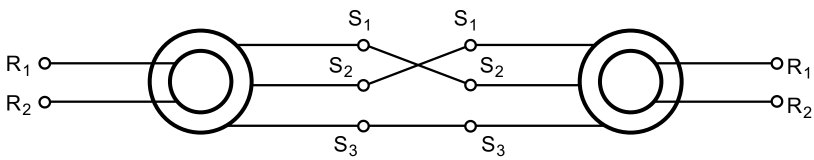


**Fig. Q. 168.**

**169.** If an electro-hydraulic servo unit is too "still" when responding to a signal, its action can be damped by

(*a*) increasing servo pressure (*b*) decreasing servo pressure

(*c*) opening the dash pot (*d*) closing the dash pot

**170.** The static friction at the pilot value of a hydraulic servo is eliminated by

(*a*) using a low viscosity servo oil

(*b*) increased valve clearance

(*c*) allowing the pump vibrations to pass into the servo

(*d*) superimposing a 50 Hz either signal at the field coils

**171.** What will be the D.C. voltage V in the following figure?

(*a*) $x$ times $y$ (*b*) $x$ divided by $y$

(*c*) $x + y$ (*d*) $x - y$

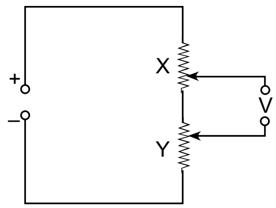


**Fig. Q. 171.**

**172.** If the coil *P* in the following figure is rotated as indicated by the arrow, the voltage induced in the coil *S* will

(*a*) remain constant

(*b*) increase as the misalignment increases up to 360°

(*c*) decrease as the misalignment increases up to 360°

(*d*) be proportional to the sine of the angle of misalignment

(*e*) be proportional to the cosine of the angle of the misalignment

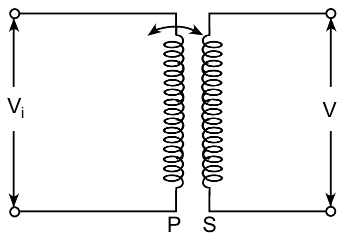


**Fig. Q. 172.**

**173.** The output of the feedback control system should be a function of

(*a*) input (*b*) reference and output

(*c*) feedback signal (*d*) input and feedback signal

**174.** Which of the following characteristics can be studied with the transfer function of the system?

(*a*) Steady state characteristics only

(*b*) Transient characteristics only

(*c*) (*a*) and (*b*) both

(*d*) None of the above

**175.** How will the transient response be affected if feedback is introduced in the system?

(*a*) The transient response dies off

(*b*) The transient response decays slowly

(*c*) The transient response decays very fast

(*d*) The transient response does not vary

**176.** The sensitivity of the feedback system is

(*a*) less than the sensitivity of the system without feedback

(*b*) more than the sensitivity of the system without feedback

(*c*) same as of the system without feedback

(*d*) zero

**177.** Which of the following is the main cause of non-linearity in electrical systems?

(*a*) Friction

(*b*) Resistance

(*c*) Inductance

(*d*) Capacitance

(*e*) Saturation of magnetic core

**178.** If the control signal is modulated by some modulating devices, the system is referred as a

(*a*) D.C. control system

(*b*) A.C. control system

(*c*) sampled data control system

(*d*) none of the above

**179.** The block diagram shown below is equivalent to

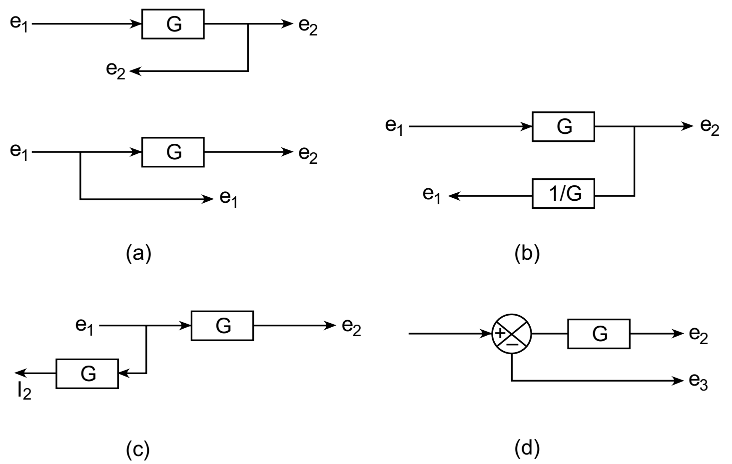


**Fig. Q. 179.**

**180.** Which of the following block systems will give transfer function $\dfrac{G}{1+GH}$?

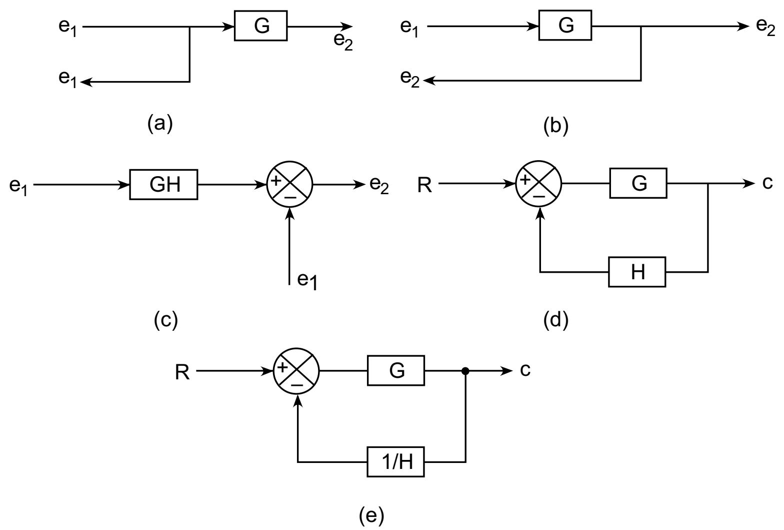


**Fig. Q. 180.**

**181.** What will be the transfer function for the following diagram?

(*a*) $\frac{0\,(s)}{I\,(s)} = \frac{RC_s}{RC_s + 1}$ (*b*) $\frac{0\,(s)}{I\,(s)} = \frac{1}{RC_s + 1}$

(*c*) $\frac{0\,(s)}{I\,(s)} = RC_s + 1$ (*d*) $\frac{0\,(s)}{I\,(s)}\ 1 - RC_s$

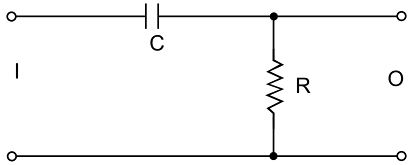


**Fig. Q. 181.**

**182.** Which of the following controllers is based on integral error compensation?

(*a*) Proportional controller
(*b*) Proportional plus derivative controller
(*c*) Proportional plus integral controller
(*d*) Proportional minus integral controller

**183.** The transfer function $F(s) = \frac{R_2C_2S + 1}{(R_1 + R_2)\,C_2S + 1}$ is for

(*a*) lag network (*b*) lead network
(*c*) lead-lag network (*d*) none of the above

**184.** The lead compensation in the system will add

(*a*) zeros (*b*) poles
(*c*) poles and zeros both (*d*) none of them

**185.** The lead-lag compensation will improve

(*a*) transient response of the system
(*b*) steady state response of the system
(*c*) transient and steady state response
(*d*) none of the above

**186.** Which network will one choose to increase the bandwidth of the system?

(*a*) Lead network (*b*) Lag network
(*c*) Lead-lag network (*d*) (*a*) or (*b*)

**187.** The lag network increases the bandwidth of the system.

(*a*) true (*b*) false

**188.** The Nyquist plot shown below indicates a

(*a*) stable system

(*b*) unstable system

(*c*) marginally stable

(*d*) none of the above

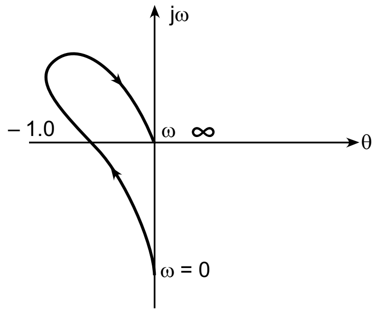


**Fig. Q. 188.**

**189.** The Nyquist stability criterion requires polar plot of

(*a*) the closed loop transfer function

(*b*) the open loop transfer function

(*c*) either (*a*) or (*b*)

(*d*) the characteristic equation

**190.** The open loop transfer function of a system is $G(s)\,H(s) = \dfrac{K}{s\,(1 + T_1\,S)(1 + T_2\,S)}$

The system will be

(*a*) stable (*b*) unstable

(*c*) conditionally stable (*d*) marginally stable

**191.** The Nyquist plot shown below indicates a

(*a*) stable system (*b*) unstable system

(*c*) conditionally stable (*d*) marginally stable

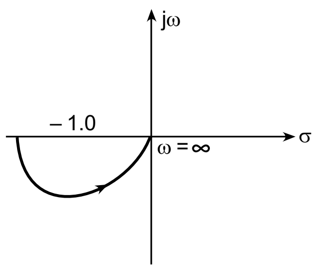


**Fig. Q. 191.**

**192.** The Bode diagram shown below is for

(*a*) a constant (*b*) pure integration

(*c*) pure differentiation (*d*) none of the above

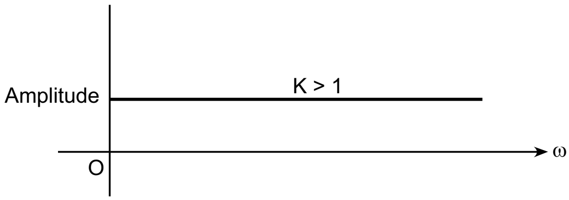


**Fig. Q. 192.**

**193.** The Bode diagram shown below is for

(*a*) a constant (*b*) pure integration

(*c*) pure differentiation (*d*) none of the above

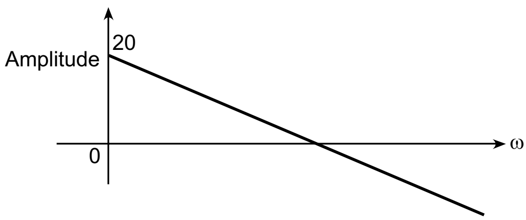


**Fig. Q. 193.**

**194.** The Bode plot shown below is for

(*a*) a constant (*b*) pure integration

(*c*) pure differentiation (*d*) none of the above

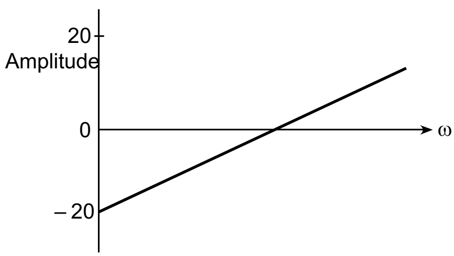


**Fig. Q. 194.**

**195.** Self-balancing instruments use

(*a*) any motor (*b*) A.C. servomotor

(*c*) D.C. servomotor (*d*) tachometer

**196.** Which of the following is odd man out?

(*a*) D.C. motor (*b*) Amplidyne

(*c*) Electronic Amplifier (*d*) D.C. generator

**197.** The transfer function $G(s) = \dfrac{50}{S\,(S^2 + 4S + 12)}$ indicates that the system will be

(*a*) stable (*b*) unstable

(*c*) conditionally stable (*d*) none of the above

**198.** For the system $G(jw)\,H(jw) = \dfrac{10}{jw\,(1 + jw)(1 + 10\,jw)}$ which of the following statements is true?

(*a*) The system is stable with two poles in right half-plane

(*b*) The system is unstable with two poles in right half-plane

(*c*) The system is unstable with two zeros in right half-plane

(*d*) The system is stable with two zeros in right half-plane

**199.** What will be the steady state velocity-lag error for the velocity input of 5 rad/sec for the system shown below?

(*a*) 2 rad (*b*) 2.5 rad

(*c*) 5 rad (*d*) 10 rad

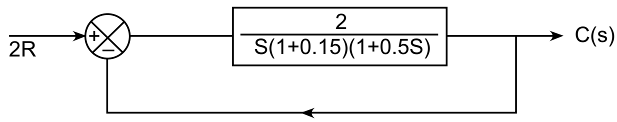


**Fig. Q. 199.**

**200.** What will be the value of *Kp, i.e.*, proportion constant for the system shown in Question 199?

(*a*) 2 (*b*) Zero

(*c*) Infinity (*d*) None of the above

**201.** What will be the value of *Kv, i.e.*, velocity constant for the system shown in Question 199?

(*a*) 2 (*b*) Zero

(*c*) Infinity (*d*) 10

**202.** What will be the value of $K_a$, *i.e.*, acceleration constant for the system in Question 199?

(*a*) 2 (*b*) Zero

(*c*) 5 (*d*) Infinity

**203.** The radar tracking servosystem is an example of a

(*a*) continuous control system

(*b*) relay type control system

(*c*) discrete data control system

(*d*) any of the above

**204.** If every state variable of the process can be controlled in finite time by some input, then the process is called

(*a*) completely controllable

(*b*) uncontrollable

(*c*) completely observable

(*d*) unobservable

**205.** If every state variable eventually affects the some of the outputs of the process then the process is called

(*a*) completely controllable (*b*) uncontrollable

(*c*) completely observable (*d*) unobservable

**206.** A signal flow graph of a process is shown below. Which statement is true for the process?

(*a*) The process is controllable

(*b*) The process is observable

(*c*) The process is uncontrollable but observable

(*d*) The process is unobservable

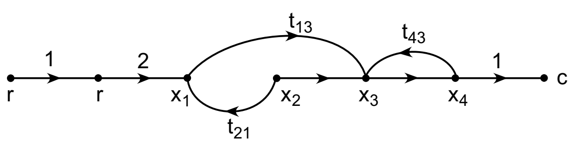


**Fig. Q. 206.**

**207.** The signal flow diagram of a process is shown below. Which statement is true for the process?

(*a*) The process is controllable

(*b*) The process is observable

(*c*) The process is controllable but unobservable

(*d*) The process is uncontrollable but observable

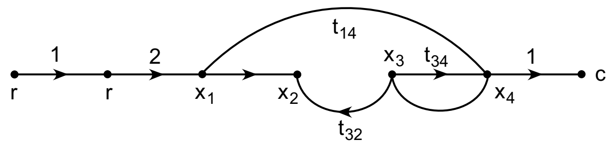


**Fig. Q. 207.**

**208.** Nonlinearity in the servosystem due to saturation is caused by

(*a*) gear trains

(*b*) servometer

(*c*) relays

(*d*) none of the above

**209.** $V(x)$ is a function of "$x$" only if "$x$" is a function of time "$t$." This statement is related to

(*a*) dynamic programming

(*b*) differential equations

(*c*) Laplace transform

(*d*) calculus of variations

**210.** What will be the Laplace transform $F(s)$ of function $F(t)$ shown in the diagram?

(*a*) $as^2 \tanh (as/2)$

(*b*) $as^2 \tan (as/2)$

(*c*) $1/as^2 \tanh (as/2)$

(*d*) $1/as \tanh (as)$

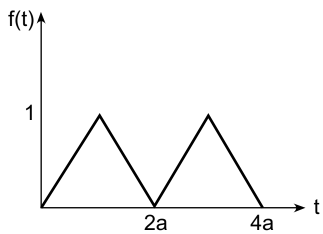


**Fig. Q. 210.**

**211.** Indicate the Laplace transform for the function $f(t)$ shown in pulse form.

(a) $\dfrac{e^{-as}(1 - e^{-as})}{s}$

(b) $e^{-as}$

(c) $1 - e^{-as}$

(d) $\dfrac{1}{1 - e^{-as}}$

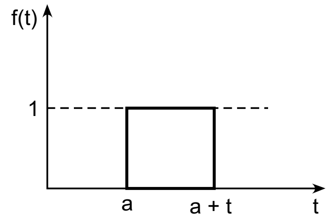


**Fig. Q. 211.**

**212.** For which of the following waveforms will the Laplace transform $F(s)$ be $\dfrac{1}{s(1 - e^{-as})}$?

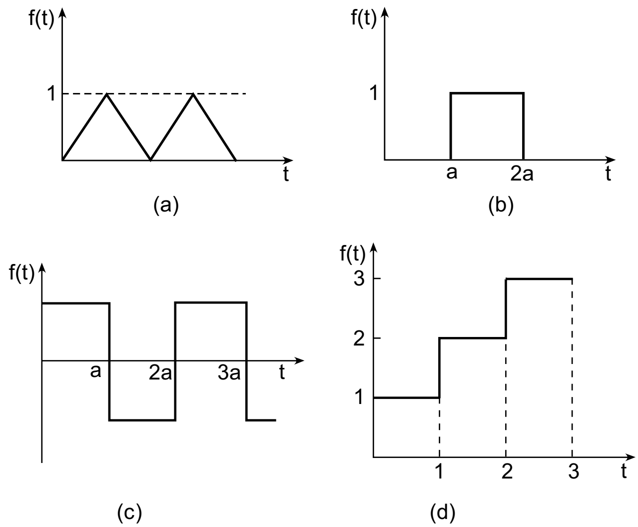


**Fig. Q. 212.**

**213.** How many bellows will be required to generate proportional (P) action in a pneumatic controller?

(a) 1 (b) 2

(c) 4 (d) 6

**214.** How many operational amplifiers are required to generate PI action?

(a) 1 (b) 2

(c) 3 (d) 4

**215.** How many variable restrictors are required in a pneumatic controller with PID action?

(*a*) 1
(*b*) 2
(*c*) 3
(*d*) 4

**216.** The essential function of an electronic controller is

(*a*) sensing
(*b*) comparison
(*c*) amplifying
(*d*) clamping

**217.** If the proportional band of a controllers is 10% that represents

(*a*) the change in control output by 10%
(*b*) the change in control output by 90%
(*c*) the change in control output from 10% to 90%
(*d*) the change in control output from maximum value to minimum value for 10% change in measured variable

**218.** Which of the following controllers will have zero proportional band?

(*a*) Linear continuous controller
(*b*) Non-linear continuous controller
(*c*) ON-OFF controller
(*d*) Either (*a*) or (*c*)

**219.** If the integral control action (I) is included in the controller having proportional (P) control action, the proportional band will

(*a*) increase
(*b*) decrease
(*c*) remain unchanged
(*d*) vary depending on integral time of I action

**220.** The oscillator is not used in the automatic control systems.

(*a*) true
(*b*) false

**221.** If the bandwidth of a control system is increased, the noise in the system will

(*a*) increase
(*b*) decrease
(*c*) not be affected
(*d*) be zero

**222.** The phase load compensator can be used to

(*a*) increase the damping of an underdamped control system

(*b*) increase the damping of an overdamped system

(*c*) decrease the damping of an underdamped system

(*d*) achieve (*a*), (*b*), and (*c*)

**223.** In the above question, the bandwidth of the control system will

(*a*) increase (*b*) decrease

(*c*) remain unaffected (*d*) be zero

**224.** The lag-compensation in the control system is achieved by

(*a*) adding zeros in the transfer function of the system

(*b*) adding poles in the transfer function of the system

(*c*) either (*a*) or (*b*)

(*d*) none of these

**225.** The load-compensation in the control system is achieved by

(*a*) adding zeros in the transfer function of the control system

(*b*) adding poles in the transfer function of the control system

(*c*) either (*a*) or (*b*)

(*d*) none of these

**226.** Which of the following devices is commonly used to provide damping in a servosystem?

(*a*) Servogenerator (*b*) Techometer

(*c*) Tachogenerator (*d*) Metadyne

(*e*) (*b*) or (*c*)

**227.** Saturation non-linearity is caused by

(*a*) relays (*b*) gear system

(*c*) servometer (*d*) none of these

**228.** The control and reference signals in an A.C. servometer are

(*a*) in phase with each other

(*b*) 90° out of phase

(*c*) 120° out of phase

(*d*) 180° out of phase

**229.** Which of the following controllers can be used to control the speed of squirrel cage motors?

(*a*) Amplidyne
(*b*) Electronic amplifier
(*c*) Magnetic amplifier
(*d*) None of these

**230.** An A.C. servometer operates on the principle of operation of a

(*a*) A.C. generator
(*b*) synchronous motor
(*c*) single phase induction motor
(*d*) two phase induction motor

# 7

# ELECTRONICS

**1.** The VTVM can be used to measure

(*a*) D.C. voltage only

(*b*) A.C. voltage of high frequency only

(*c*) D.C. voltage and A.C. voltage up to the order of 5 MHz frequency

(*d*) A.C. voltage of low frequency

**2.** An oscillator cannot be used as an *X*-*Y* plotter.

(*a*) true (*b*) false

**3.** The forward resistance of the diode will be

(*a*) zero (*b*) small

(*c*) infinity (*d*) high

**4.** Vacuum tubes are

(*a*) high current devices

(*b*) low current and high voltage devices

(*c*) low voltage devices

(*d*) low current and low voltage devices

**5.** Transistors are

(*a*) high voltage devices

(*b*) low voltage and low current devices

(*c*) high current devices

(*d*) low current devices

**6.** The voltage at which electron flow starts from the anode to cathode is called

(*a*) breakdown voltage
(*b*) peak inverse voltage
(*c*) peak voltage
(*d*) pinch off voltage

**7.** The energy needed to disrupt the bonds of pure germanium is

(*a*) 1.12 eV
(*b*) 0.75 eV
(*c*) 0.6 eV
(*d*) 7.5 eV

**8.** The lifetime of an electron hole before recombination will be

(*a*) 1/2 minute
(*b*) 1/2 second
(*c*) less than microseconds to more than milliseconds depending on circumstances
(*d*) 1/4 second
(*e*) milliseconds

**9.** Which of the following doping will create a "*p*-type" semiconductor?

(*a*) Germanium with phosphor
(*b*) Silicon with indium
(*c*) Germanium with antimony
(*d*) Germanium with indium

**10.** The triode has

(*a*) two electrodes
(*b*) three electrodes
(*c*) four electrodes
(*d*) none of the above

**11.** The input to the triode is given between

(*a*) plate and grid
(*b*) plate and cathode
(*c*) grid and cathode
(*d*) plate and heater

**12.** The grid in the triode has

(*a*) negative potential
(*b*) positive potential
(*c*) negative potential but more positive than cathode
(*d*) negative potential but more negative than cathode

**13.** When the grid of the triode is negative

(*a*) the plate current will increase
(*b*) the plate current will decrease
(*c*) the plate current will not be affected
(*d*) the grid will attract more electrons

**14.** The term "No Signal" related to electron tubes usually indicates

(*a*) open grid circuit
(*b*) open plate circuit
(*c*) open cathode circuit
(*d*) signal of zero volt

**15.** The amplification of a signal by a triode common-cathode amplifier will cease if

(*a*) the grid is more positive
(*b*) the grid is more negative than cut off voltage
(*c*) the plate is more positive
(*d*) the plate is more negative

**16.** The unit of the amplification factor is

(*a*) decibels
(*b*) volt
(*c*) neper
(*d*) none of the above

**17.** To define the amplification factor of a tube, which of the following quantities remains constant?

(*a*) Plate voltage
(*b*) Plate current
(*c*) Grid voltage
(*d*) Grid current

**18.** The bypass capacitor used in a self-biased amplifier must have

(*a*) very high capacitance
(*b*) very low capacitance
(*c*) low capacitance for low frequency signal
(*d*) low capacitance for high frequency signal

**19.** The unit of transconductance is

(*a*) ohm
(*b*) mho
(*c*) henry
(*d*) none of the above

**20.** In a pentode the screen grid is placed closer to the

(*a*) plate
(*b*) cathode
(*c*) heater
(*d*) heater than the suppression grid

**21.** A pentode cannot be used for amplification purposes.

(*a*) true
(*b*) false

**22.** The $p$-$n$ junction behaves like a

(*a*) diode (*b*) triode

(*c*) tetrode (*d*) pentode

**23.** In $n$-$p$-$n$ transistors under forward biased condition, the $p$ layer is extremely thin because

(*a*) the material used for $p$-type semiconductors is very costly

(*b*) a $p$-type semiconductor requires more energy to disturb the electrons in the valence band

(*c*) 90% of electrons can be collected at the collector

(*d*) 90% of electrons can be controlled at the emitter

**24.** The function of the base in the transistor is analogous to the

(*a*) plate in the triode (*b*) cathode in the triode

(*c*) grid in the triode (*d*) heater in the triode

**25.** In many ways the base transistor is more analogous to the screen grid of a pentode than the grid of a triode.

(*a*) true (*b*) false

**26.** The screen grid in the pentode carries

(*a*) zero current (*b*) small current

(*c*) high current (*d*) current equal to control grid

**27.** The characteristic curves of a transistor are much more like those of a

(*a*) diode (*b*) triode

(*c*) pentode (*d*) tetrode

**28.** The choice of the bias voltage of a transistor will depend on the

(*a*) emitter current (*b*) collector current

(*c*) nature of the signal source (*d*) nature of the output

**29.** The impedance of an operational amplifier is

(*a*) infinite (*b*) zero

(*c*) very small but not zero (*d*) very high

**30.** The input impedance of an operational amplifier is

(*a*) infinite (*b*) zero

(*c*) very high but not infinite (*d*) very small

**31.** The output voltage of an operational amplifier is

(*a*) 90° out of phase from the input

(*b*) 180° out of phase from the input

(*c*) 45° out of phase from the input

(*d*) – 90° out of phase from the input

**32.** If the current gain and voltage gain of a common-emitter amplifier are given, the power gain cannot be found with given data.

(*a*) true (*b*) false

**33.** The collector current in a transistor will

(*a*) increase if the temperature increases

(*b*) decrease if the temperature decreases

(*c*) not change with temperature variation

(*d*) none of the above

**34.** The phenomenon of "Thermal Runaway" relates to the

(*a*) diode

(*b*) transistor

(*c*) tetrode

(*d*) pentode

**35.** Electrons are the majority carrier in the

(*a*) *n-p-n* transistor

(*b*) *p-n-p* transistor

(*c*) *n*-type semiconductor

(*d*) *p*-type semiconductor

**36.** Why is the bias used in the transistor amplifier circuit?

(*a*) To increase the current capacity of the transistor

(*b*) The biased circuit will saturate at the high current

(*c*) To avoid the use of a separate power source for the input and output circuit of the transistor-amplifier

(*d*) None of the above

**37.** A measure of an amplifier's stability against temperature thermal runaway is the ratio of

(*a*) $\dfrac{\text{change in collector current}}{\text{change in collector leakage current}}$

(*b*) $\dfrac{\text{change in emitter current}}{\text{change in collector leakage current}}$

(*c*) $\dfrac{\text{change in emitter current}}{\text{change in collector current}}$

(*d*) $\dfrac{\text{change in collector leakage current}}{\text{change in collector current}}$

(*e*) $\dfrac{\text{change in collector current}}{\text{change in emitter current}}$

**38.** The emitter-follower is a

(*a*) common collector amplifier

(*b*) common emitter amplifier

(*c*) common base amplifier

(*d*) none of the above

**39.** The output in a cathode follower is taken across

(*a*) the bias resistance $R_k$ connected to the cathode of the triode

(*b*) between the plate and cathode

(*c*) between the grid and plate

(*d*) between the grid and cathode

**40.** In a cathode-follower the output voltage

(*a*) is in phase with the input voltage

(*b*) is 180° out of phase from the input voltage

(*c*) is 90° out of phase from the input voltage

(*d*) is 45° out of phase from the input voltage

**41.** If the grid current in the cathode follower is increased, the plate current will

(*a*) increase (*b*) decrease

(*c*) not change (*d*) be zero

**42.** The voltage gain of a cathode-follower is

(*a*) unity (*b*) less than unity

(*c*) more than unity (*d*) any of the above

**43.** A common base amplifier is used
(*a*) in very high frequency circuits
(*b*) in low frequency circuits
(*c*) in medium frequency circuits
(*d*) in low current circuits

**44.** Bipolar transistors have
(*a*) low input resistance compared to FET
(*b*) high input resistance compared to FET
(*c*) zero input resistance
(*d*) infinity resistance

**45.** Field effect transistors contain
(*a*) holes carrier only
(*b*) electrons carrier only
(*c*) either (*a*) or (*b*)
(*d*) (*a*) and (*b*) both

**46.** Which of the following transistors is unipolar?
(*a*) *n-p-p* transistor
(*b*) *p-n-p* transistor
(*c*) Field$^2$ effect transistor
(*d*) None of the above

**47.** A field-effect transistor can be used as a
(*a*) variable capacitance
(*b*) variable reactance
(*c*) variable inductance
(*d*) variable resistance
(*e*) none of the above

**48.** In a field effect transistor, the drain voltage above which there is no increase in the drain current is called
(*a*) pick off voltage
(*b*) critical voltage
(*c*) pinch off voltage
(*d*) breakdown voltage

**49.** An *RC* coupled amplifier is used in a radio receiver
(*a*) to minimize the noise
(*b*) to increase the bandwidth
(*c*) to isolate A.C. signal from D.C. signal
(*d*) none of the above

**50.** The phase shift between the input and output signals in an *RC* coupled amplifier for a high pass network can be expressed in terms of lower frequency response limit $f_1$ or upper frequency response limit $f_2$.

(*a*) true (*b*) false

**51.** If the gain of an *RC* coupled amplifier decreases

(*a*) the phase shift will increase

(*b*) the phase shift will decrease

(*c*) the phase shift will not vary

(*d*) the phase shift has no relation with gain

**52.** If three amplifiers having same bandwidth are cascaded, the bandwidth of the resulting amplifier will be

(*a*) better than that of each stage

(*b*) worse than that of each stage

(*c*) same as that of each stage

(*d*) none of the above

**53.** The bandwidth of the resulting amplifier in the above question will

(*a*) increase as the number of identical amplifier stages increases

(*b*) decrease as the number of identical amplifier stages increases

(*c*) not change as the number of identical amplifier stages increases

(*d*) be very high as the number of identical amplifier stages increases

**54.** The transformer coupling of amplifiers provides a more efficient signal transfer than RC coupling because

(*a*) the problem of impedance matching is solved

(*b*) there is a little power loss in the transformer winding

(*c*) the use of a transformer is cheaper than the *RC* coupled network

(*d*) of easy control of voltage output

**55.** Which of the following amplifiers is used to operate a loudspeaker?

(*a*) Audio voltage amplifier

(*b*) Audio power amplifier

(*c*) Audio current amplifier

(*d*) Any one of the above

**56.** If the triode is used as an amplifier, the maximum power will be developed in the load when

(*a*) plate resistance is equal to the load resistance

(*b*) plate resistance is less than the load resistance

(*c*) plate resistance is more than the load resistance

(*d*) load resistance is very high

**57.** The transformer coupling of an amplifier will provide proper impedance matching between circuits.

(*a*) true (*b*) false

**58.** Sometimes the power required for the load is more than can be handled by convenient amplification elements. Which of the following amplifiers is called for?

(*a*) *RC* coupled amplifier

(*b*) Transformer coupled amplifier

(*c*) Push-pull amplifier

(*d*) Audio power amplifier

**59.** The two input signals applied to a push-pull amplifier are

(*a*) 60° out of phase (*b*) 180° out of phase

(*c*) in phase (*d*) 90° out of phase

**60.** The amplifier which provides the push-pull output stage with equal but opposite signals is called a

(*a*) phase-converter amplifier (*b*) phase-inverter amplifier

(*c*) phase-diverter amplifier (*d*) none of the above

**61.** Zener breakdown of a *p-n* junction will occur if

(*a*) the electrons drifting through the depletion region pick up sufficient K.E. to ionize other atoms with which they collide and produce a sudden large reverse current

(*b*) there is a large forward bias current to cause breakdown

(*c*) there is a large reverse bias current to break covalent bonds and produce free electron-hole pairs

(*d*) none of the above

**62.** If the diode is reversed biased, the sudden increase of the current in the diode is attributed to

(*a*) Zener breakdown only
(*b*) avalanche breakdown only
(*c*) either (*a*) or (*b*)
(*d*) (*a*) and (*b*) both

**63.** The output of a thermocouple is

(*a*) D.C. voltage
(*b*) A.C. voltage
(*c*) square wave
(*d*) sinusoidal voltage

**64.** The chopper amplifies D.C. signal

(*a*) without converting it to alternating current
(*b*) first converting to alternating current and amplifying it, then reconverting to direct current
(*c*) either (*a*) or (*b*)
(*d*) none of the above

**65.** Which of the following amplifiers has the largest bandwidth?

(*a*) RC coupled amplifier
(*b*) Transformer coupled amplifier
(*c*) Direct-coupled amplifier
(*d*) Difference amplifier

**66.** If one wishes to amplify the potential difference between two points in a circuit when neither of these points is grounded, which of the following amplifiers will be used?

(*a*) *RC* coupled amplifier
(*b*) Transformer coupled
(*c*) Difference amplifier
(*d*) Audio power amplifier

**67.** Any electrical conductor acts as an antenna for the reception of the electromagnetic radiation in the radio frequency range.

(*a*) true
(*b*) false

**68.** If a mechanical movement is converted into an electrical signal in an instrument and acts as noise to the system, this effect is called

(*a*) stereophonic
(*b*) microphonic
(*c*) electro-chemical conversion
(*d*) vibrational echo

**69.** The thermal noise in electronic tubes is eliminated at a temperature of

(*a*) 0°C (*b*) absolute zero
(*c*) 0°F (*d*) 273°K

**70.** In a cascaded amplifier the last stage contributes the most towards the total noise in the amplifier output.

(*a*) true (*b*) false

**71.** The upper cut-off frequency of an *RC* coupled amplifier is mainly due to

(*a*) coupled capacitor
(*b*) cathode bypass capacitor
(*c*) output capacitance of the signal source
(*d*) inter-electrode capacitance and stray capacitance

**72.** If the bandwidth of an amplifier is reduced, the thermal noise in the amplifier will

(*a*) increase (*b*) decrease
(*c*) not be affected (*d*) become random in nature

**73.** The temperature coefficient for forward voltage drop across a *p-n* junction is

(*a*) positive (*b*) negative
(*c*) zero (*d*) unity

**74.** The noise factor of an amplifier which contributes no noise will be

(*a*) zero (*b*) one
(*c*) infinity (*d*) less than zero

**75.** A tuned amplifier can be used for

(*a*) the ratio range of frequency only
(*b*) the audio range of frequency only
(*c*) (*a*) and (*b*) both
(*d*) video range of frequency only

**76.** Negative feedback is applied in many oscillator circuits to

(*a*) increase output impedance
(*b*) decrease output impedance
(*c*) stabilize the frequency of the oscillators
(*d*) stabilize the output amplitude

**77.** Negative feedback used in amplifiers will reduce the noise by the same factor as gain.

(*a*) true (*b*) false

**78.** Enumerate the four benefits of negative feedback used in the amplifiers:

(i) Increased input impedance

(ii) Reduced output impedance

(iii) Improved gain stability

(iv) Extended bandwidth

**79.** When the same amount of current can be controlled from a low impedance source to a high impedance source, this is called

(*a*) power amplification (*b*) current amplification

(*c*) voltage amplification (*d*) gain amplification

**80.** When the signal feedback to the amplifier circuit is proportional to the output current rather than output voltage, an amplifier is said to have

(*a*) power feedback (*b*) voltage feedback

(*c*) current feedback (*d*) signal feedback

**81.** An element is said to have negative resistance when

(*a*) the element has negative temperature coefficient

(*b*) the current/voltage curve has negative slope

(*c*) the element has negative specific resistance

(*d*) the current/voltage curve has positive slope

**82.** A feedback oscillator would oscillate at all frequencies for which

(*a*) $A\beta = 0$ (*b*) $A\beta \le 1$

(*c*) $A\beta \ge 1$ (*d*) $A\beta = 1$

**83.** The phase-shift network fulfils the oscillation condition of regenerative feedback for only one frequency.

(*a*) true (*b*) false

**84.** When *R* and *C* are the same for all three high pass filters in series, the frequency of oscillation of the oscillator will be

(*a*) $f_o^{+4} = 1/2\pi\sqrt{RC}$ (*b*) $f_o^{+4} = 1/2\pi\sqrt{3RC}$

(*c*) $f_o^{+4} = 1/2\pi\sqrt{6RC}$ (*d*) $f_o^{+4} = 1/\sqrt{RC}$

**85.** The tuned circuit in an oscillator may be connected to

(*a*) the grid circuit only

(*b*) the plate circuit only

(*c*) (*a*) or (*b*)

(*d*) none of the above

**86.** The grid has no control over electrons, activities when the ionization of gas has occurred in the thyratron tube because the

(*a*) grid becomes more negative

(*b*) grid becomes more positive

(*c*) grid is neutralized as it is surrounded by the positive ions

(*d*) grid is disconnected from the circuit

**87.** The unijunction transistor can be used as a voltage divider.

(*a*) true (*b*) false

**88.** What will happen if the emitter current increases in a unijunction transistor?

(*a*) The junction resistance increases and the emitter voltage decreases

(*b*) The junction resistance decreases and the emitter voltage decreases

(*c*) The junction resistance decreases and the emitter voltage increases

(*d*) The junction resistance increases and the emitter voltage increases

**89.** The tunnel diode cannot be used as a very stable relaxation oscillator.

(*a*) true (*b*) false

**90.** A grounded shield used in choppers (to convert the D.C. balance signal in a potentiometer to A.C. signal) helps

(*a*) to reduce vibrational noise

(*b*) to reduce the noise component from pick-up and leakage

(*c*) to avoid electrical shocks

(*d*) to avoid the need of an earth wire

**91.** How many thyratron tubes will be used to have directional rotation of a D.C. motor when the speed of the motor is being controlled?

(*a*) One (*b*) Two

(*c*) Three (*d*) Four

**92.** Which of the following statements is true?

(*a*) When the speed of a D.C. motor is controlled by using a thyratron, the plate voltage determines the armature current and the motor speed

(*b*) When the speed of a D.C. motor is controlled by using a thyratron, the grid voltage determines the armature current and the motor speed

(*c*) When the speed of a D.C. motor is controlled by using a thyratron, the type of gas used in the tube will determine the armature current and the motor speed

(*d*) When the speed of a D.C. motor is controlled by using a thyratron, the size of the thyratron will determine the armature current and the motor speed

**93.** An operational amplifier should have

(*a*) zero output impedance
(*b*) low output impedance
(*c*) high output impedance
(*d*) infinity impedance

**94.** Operational amplifiers are seldom used for differentiation because

(*a*) the problem of drift exists with the differentiating circuits

(*b*) the noise pulses are amplified, and this can be significant in the output

(*c*) the problem of drift does not exist in the differentiating network

(*d*) the differentiating circuits are not economic

**95.** The problem of drift exists in the differentiating network when the operational amplifier is used in the circuit.

(*a*) true
(*b*) false

**96.** When it is necessary to sum signals at any amplifier input, operational feedback is used and with operational feedback

(*a*) the signal potentials are being added

(*b*) the signal currents are being added

(*c*) either (*a*) or (*b*)

(*d*) (*a*) and (*b*) simultaneously

**97.** A operational amplifier cannot be used as voltage or current amplifier.

(*a*) true
(*b*) false

**98.** Enumerate the three major sources of error in the integrator circuit where an operational amplifier has been used to fabricate the integrator.

(i) Zero-level offset

(ii) Current leakage of the summing point

(iii) Capacitor leakage

**99.** If the gain of the chopper amplifier is 1000 and the operational amplifier gain is 50,000, the D.C. gain of the chopper stabilized operational amplifier will be

(*a*) 50,000 (*b*) $50 \times 10^6$

(*c*) 1000 (*d*) 50

**100.** A chopper amplifier detects offset by measuring the potential at the summing point of the operational amplifier.

(*a*) true (*b*) false

**101.** In some cases, the operational amplifier can be used as a precision waveform generator.

(*a*) true (*b*) false

**102.** The term "fly back" is associated with

(*a*) CRT (*b*) transistor

(*c*) operational amplifier (*d*) rectifier

(*e*) electronic tubes

**103.** Which of the following waveforms is referred as "sweep"?

(*a*) Square waveform (*b*) Sinusoidal waveform

(*c*) Triangular waveform (*d*) Sawtooth waveform

**104.** A silicon Zener diode has a theoretical switching time of about

(*a*) $1 \times 10^{-6}$ seconds (*b*) $1 \times 10^{-8}$ seconds

(*c*) $8 \times 10^{-6}$ seconds (*d*) $1 \times 10^{-12}$ seconds

**105.** A diode-resistor circuit can be used as a limiter by connecting the load

(*a*) in series with the diode only (*b*) in shunt with the diode only

(*c*) (*a*) or (*b*) (*d*) none of the above

**106.** The "D.C. resistor" is the name given to a

(*a*) clipper (*b*) clamper

(*c*) limiter (*d*) shunt limiter

**107.** Enumerate the four advantages of SCR over the thyratron.

(*i*) No filament current is required

(*ii*) Smaller size

(*iii*) Higher current handling capacity

(*iv*) Much smaller voltage across the "on" SCR

**108.** Thyristors are not made of the germanium because
(*a*) germanium is costlier than the silicon
(*b*) germanium is not used as a semiconductor
(*c*) the leakage current is high in germanium
(*d*) the current handling capacity of germanium is less than silicon

**109.** A voltage amplifier is shown to the right. What is the highest voltage gain accurate to 1% obtainable with an amplifier whose open loop gain is 1000?
(*a*) 100 (*b*) 10
(*c*) 1000 (*d*) 10,000

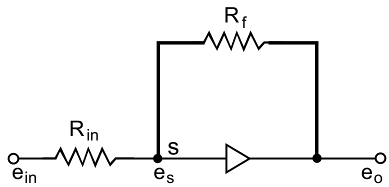

**Fig. Q. 109.**

**110.** The circuit diagram of Question 109 is used to measure D.C. voltage of 10 volt having a source resistance of 1 kilo-ohm. If $R_{in}$ = 10 kilo-ohms and $R_f$ = 100 kilo-ohms, what will be the value of $e_0$?
(*a*) – 90 volts (*b*) – 91 volts
(*c*) – 10 volts (*d*) – 100 volts

**111.** The operational amplifier shown to the right is said to limit when the current output or voltage reaches values of ± 1 mA or ± 50 volts respectively, $e_{ref}$ = 10 volts, $Z_2$ is a resistive load, and $Z_1$ = 0. What is the voltage across $Z_2$?
(*a*) 7.5 volts (*b*) 5 volts
(*c*) 100 volts (*d*) 10 volts
(*e*) 2.5 volts

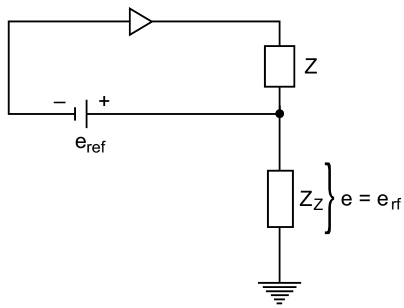

**Fig. Q. 111.**

**112.** When the transistor is saturated
(*a*) the emitter potential is more than base and collector
(*b*) the collector potential is more than the emitter and base potential
(*c*) the base potential is more than the collector and emitter potential
(*d*) the base, emitter, and collector are all at essentially the same potential

**113.** Transistors are seldom used as switching devices because
(*a*) use of transistors as switching device is not economic
(*b*) they can handle high voltage but not high current
(*c*) they are slow to respond and unable to withstand high voltage
(*d*) they need separate circuitry when used as switching devices

**114.** Which of the following multivibrators is called the flip-flop?
(*a*) Astable multivibrator (*b*) Monostable multivibrator
(*c*) Bistable multivibrator (*d*) (*a*) or (*b*)

**115.** External triggering is not needed for the transition of state in the
(*a*) bistable multivibrator (*b*) monostable multivibrator
(*c*) astable multivibrator (*d*) (*b*) and (*c*) both

**116.** The term "free running" is associated with
(*a*) bistable multivibrators (*b*) monostable multivibrators
(*c*) astable multivibrators (*d*) (*b*) or (*c*)

**117.** Astable multivibrators cannot be used for frequency division.
(*a*) true (*b*) false

**118.** A blocking oscillator can perform many of the same functions as multivibrators and can be
(*a*) an astable multivibrator
(*b*) a monostable multivibrator
(*c*) a bistable multivibrator
(*d*) (*a*) or (*b*)

**119.** A 10 volts rectangular pulse with a 1 m-sec pulse is applied at time $t_o$ to a series *RC* circuit shown below with $R$ = 100 kilo-ohms and $C$ = 1000 pF; what will be the voltage across $R$ at $t = t_o$?
(*a*) 10 volts
(*b*) 5 volts
(*c*) 7.5 volts
(*d*) 2.5 volts

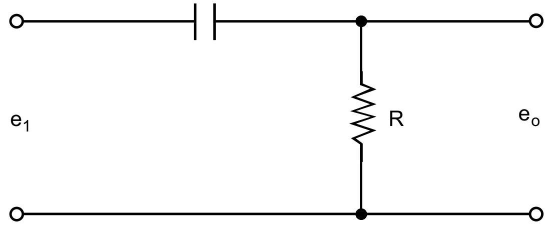


**Fig. Q. 119.**

**120.** A 100 volts peak to peak sine wave is applied to the circuit shown below. $Z_1$ is a 30 volts Zener-diode. The output voltage is 55 volts peak to peak. What will be the breakdown voltage of $Z_2$?

(*a*) 100 volts (*b*) 155 volts

(*c*) 30 volts (*d*) 25 volts

(*e*) 85 volts

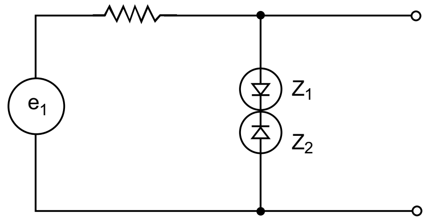


**Fig. Q. 120.**

**121.** For a carbon-composition resistor color-coded with yellow, violet, orange, and silver strips from left to right, the resistance with tolerance is

(*a*) 740 ohms ± 5% (*b*) 4700 ohms ± 10%

(*c*) 7400 ohms ± 1% (*d*) 47,000 ohms ± 10%

**122.** With input frequencies from zero up to 16 kHz, a high pass filter allows the maximum voltage to be developed across the load resistance for which of the following frequencies?

(*a*) Direct current (*b*) 16 Hz

(*c*) 160 Hz (*d*) 16,000 Hz

**123.** With input frequencies from zero up to 16 kHz, a low pass filter allows the most output voltage to be developed across the load resistance for which of the following frequencies?

(*a*) Direct current (*b*) 160 Hz

(*c*) 16 Hz (*d*) 16,000 Hz

**124.** An *R-C* coupled circuit is a high pass filter for pulsating D.C. voltage because

(*a*) *C* has high reactance for high-voltages

(*b*) *C* blocks D.C. voltages

(*c*) *C* has low reactance for low voltages

(*d*) none of the above

**125.** A transformer with isolated secondary winding is considered a high pass filter for pulsating direct primary current because

(*a*) the D.C. primary current has no magnetic field

(*b*) the working component of primary current has the strongest field

(*c*) the secondary voltage is maximum for direct current in the primary

(*d*) only variations in the primary current can induce secondary voltage

**126.** Which of the following statements is true?

($a$) $L$-type filter with series $C$ and shunt $L$ is low pass filter

($b$) $\pi$-type filter with series $C$ and shunt $L$ is low pass filter

($c$) $T$-type filter with series $C$ and shunt $L$ is low pass filter

($d$) $L$-type filter with series $C$ and shunt $C$ is low pass filter

**127.** With input frequencies from zero to 100 kHz, for which of the following frequencies is output voltage developed as a bandpass filter for audio frequencies cut off at 20 Hz at the low and 20 kHz at the high end?

($a$) Zero to 20 Hz ($b$) 20 cps to 20 kHz

($c$) Zero 20 kHz ($d$) 20 cps to 100 kHz

**128.** A power-line filter for rejecting of interference has

($a$) R.F. coupling capacitor in series with the power line

($b$) 50 Hz chokes in series with the power line

($c$) R.F. capacitors in shunt across the power line

($d$) R.F. chokes in shunt across the power line

**129.** Which of the following $L$-type filters is the best band stop filter?

($a$) Parallel resonant $L$-$C$ circuits in series and in parallel with the load

($b$) Series resonant $L$-$C$ circuits in series and in parallel with the load

($c$) Series resonant $L$-$C$ circuits in series with the load and parallel resonant $L$-$C$ circuit in shunt

($d$) Parallel resonant $L$-$C$ circuits in series with the load and parallel resonant $L$-$C$ circuit in shunt

**130.** The plate current in a triode, tetrode or pentode will increase if the

($a$) control grid is made more negative

($b$) plate voltage is made less negative

($c$) control grid voltage is made less negative

($d$) screen grid voltage is made less negative

**131.** The screen grid in a pentode is used to

($a$) make the plate current more dependent on plate voltage

($b$) have the same potential as cathode

($c$) decrease the grid-plate capacitance as compared with triode

($d$) eliminate the problem of secondary emission from the plate

**132.** The suppression grid in the pentode is used to eliminate the problem of secondary emission.

(*a*) true (*b*) false

**133.** In the half-wave rectifier diode conducts when the

(*a*) A.C. input voltage is at its average value of zero

(*b*) anode is made positive by positive alteration of the A.C. input voltage

(*c*) plate is made negative by negative alteration of the A.C. input voltage

(*d*) cathode is made positive

**134.** With an indirectly heated cathode in the tube, the heater voltage

(*a*) is applied to the cathode

(*b*) is separate from the cathode circuit

(*c*) must be steady voltage

(*d*) is equal to the capacitor bias voltage

**135.** The transistor has no heater and hence it presents

(*a*) high power rating up to 10 kW

(*b*) long warm up time in amplifier circuit

(*c*) no hum from heater cathode leakage

(*d*) short service life because of solid construction

**136.** When germanium is doped with a controlled amount of impurity

(*a*) *p*-type semiconductor with excess holes is produced by doping with arsenic

(*b*) *n*-type semiconductor with excess electrons is produced by doping with arsenic

(*c*) *n*-type semiconductor with excess electrons is produced by doping with indium

(*d*) *n*-type semiconductor with excess holes is produced by doping with arsenic

**137.** The hole current is the movement of

(*a*) positive charges in the opposite direction from electron current

(*b*) positive charges in the same direction as electron current

(*c*) neutral charges in the opposite direction from electron current

(*d*) negative charges in the opposite direction from electron current

**138.** The barrier voltage at a *p-n* or *p-n* junction is approximately

(*a*) 5 volts aiding forward current

(*b*) 0.2 volts opposing forward current

(*c*) 2.5 volts opposing forward current

(*d*) 2.5 volts opposing reverse current

**139.** The collector circuit in a transistor amplifier circuit is

(*a*) forward bias at all times

(*b*) reverse bias for *p-n-p* and forward bias for *n-p-n* transistor

(*c*) reverse bias at all times

(*d*) reverse bias for *n-p-n* forward bias for *p-n-p* transistor

**140.** Which of the following circuits is mostly used as an amplifier?

(*a*) Common base circuit because it has high voltage gain

(*b*) Common emitter circuit because it has high voltage and current gain

(*c*) Common collector circuit because it has high gain

(*d*) Common emitter circuit is of a little use because it has extremely low input resistance

**141.** The arrow in the symbol for a transistor indicates the direction of

(*a*) hole current in the collector

(*b*) electron current in the emitter

(*c*) hole current in the emitter

(*d*) electron current in the collector

**142.** When a change in base current from 40 to 50 mA changes the collector current from 600 to 1000 mA, the β factor of this power transistor equals

(*a*) 800 (*b*) 400

(*c*) 3 (*d*) 40

**143.** A heat sink is often used with transistors and semiconductor diodes to

(*a*) increase the forward current

(*b*) increase the reverse current

(*c*) prevent excessive temperature rise

(*d*) compensate for excessive doping

**144.** The skin effect will produce the least losses with R.F. current flowing in a

(*a*) square thin wire
(*b*) round thin wire
(*c*) hollow tubular conductor of large diameter
(*d*) long thin wire

**145.** Which of the following is the best bypass for a 1 MΩ resistor at 50 MHz?

(*a*) 100 μμF ceramic capacitor
(*b*) 1 μF paper capacitor
(*c*) 1 μF electrolyte capacitor
(*d*) 40 μF electrolyte capacitor

**146.** For an R.F. electromagnetic field the best shield is a

(*a*) iron enclosure
(*b*) Faraday screen
(*c*) permalloy
(*d*) copper or aluminium enclosure

**147.** The current through an external plate load resistor is the same as the internal electron flow in a tube to the plate.

(*a*) true (*b*) false

**148.** The emitter is always forward biased while the collector has the reverse bias in the transistor.

(*a*) true (*b*) false

**149.** The input characteristic of the transistors is the ratio of the collector current to the base current.

(*a*) true (*b*) false

**150.** The + mark on the silicon diode power rectifier indicates where positive D.C. output voltage is obtained.

(*a*) true (*b*) false

**151.** The "slide rule" is said to be a

(*a*) analog computer
(*b*) digital computer
(*c*) hybrid computer
(*d*) tele-type machine

**152.** The series combination of resistance and capacitance is put across the thyristor to protect it from

(*a*) high current
(*b*) high voltage
(*c*) high rate of change of voltage
(*d*) high rate of change of current
(*e*) thermal runaway

**153.** A radar measures distance by measuring the

(*a*) voltage amplitude of the transmitted R.F. pulses
(*b*) voltage amplitude of an echo
(*c*) time between transmitted R.F. pulses
(*d*) time between its R.F. pulse and its echo

**154.** Inductors are not common in ICs.

(*a*) true (*b*) false

**155.** $SiO_2$ is a conductor.

(*a*) true (*b*) false

**156.** In semiconductor ICs a resistance is made when the base of the transistor is made.

(*a*) true (*b*) false

**157.** In semiconductor ICs a diode is like a capacitor.

(*a*) true (*b*) false

**158.** It is easy to make *n-p-n* and *p-n-p* transistors on the same chip.

(*a*) true (*b*) false

**159.** Hybrid ICs are generally cheaper than other types of ICs.

(*a*) true (*b*) false

**160.** In triggering a triac with a gate pulse, a low current has a long turn-on time and a high current a short turn-on time.

(*a*) true (*b*) false

**161.** A 4-volt change in control grid voltage is equal to a 4-volt change in plate voltage on the amount of electrons reaching plate.

(*a*) true (*b*) false

**162.** All electron-emitting materials are placed on the filaments.

(*a*) true (*b*) false

**163.** An increase in the grid bias of a thyratron will require an increase in anode voltage to make it conduct.

(*a*) true (*b*) false

**164.** What is the distance between crests of a radio wave whose frequency is $3 \times 108$ Hz?

(*a*) 1 m/cycle (*b*) 1 cm/cycle

(*c*) 40 cm/cycle (*d*) 10 cm/cycle

**165.** Phototubes are relatively high resistance devices even when they conduct.

(*a*) true (*b*) false

**166.** The reverse bias in semiconducting devices will

(*a*) increase the potential barrier

(*b*) decrease the potential barrier

(*c*) not affect the potential barrier

(*d*) make the potential barrier zero

**167.** Bipolar transistors have larger voltage gain than JFET for a given supply voltage.

(*a*) true (*b*) false

**168.** MOSFET is

(*a*) a current-driven device

(*b*) a voltage-driven device

(*c*) a low input impedance device

(*d*) an inefficient switching device

(*e*) a power-driven device

**169.** MOSFETs essentially require a dual polarity power supply to turn them ON and OFF.

(*a*) true (*b*) false

**170.** The typical value of leakage current for a MOSFET is

(*a*) $10^{-14}$ A (*b*) $10^{-4}$ A

(*c*) $10^{-10}$ A (*d*) $10^{-12}$ A

**171.** MOSFETs are suitably used where source resistance ranges from

(*a*) a few ohms to 1000 ohms (*b*) 10 to 100 MΩ

(*c*) 100 MΩ and above (*d*) milliohms to a few ohms

**172.** Which of the following devices is the best for improving switching speeds of bipolar transistors?

(*a*) Speed-up capacitor

(*b*) Transistor with higher cut-off frequency

(*c*) Clamping diode

(*d*) Clamping diode with zero storage time

**173.** Which of the following makes an active circuit?

(*a*) Inductor (*b*) Resistor

(*c*) Field effect transistor (*d*) Bipolar transistor

(*e*) (*c*) and (*b*) both (*f*) Capacitor

**174.** Which of the following displays has minimum power consumption?

(*a*) Light emitting diode (LED)

(*b*) Liquid crystal display (LCD)

(*c*) Nixie tubes

(*d*) Fluorescent

**175.** Which of the following displays has slowest switching speed?

(*a*) LEDs (*b*) LCD

(*c*) Nixie tubes (*d*) Fluorescent

**176.** A transistor is a faster switching device than a silicon-controlled rectifier of same capacity.

(*a*) true (*b*) false

**177.** For the operation of FET with TTL logic, the threshold voltage of FET shall be

(*a*) 4 V (*b*) –12 V

(*c*) –4 V (*d*) 2.2 V

**178.** An operational amplifier shall have zero voltage output for zero input voltage.

(*a*) true (*b*) false

**179.** The output offset of an operational amplifier is attributed to
(*a*) an input-voltage offset
(*b*) an input current offset
(*c*) either (*a*) or (*b*)
(*d*) (*a*) and (*b*) both

**180.** Offset voltages of an amplifier are dependent on circuit gain.
(*a*) true
(*b*) false

**181.** The conduction in JFET is always by the
(*a*) majority carriers
(*b*) minority carriers
(*c*) holes
(*d*) electrons
(*e*) holes and electrons simultaneously

**182.** Which of the following can be used as an adjustable temperature coefficient device?
(*a*) Zener diode
(*b*) Gas filled tubes
(*c*) JFET
(*d*) *P-N-P* transistor

**183.** The "pinch off" voltage of a JFET can range from
(*a*) 4 to 8 V
(*b*) –4 to –8 V
(*c*) 0.4 to –0.8 V
(*d*) –0.4 to –8 V
(*e*) 0.4 to 8 V

**184.** A multiplexer is an electronic device which is used for
(*a*) multiplication of two or more quantities
(*b*) superimposition of two or more electrical signals of different frequencies for their parallel transmission through one channel
(*c*) scanning of analog or digital inputs on "Time-Sharing" basis
(*d*) (*b*) and (*c*) both

**185.** MOSFETs are not suitable for low voltage switching.
(*a*) true
(*b*) false

**186.** Enumerate five special features of MOSFETs
(*i*) fast switching
(*ii*) low drive current
(*iii*) no second breakdown
(*iv*) ease of paralleling
(*v*) excellent temperature stability

**187.** What is the critical range of conduction-angle control of a thyristor outside which the conduction-angles have very little effect on the percentage of applied power to the load?

(*a*) 30° to 90° (*b*) 0° to 90°
(*c*) 40° to 140° (*d*) 0° to 180°
(*e*) none of the above

**188.** If an SCR is manufactured for a maximum junction temperature of 130°C, ambient temperature of 85°C and thermal resistance (from junction to ambient) of 1.5°C per watt, what will be the maximum internal power dissipation?

(*a*) 30 watts (*b*) 60 watts
(*c*) 175 milliwatts (*d*) 300 milliwatts

**189.** An SCR cannot be brought in conduction state without gate current.

(*a*) true (*b*) false

**190.** The disease "sleeping sickness" is observed in

(*a*) junction transistors (*b*) coated cathodes valves
(*c*) (*a*) and (*b*) both (*d*) integrated circuits

**191.** If the diagonal measure of a television screen in 50 cm, what will be the width of the screen as per American Standard?

(*a*) 30 cm (*b*) 40 cm
(*c*) 50 cm (*d*) 35 cm

**192.** Which of the following diodes has almost zero minority carrier storage time?

(*a*) Rectifier (*b*) Schottky
(*c*) PIN (*d*) Zener
(*e*) Tunnel

**193.** A Schottky diode essentially consists of a

(*a*) *p*-*n* junction
(*b*) metal-to-semiconductor junction
(*c*) *p* and *n* regions separated by an intrinsic region
(*d*) *p*-*n* junction with every heavy dropping

**194.** A Schottky diode is a majority carrier device.

(*a*) true (*b*) false

**195.** The UJT often reduces the number of components necessary to perform a given function to less than half that required if bipolar transistors are used.

(*a*) true (*b*) false

**196.** In which of the following devices are the base resistors not added in the package but added externally?

(*a*) UJT (*b*) CUJT

(*c*) PUT (*d*) None of the above

**197.** Diodes are somewhat analogous to

(*a*) toggle switches (*b*) relays

(*c*) circuit breakers (*d*) fuses

**198.** Transistors are analogous to

(*a*) toggle switches (*b*) relays

(*c*) circuit breakers (*d*) fuses

**199.** Oscillator circuits with only D.C. power sources can produce

(*a*) A.C. wave only (*b*) square wave only

(*c*) sawtooth wave only (*d*) any of the above

**200.** With no voltage applied between the gate and source electrodes in MOSFETs, the impedance between the drain and source terminals is very low.

(*a*) true (*b*) false

**201.** Thermionic Integrated Micro-Module (TIMM) is the trade name for

(*a*) vacuum diodes (*b*) vacuum tubes

(*c*) vacuum diodes and tubes with no heaters

(*d*) triodes (*e*) pentodes

**202.** The forward resistance of thermionic diodes is

(*a*) zero (*b*) very small

(*c*) in the range of 100 to 1000 ohms (*d*) very large

**203.** The interelectrode capacitance of a thermionic diode is

(*a*) small (*b*) zero

(*c*) of the order of 5 pf (*d*) very large

**204.** The plate characteristics of a triode plotted with positive and negative grid voltages will have

(*a*) the same slopes

(*b*) completely different slopes

(*c*) almost the same slopes

(*d*) positive and negative slopes respectively

**205.** The reciprocal of slope of plate characteristics of the triode will generate

(*a*) plate resistance

(*b*) amplification factor

(*c*) mutual conductance of triode

(*d*) penetration factor

**206.** The plate-grid capacitance in a triode is

(*a*) less than that of a tetrode

(*b*) more than that of a tetrode

(*c*) equal to that of a tetrode

(*d*) zero

**207.** In a cathode follower the voltage drop across the cathode is

(*a*) positive

(*b*) negative

(*c*) zero

(*d*) none of the above

**208.** The "grid base" of a tube is

(*a*) dependent on the peak voltage of the plate

(*b*) independent of the peak voltage of the plate

(*c*) dependent on the cathode voltage

(*d*) none of the above

**209.** A triode tube has an amplification factor 8 and is operated at a plate voltage of 240 volts. What grid potential is required to reduce the plate current to zero?

(*a*) 30 volts (*b*) –30 volts

(*c*) 5 volts (*d*) –5 volts

(*e*) –15 volts

**210.** The following circuit will behave as a

(*a*) triode with high amplification factor

(*b*) triode with medium amplification factor

(*c*) tetrode with high amplification factor

(*d*) tetrode with medium amplification factor

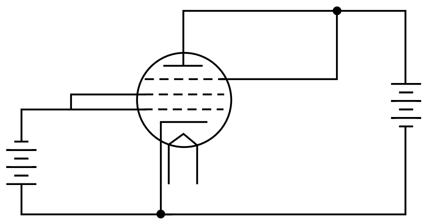

**Fig. Q. 210.**

**211.** The materials whose electrical conductivity is usually less than $1 \times 10^6$ mho/m are

(*a*) semiconductors (*b*) conductors

(*c*) insulators (*d*) alloys

**212.** The Hall Coefficient for *p*-type semiconductors is

(*a*) negative only (*b*) positive only

(*c*) either positive or negative (*d*) not applicable

**213.** The Hall Coefficient will be zero for a

(*a*) insulator

(*b*) *n*-type semiconductor

(*c*) conductor

(*d*) *p*-type semiconductor

**214.** Fermi Level is the energy where the probability of a state occupied in conduction and valance band is

(*a*) 0.1 (*b*) 0.5

(*c*) 1.0 (*d*) 0.33

**215.** The average energy of an electron in the conduction band of a metal at 0°K as a function of Fermi Level ($E_F$) will be

(*a*) 1/5 $E_F$ (*b*) 2/5 $E_F$

(*c*) 3/5 $E_F$ (*d*) 4/5 $E_F$

**216.** The thickness of the depletion region in a semiconductor diode is of the order of

(*a*) $1 \times 10^{-4}$ micron
(*b*) $1 \times 10^{-6}$ micron
(*c*) 1 micron
(*d*) $1 \times 10^{-6}$ cm

**217.** In certain semiconductors including transistors, the electrons pass freely in both directions between semiconductor and terminals with expenditure of little or no energy. When this happens, transition is called

(*a*) ohmic
(*b*) non-rectifying
(*c*) either (*a*) or (*b*)
(*d*) rectifying

**218.** Which of the following transistor configurations will give both current and voltage gain?

(*a*) Common emitter
(*b*) Common collector
(*c*) Common case
(*d*) None of the above

**219.** Why are *n-p-n* transistors preferred over *p-n-p* transistors?

(*a*) *n-p-n* transistors have low heat dissipation
(*b*) *n-p-n* transistors are cheap and easily available
(*c*) *n-p-n* transistors have high mobility of holes
(*d*) *n-p-n* transistors have higher mobility of electrons than holes in *p-n-p* transistors

**220.** How many valence electrons will there be in the atoms of elements of the 4th group (column) in the periodic table?

(*a*) 2
(*b*) 3
(*c*) 4
(*d*) 6

**221.** Where is the largest mass of an atom?

(*a*) In the protons
(*b*) In the electrons
(*c*) In the neutrons
(*d*) In the atomic nucleus which contains protons and neutrons

**222.** How many similar and dissimilar atoms can be combined in the molecule of a substance?

(*a*) Only two atoms
(*b*) Only one atom
(*c*) Only four atoms
(*d*) Any number of atoms

**223.** Which of the following statements is true when atoms are electrically neutral?

(*a*) The number of electrons is equal to protons

(*b*) The number of electrons is less than protons

(*c*) The number of electrons is more than protons

(*d*) The number of protons is equal to neutrons

**224.** In which shells do electrons have more accommodating space?

(*a*) In the shells closer to the atomic nucleus

(*b*) In the outer shell

(*c*) In any position of the shells

(*d*) None of them

**225.** If pairs of electrons are shared by adjacent atoms in a covalent bond, the atoms

(*a*) remain neutral

(*b*) become electrically charged

(*c*) become negatively charged

(*d*) become positively charged

**226.** Which of the following statements is correct?

(*a*) Inner electrons are always present in the semiconductor

(*b*) Bound electrons are always present in the semiconductor

(*c*) Free electrons are always present in the semiconductor

(*d*) Inner and bound electrons are always present in the semiconductor

**227.** Intrinsic semiconductors have

(*a*) more electrons than holes (*b*) more protons than holes

(*c*) more holes than electrons (*d*) electrons equal holes

**228.** Why are the valence electrons specifically important in semiconductors?

(*a*) Because they are negatively charged

(*b*) Because they can contribute to current flow in certain situations

(*c*) Because they can produce bonds with other atoms

(*d*) Because they make covalent bonds

**229.** Which electrons are important in holding the atoms in a crystal together?
(*a*) The inner electrons of the atoms
(*b*) The valence electrons that are in outer shells of atoms
(*c*) (*a*) and (*b*) both
(*d*) All the electrons irrespective of location

**230.** The reciprocal of slope of a line joining the operating point to the origin in the volt-ampere characteristics curve of a diode is defined as
(*a*) dynamic resistance of diode
(*b*) static resistance of diode
(*c*) (*a*) and (*b*) both
(*d*) reverse resistance

**231.** Which of the following resistances is important in the case of diodes?
(*a*) Dynamic resistance
(*b*) Static resistance
(*c*) Reverse resistance
(*d*) None of the above

**232.** If the reverse voltage in a diode is increased, the barrier capacitance would
(*a*) increase
(*b*) decrease
(*c*) remain constant
(*d*) increase proportional to applied voltage

**233.** The diode used for voltage regulating purposes below 2 V is usually chosen to conduct
(*a*) in forward direction
(*b*) in reverse direction
(*c*) in either forward or reverse direction
(*d*) in both directions depending on the polarity of applied voltage

**234.** Which of the following combinations will be chosen to use the diodes for higher voltage rating?
(*a*) The diodes shall be connected in series
(*b*) The diodes shall be connected in parallel
(*c*) Some diodes in series and a few in parallel
(*d*) Such combinations are not possible and only a single diode shall be used of the rated voltage

**235.** Diodes manufactured specially for voltage tuning of LC resonant circuits are called

(*a*) tunnel diodes
(*b*) Zener diodes
(*c*) varactors
(*d*) varicaps
(*e*) voltacaps
(*f*) (*c*) or (*d*) or (*e*)

**236.** The degree of doping in a semiconductor material is commonly expressed in terms of

(*a*) drift
(*b*) diffusion
(*c*) conductivity
(*d*) resistivity
(*e*) conductivity or resistivity

**237.** Which of the following assumptions is taken into consideration if the transistor alpha is defined as the product of the transport factor and emitter efficiency?

(*a*) Collector multiplication ratio is zero
(*b*) Collector multiplication ratio is positive
(*c*) Collector multiplication ratio is negative
(*d*) Collector multiplication ratio is unity

**238.** A transistor can provide

(*a*) current amplification
(*b*) voltage amplification
(*c*) power amplification
(*d*) current, voltage and power amplification

**239.** Which of the following conditions must be satisfied to operate a *p*-*n*-*p* transistor in an active region?

(*a*) The collector and the emitter junctions are biased in the forward direction
(*b*) The collector junction is biased in the forward direction and the emitter junction is biased in reverse direction
(*c*) The collector junction is biased in reverse direction and emitter junction is biased in forward direction
(*d*) The collector and emitter junctions are biased in reverse direction

**240.** If a transistor is used as an amplifier without appreciable distortion with common configuration, it should be restricted to operate in a

(*a*) cut-off region

(*b*) action region

(*c*) saturation region

(*d*) any of the above

**241.** Which of the following statements is true?

(*a*) The saturation voltage $V_{CF}$ of a silicon transistor is more than a germanium transistor

(*b*) The saturation voltage $V_{CE}$ for a germanium transistor is more than a silicon transistor

(*c*) The saturation voltage $V_{CE}$ for a silicon transistor is same as that for a germanium transistor

(*d*) The saturation voltage $V_{CE}$ for a silicon transistor is lower than a germanium transistor

**242.** If the D.C. current gain of a transistor is given, can it be decided how much input base current will be required to saturate the transistor?

(*a*) Yes (*b*) No

**243.** The equation $hfe = \dfrac{hFe}{1-(I_{CBO}+I_B)\dfrac{\partial hFE}{\partial I_C}}$ is valid

(*a*) in the saturation region of the transistor

(*b*) in the cut-off region of the transistor

(*c*) in the active region of the transistor

(*d*) in any of the above regions of the transistor

**244.** The stability factor of a transistor in an active region is

(*a*) very small

(*b*) very high

(*c*) usually less than unity

(*d*) always greater than one

**245.** Germanium transistors are seldom used above

(*a*) 60°C temperature (*b*) 75°C temperature

(*c*) 175°C temperature (*d*) 125°C temperature

**246.** Power dissipation at the collector junction causes an increase in collector current and subsequent increase in power dissipation at the junction. This phenomenon is known as

(*a*) thermal gradient
(*b*) thermal instability
(*c*) thermal runaway
(*d*) thermal dissipation
(*e*) thermal coefficient
(*f*) thermal stability

**247.** Amplifiers are invariably described based on the

(*a*) frequency range
(*b*) method of operation
(*c*) ultimate use
(*d*) type of load
(*e*) all the above

**248.** In which of the following amplifiers is the output signal zero for less than half a cycle if input signal voltage is sinusoidal?

(*a*) Class A
(*b*) Class B
(*c*) Class AB
(*d*) Class C

**249.** The application of a sinusoidal signal to the input of an ideal Class A amplifier will result in a sinusoidal output wave.

(*a*) true
(*b*) false

**250.** In the high frequency region, *i.e.,* above midband, an amplifier state may behave like a

(*a*) low-pass filter
(*b*) high-pass filter
(*c*) current amplifier
(*d*) power amplifier

**251.** If a 50 Hz square wave is applied to amplifier circuit and output is desired with less than 10% tilt, then lower 3 dB frequency must not exceed

(*a*) 2 Hz
(*b*) 1.6 Hz
(*c*) 1.6 kHz
(*d*) 1 Hz

**252.** If the amplitude response is plotted on log-log paper for a five-stage amplifier, what will be the slope of plotted straight line?

(*a*) 30 dB per octave
(*b*) 6 dB per octave
(*c*) 100 dB per decade
(*d*) (*a*) or (*c*)
(*e*) 10 dB per decade

**253.** The Johnson noise in amplifiers is

(*a*) electrical noise
(*b*) thermal noise
(*c*) vibrational noise
(*d*) frequency noise

**254.** The noise for which the frequency spectrum is flat, *i.e.*, a distribution which gives the same noise per unit, the bandwidth of the amplifier anywhere in frequency spectrum is called

(*a*) blue noise (*b*) white noise
(*c*) red noise (*d*) black noise

**255.** The noise in the amplifier which varies approximately as reciprocal to frequency at low frequencies is called

(*a*) shot noise (*b*) white noise
(*c*) flicker noise (*d*) excess noise

**256.** White noise in the transistor amplifier is caused by

(*a*) thermal agitation
(*b*) recombination of holes and electrons
(*c*) bulk resistance of semiconductor material and fluctuation of currents
(*d*) frequency variations

**257.** An ideal voltage amplifier must have

(*a*) infinite input resistance and zero output resistance
(*b*) zero input resistance and infinite output resistance
(*c*) same input and output resistance
(*d*) none of the above

**258.** A voltage amplifier provides output voltage proportional to the input voltage and the proportionality factor is independent of magnitude of source and load resistances.

(*a*) true (*b*) false

**259.** An ideal amplifier whose output current is proportional to the input voltage is called

(*a*) voltage amplifier
(*b*) current amplifier
(*c*) transconductance amplifier
(*d*) transresistance amplifier

**260.** If a transfer gain of the amplifier with feedback signal is more than the transfer gain without feedback, the amplifier has

(*a*) negative feedback (*b*) positive feedback
(*c*) positive feedforward (*d*) negative feedforward

**261.** If the feedback block does not contain reactive elements, the overall gain of the amplifier is

(*a*) independent of frequency

(*b*) dependent on frequency

(*c*) independent of phase distortion

(*d*) none of the above

**262.** Negative feedback in amplifiers in which feedback signal is returned to the input voltage in shunt with the applied signal

(*a*) increases input resistance of the amplifiers

(*b*) decreases input resistance of the amplifiers

(*c*) does not change the input resistance of the amplifiers

(*d*) decreases output resistance of the amplifiers

(*e*) (*b*) and (*d*) both

**263.** The current-shunt negative feedback

(*a*) increases the input resistance of the amplifier

(*b*) decreases the input resistance of the amplifier

(*c*) does not change the input resistance of the amplifier

(*d*) increases the output resistance of the amplifier

**264.** For which of the following amplifiers does the negative feedback introduced increase the bandwidth?

(*a*) Voltage amplifier

(*b*) Current amplifier

(*c*) Transconductance amplifier

(*d*) Transresistance amplifier

(*e*) All of the above

**265.** The hum in an electronic tube audio amplifier may be caused by the interference of

(*a*) power frequency voltage (*b*) power frequency currents

(*c*) power frequency fields (*d*) (*a*), (*b*), and (*c*)

**266.** For a Class A push-pull amplifier, the output transformer will give the correct impedance match to the load with a simple output tube when one half of the center tapped winding is used as primary.

(*a*) true (*b*) false

**267.** If a small inductance is connected in series with resistance in a resistance coupled amplifier, how does inductance change the characteristic of the amplifier?

(*a*) The inductance will lower down the amplification at high frequencies

(*b*) The inductance tends to correct for the falling off in amplification that otherwise occurs at higher frequencies

(*c*) The inductance decreases the load impedance of the plate and hence the gain is at high frequencies

(*d*) The inductance increases plate load impedance at high frequencies and hence prevents the gain increase

**268.** If the overshoot of the individual stage of a multistage video amplifier is 5 to 10%, then the overshoot of the overall system is approximately

(*a*) proportional to the square root of the number of stages of the amplifier

(*b*) proportional to the number of stages of the video amplifier

(*c*) inversely proportional to the number of stages of the video amplifier

(*d*) 5 to 10% of the number of stages of the video amplifier

**269.** In a multistage video amplifier, when the sag is small to moderate, one can calculate the sag introduced by each individual part of the amplifier although no other sources of sag existed, and then add these individual sags arithmetically to obtain the total sag.

(*a*) true (*b*) false

**270.** If an amplifier is made of pentode, which of the following parameters will produce sag in the output amplifier?

(*a*) Grid leak-capacitor combination (*b*) Screen impedance

(*c*) Bias impedance (*d*) All the above

**271.** If the plate resistance of a triode cathode follower amplifier is very small and the amplification factor is 9, what will be the approximate voltage gain of the amplifier?

(*a*) 9 (*b*) 10

(*c*) 0.9 (*d*) 1

**272.** Which of the following transistor amplifiers has a voltage gain of less than unity?

(*a*) Common emitter amplifier (*b*) Common collector amplifier

(*c*) Common base amplifier (*d*) Cathode follower

**273.** A common base amplifier has
(*a*) voltage gain of less than unity but current gain more than unity
(*b*) voltage gain of more than unity but current gain less than unity
(*c*) voltage and current gains of more than unity
(*d*) voltage and current gains of less than unity

**274.** A common collector amplifier has
(*a*) high input resistance and low output resistance
(*b*) low input resistance and high output resistance
(*c*) high input and output resistances
(*d*) low input and output resistances

**275.** Which of the following configurations is equivalent to a grounded-grid amplifier?
(*a*) Common collector (*b*) Common emitter
(*c*) Common base (*d*) Cathode follower

**276.** Which of the following amplifiers will be preferred for pH meters?
(*a*) RC coupled amplifier (*b*) D.C. coupled amplifier
(*c*) Electrometer amplifier (*d*) Cathode follower

**277.** An operational amplifier is used to sum up the signals. Operational feedback is required while summing up the
(*a*) current signals (*b*) voltage signals
(*c*) potential signals (*d*) power signals

**278.** The bypass capacitor used in a self-biased amplifier must have
(*a*) very high capacitance
(*b*) very low capacitance
(*c*) low capacitance for low frequency signal
(*d*) low capacitance for high frequency signal

**279.** The natural vibration frequency of a crystal in a crystal oscillator depends on
(*a*) its cut and size (*b*) its weight
(*c*) its position in the circuit (*d*) its supply voltage

**280.** The ripple factor of a half wave rectifier is
(*a*) 1.57 (*b*) 1.11
(*c*) 1.21 (*d*) 0.482

**281.** What will happen if an inductor is connected in series with load resistance of the full wave rectifier?

(*a*) The ripple factor of the rectifier circuit will be more than that of the circuit without inductance

(*b*) The ripple factor of the rectifier circuit will be less than that of the circuit without inductance

(*c*) The ripple factor will not be affected with addition of inductance

(*d*) The ripple factor is independent of inductance in the circuit

**282.** Which of the following statements is correct in the case of rectifiers employing capacitor input filters?

(*a*) The ripple in the output will be high for large loads

(*b*) The ripple in the output will be low for large loads

(*c*) The ripple in the output will be same for all loads

(*d*) The capacitor eliminates the ripple in the output

**283.** Which of the following statements is true?

(*a*) The maximum energy of electrons liberated photo-electrically from a metal surface is dependent on light intensity but independent of the frequency of the incident light

(*b*) The maximum energy of the electrons liberated photo-electrically is independent of light intensity but varies linearly with the frequency of the incident light

(*c*) The maximum energy of the electrons liberated photo-electrically is dependent on light intensity and varies linearly with the frequency of the incident light

(*d*) The maximum energy of electrons liberated photo-electrically varies non-linearly with the frequency of the incident light

**284.** The minimum frequency of light that can be used to cause photo-electric emission is called

(*a*) threshold frequency

(*b*) cut-off frequency

(*c*) cut-in frequency

(*d*) radiation frequency

**285.** The current varies almost linearly with the light flux if

(*a*) a forward-biased *p-n* junction is illuminated

(*b*) a reverse-biased *p-n* junction is illuminated

(*c*) (*a*) or (*b*)

(*d*) none of the above

**286.** The tuned circuit in an oscillator may be connected to
(*a*) the grid circuit
(*b*) the plate circuit
(*c*) (*a*) or (*b*)
(*d*) none of the above

**287.** Which of the following devices may be used for sinusoidal negative-resistance oscillators?
(*a*) Tunnel diode
(*b*) Tetrode
(*c*) Point contact transistor
(*d*) Pentode
(*e*) (*a*), (*b*), and (*c*)

**288.** In principle, the relaxation oscillator differs from the negative-resistance oscillator only in that it is not confined to a linear portion of the negative resistance region.
(*a*) true (*b*) false

**289.** Which of the following rectifiers has the best efficiency and regulation?
(*a*) Half wave rectifier
(*b*) Full wave rectifier
(*c*) Half wave, voltage doubler rectifier
(*d*) Full wave, voltage doubler rectifier

**290.** The frequencies that a video detector must handle lie between
(*a*) 30 Hz to 4.5 MHz (*b*) 30 kHz to 4.5 MHz
(*c*) 10 kHz to 9 MHz (*d*) 20 kHz to 20 MHz

**291.** A photo-electric emitter is exposed to light a 3000 Å wavelength resulting in emission of electrons. What will be the frequency of the light?
(*a*) $6 \times 10^{14}$ Hz (*b*) $3 \times 10^{15}$ Hz
(*c*) $1 \times 10^{15}$ Hz (*d*) $1 \times 10^{14}$ Hz

**292.** In practice the secondary emission rates of a photo-multiplier is of the order of
(*a*) 5 to 10 (*b*) 10 to 20
(*c*) 5 (*d*) 1 to 5

**293.** During a short period after the application of light to photo-conductive materials, the change in current due to illumination is

(*a*) proportional to incident flux

(*b*) inversely proportional to incident flux

(*c*) proportional to the square root of incident flux

(*d*) frequency of fluctuation of light flux

**294.** With fluctuating light to photo-conductive material, the A.C. current produced is proportional to the frequency of light flux.

(*a*) true (*b*) false

**295.** Which of the following configurations can be used as a constant current source?

(*a*) Common-emitter stage

(*b*) Common-collector stage

(*c*) Common-base stage

(*d*) (*a*) or (*b*)

(*e*) None of the above

**296.** Which of the following configurations has voltage gain less than unity?

(*a*) Common-collector stage

(*b*) Common-emitter stage

(*c*) Common-base stage

(*d*) All of the above

**297.** Which of the following transistor configurations is used in practice to increase overall voltage amplification?

(*a*) Common-emitter stage in cascade

(*b*) Common-collector stage in cascade

(*c*) Common-base stage in cascade

(*d*) Any of the above

**298.** The addition of the emitter resistance in common-emitter configuration of the transistor amplifier will make the voltage gain independent of all transistor parameters.

(*a*) true (*b*) false

**299.** Which of following circuits will one choose to perform the function of impedance transformation over a wide range of frequencies with voltage gain close to unity?

(*a*) Common-emitter transistor configuration

(*b*) Common-collector transistor configuration

(*c*) Common-base transistor configuration

(*d*) Any of the above

**300.** The collector resistance $R_c$ is added in the common-collector circuit of a transistor

(*a*) to protect the transistor from open circuit across $R_e$

(*b*) to protect the transistor from short circuit across $R_e$

(*c*) to protect the transistor from short circuit across $R_e$ or large input-voltage swing

(*d*) to increase input-resistance and decrease output resistance of the amplifier circuit

**301.** The value of time constant in case of differentiation is

(*a*) more than the value of time constant in case of integrator

(*b*) less than the value of time constant in case of integrator

(*c*) same as the value of time constant in case of integrator

(*d*) very high

**302.** An integrating circuit will have high value of time constant in comparison to time constant value of differentiating circuit.

(*a*) true (*b*) false

**303.** Which of the following multivibrators one will choose to convert voltage to frequency?

(*a*) Monostable multivibrator

(*b*) Astable multivibrator

(*c*) Bistable multivibrator

(*d*) Any of the above

**304.** The horizontal amplifier of a television to some extent controls

(*a*) brightness (*b*) sound

(*c*) picture (*d*) all the above

**305.** Which of the following should be selected for the best picture on a television?
(*a*) Optimum frequency of oscillator
(*b*) Optimum frequency of horizontal amplifier
(*c*) Gain of the horizontal amplifier
(*d*) Minimum frequency of oscillator

**306.** How is the performance of Amplitude Modulation transmitters affected if they have a low level of modulation?
(*a*) Transmitters will have high efficiency
(*b*) Transmitters will have low efficiency
(*c*) Transmitters will require Class B amplifier
(*d*) Transmitters will require high power

**307.** The atmosphere is most transparent to which regions of the electromagnetic spectrum
(*a*) visual and radio
(*b*) IR and UV
(*c*) microwave and gamma
(*d*) UV and microwave

**308.** The frequency of 4000 MHz to 8000 MHz corresponds to
(*a*) X band (*b*) C band
(*c*) L band (*d*) S band

**309.** The RC phase shift is commonly used for
(*a*) video frequency range
(*b*) audio frequency range
(*c*) power frequency range
(*d*) TV frequency range

**310.** Ferrite Core is commonly used in
(*a*) distribution transformers (*b*) pulse transformers
(*c*) D.C. transformers (*d*) any of the above

**311.** Which of the following configurations of transistors offers the lowest output impedance?
(*a*) Common emitter (*b*) Common collector
(*c*) Common base (*d*) Either (*a*) or (*b*)

**312.** Which of the following configurations of transistors offers the highest output impedance?

(*a*) Common emitter (*b*) Common collector

(*c*) Common base (*d*) Either (*a*) or (*b*)

**313.** Capacitor filters offer

(*a*) small ripple and small voltage at high loads

(*b*) small ripple and high voltage at low loads

(*c*) small ripple and high voltage at high loads

(*d*) high ripple and high voltage at low loads

**314.** Bridge rectifiers have

(*a*) small transformers (*b*) high peak inverse voltage

(*c*) low peak inverse voltage (*d*) (*a*) and (*c*) both

**315.** The Class C amplifier should be operated in Class AB mode to avoid cross-over distortion.

(*a*) true (*b*) false

**316.** Which amplifier suffers from cross-over distortion?

(*a*) Class AB (*b*) Class B

(*c*) Class C (*d*) (*b*) or (*c*)

**317.** A full wave rectifier may have the ripple frequency of

(*a*) A.C. supply (*b*) half of A.C. supply frequency

(*c*) double of A.C. supply frequency (*d*) thrice of A.C. supply frequency

**318.** The frequency of $f = \dfrac{1}{2\pi\sqrt{6RC}}$ is for

(*a*) an oscillator in *RC* phase shift oscillator

(*b*) Wein bridge oscillator

(*c*) Hartley oscillator

(*d*) either (*a*) or (*b*)

**319.** The frequency $f = \dfrac{1}{2\pi\sqrt{LC}}$ is for

(*a*) an oscillator in *RC* phase shift oscillator

(*b*) Wein bridge

(*c*) Hartley oscillator

(*d*) either (*a*) or (*b*)

**320.** The frequency $f = \dfrac{1}{2\pi RC}$ is for

(*a*) an oscillator in *RC* phase shift oscillator

(*b*) Wein bridge oscillator

(*c*) Hartley oscillator

(*d*) either (*a*) or (*b*)

**321.** If the input resistance of a transistor amplifier is increased, the power gain is reduced.

(*a*) true (*b*) false

**322.** A phase shift oscillator will comprise

(*a*) *RC* elements

(*b*) *LC* elements

(*c*) *RL* elements

(*d*) *RLC* elements

**323.** What is the approximate distance from Earth at which the ionosphere starts?

(*a*) 100 km (*b*) 10 km

(*c*) 1000 km (*d*) 80 km

**324.** Which of the following statements is correct?

(*a*) TV systems use amplitude modulation

(*b*) TV systems use frequency modulation

(*c*) TV systems use amplitude modulation for picture and frequency modulation for sound

(*d*) TV systems use frequency modulation for sound and amplitude modulation for picture

**325.** Wave guide effectively can be treated as a

(*a*) low pass filter

(*b*) medium pass filter

(*c*) high pass filter

(*d*) band pass filter

**326.** The space wave is same as the sky wave.

(*a*) true (*b*) false

**327.** The space wave represents

(*a*) energy that reaches the receiving antenna because of a bending of the wave path introduced by the ionization in the upper atmosphere

(*b*) energy that travels from the transmitting to the receiving antenna in the Earth's troposphere

(*c*) energy from the transmitting to receiving antenna which is close to the surface

(*d*) the surface wave

**328.** Several Schumann resonances are between 6 Hz and 40 Hz

(*a*) true (*b*) false

**329.** Which of the following parameters are considered in a microwave system?

(*a*) Distributed parameter (*b*) Lumped parameters

(*c*) (*a*) or (*b*) (*d*) (*a*) and (*b*) together

**330.** Which of the following wave guides will one choose where physical compactness is more concerned?

(*a*) Circular wave guide (*b*) Rectangular wave guide

(*c*) Flexible wave guide (*d*) Ridged wave guide

**331.** The attenuation of the ridged wave guide structure per unit length is greater than for the corresponding rectangular wave.

(*a*) true (*b*) false

**332.** The wave impedance for TM waves is given by

(*a*) 377 $\lambda g/\lambda$ ohms (*b*) 377 $\lambda/\lambda g$ ohms

(*c*) $377/\lambda$ ohms (*d*) $400/\lambda g$ ohms

where $\lambda$ and $\lambda g$ are free space and guide wavelengths respectively

**333.** Which of the following statements is true?

(*a*) Electromagnetic waves are refracted when they pass through the medium of constant dielectric

(*b*) Electromagnetic waves are refracted when they pass through a conducting surface

(*c*) Electromagnetic waves are refracted when they pass through a medium of different dielectric constant

(*d*) None of the above

**334.** Which wave predominates at a large distance above the Earth?
(*a*) Ground waves
(*b*) Sky waves
(*c*) Space waves
(*d*) (*a*) or (*c*)

**335.** The noise output of a frequency modulation receiver will be minimized when the receiver does not respond to the amplitude variations of the input signals.
(*a*) true (*b*) false

**336.** When a sky wave enters the ionosphere, the edge of the wave front in the region of highest electron density will advance faster than the part of the wave front encountering regions of lower electron density.
(*a*) true (*b*) false

**337.** The bending of the wave produced by the ionosphere follows
(*a*) refraction law (*b*) reflection law
(*c*) optical law (*d*) absorption law

**338.** Which of the following conditions are necessary in TV broadcasting?
(*a*) All transmitters employ same picture shape
(*b*) All transmitters employ the same procedure in scanning the scene to be transmitted
(*c*) All transmitters have the same means for synchronizing receivers
(*d*) (*a*), (*b*), and (*c*)

**339.** The standard TV picture employed in the USA has a ratio of width to height of
(*a*) 1 : 1 (*b*) 4 : 3
(*c*) 3 : 4 (*d*) 1 : 2

**340.** Pulse communication systems normally operates on
(*a*) audio frequencies
(*b*) video frequencies
(*c*) microwave frequencies
(*d*) none of above

**341.** Pulse code modulation transmission has the advantage over other types of signal transmission in that

(*a*) the signal is not corrupted by noise

(*b*) the noise does not introduce any error in the receiving signal

(*c*) the noise does not introduce any error in the signal whatsoever, provided that signal to noise ratio is such that the largest noise peaks will not be mistaken for pulses

(*d*) the transmission is faster

**342.** Synchronous pulses are needed for

(*a*) time matching (*b*) linearity

(*c*) time base (*d*) reducing noise

**343.** Synchronous pulses in TV are sent during

(*a*) blanking periods (*b*) serrations

(*c*) interlacing (*d*) vertical blanking

**344.** Field frequency irregularities in TV are minimized by

(*a*) synchropulses (*b*) blanking pulses

(*c*) equalizing pulses (*d*) pulse modulation

**345.** The interval between the beginning of the blanking pulse and beginning of the synchronizing pulses is commonly known as

(*a*) back porch (*b*) front porch

(*c*) side porch (*d*) interlace

**346.** If a TV is switched on and sound is normal but there is no brightness in the picture the trouble may be in the

(*a*) power supply

(*b*) vertical amplifier

(*c*) R.F. amplifier

(*d*) horizontal amplifier

**347.** The anode voltage for picture tubes should be of the order of

(*a*) 4 V (*b*) 10 V

(*c*) 24 V (*d*) 3.3 kV

(*e*) 12 kV

**348.** The Radar Altimeter is used to
(*a*) measure pressure
(*b*) measure the distance of an air plane from ground
(*c*) measure the distance of a hill top from ground
(*d*) measure humidity

**349.** The photosensitive surface of an image-orthicon camera tube is operated at
(*a*) positive potential
(*b*) negative potential
(*c*) either (*a*) or (*b*)
(*d*) very high positive potential

**350.** The output current of an image-orthicon tube varies
(*a*) linearly with light intensity
(*b*) exponentially with light intensity
(*c*) inversely with light intensity
(*d*) randomly with light intensity

**351.** The Vidicon Camera tube makes use of
(*a*) conducting material
(*b*) semiconducting material
(*c*) insulating material
(*d*) none of the above

**352.** If amorphous selenium is exposed to light, the resistance of this material will
(*a*) increase
(*b*) decrease
(*c*) not vary
(*d*) vary exponentially

**353.** The bridge arrangement in the transmitting antenna used for picture sound transmission is known as
(*a*) duplexer
(*b*) diplexer
(*c*) dual transmitter
(*d*) either (*a*) or (*b*)

**354.** In pulse position modulation, the average transmitter power required to make the pulses stronger than the noise is independent of the bandwidth of the system, even though the amount of noise power present is proportional to the bandwidth.
(*a*) true
(*b*) false

**355.** A practical pulse communication system operates on
(*a*) power frequencies
(*b*) radio frequencies
(*c*) ultra-high frequencies
(*d*) ultra-high or microwave frequencies

**356.** Pulse code modulation has an advantage over other methods of modulation in that
(*a*) the signal can be repeated hundreds of times and remain free of noise
(*b*) if the signal is kept above threshold value, the signal can be repeated hundreds of times and remain free of noise
(*c*) if the signal is kept below the threshold value, the signal can be repeated hundreds of times and remain free of noise
(*d*) none of the above

**357.** If pulse code modulation operates with a signal strength that is above the threshold value, the signal to noise ratio at the receiver output will be
(*a*) proportional to the bandwidth of the system
(*b*) independent of the bandwidth of the system
(*c*) inversely proportional to the bandwidth of the system
(*d*) proportional to frequency modulation

**358.** In a TV system, the transfer characteristic $r = 1$ corresponds to
(*a*) lack of picture brightness
(*b*) amplitude distortion
(*c*) a linear system free of brightness or amplitude distortion
(*d*) a linear system free of amplitude distortion

**359.** The colour picture can be obtained by appropriately combining.
(*a*) red, green, and blue colors
(*b*) red, yellow, and green colors
(*c*) red, black, and blue colors
(*d*) red, white, and black colors

**360.** The Earth's magnetic field will normally cause a radio wave that was originally plane polarized to become elliptically polarized after it has travelled some distance in the ionosphere.
(*a*) true
(*b*) false

**361.** The average velocity of the electric field of a radio wave is
(*a*) proportional to the frequency
(*b*) inversely proportional to the frequency
(*c*) analogous to the frequency
(*d*) same as light velocity

**362.** The effect of Earth's magnetic field on the paths of vibrating electrons will be greater at
(*a*) high radio frequencies
(*b*) low radio frequencies
(*c*) all radio frequencies
(*d*) any specific radio frequencies

**363.** What effect will the Earth's magnetic field have on a radio wave if the magnetic field is in the same direction as the electric field of the radio wave?
(*a*) The magnetic field will have no effect on the radio wave
(*b*) The wave will follow the elliptical path
(*c*) The waves will be distorted
(*d*) None of the above

**364.** Which of the following frequencies is known as gyro frequency?
(*a*) 1400 Hz
(*b*) 1400 kHz
(*c*) 3400 kHz
(*d*) 20 kHz

**365.** What will happen if a radio wave is passed through an ionized medium in the presence of a magnetic field?
(*a*) The polarization of the wave will be affected
(*b*) The wave will be ionized
(*c*) In addition to the polarization affect, the magnetic field will split the wave into two components
(*d*) The magnetic field will split the wave into two components

**366.** Which of the following statements is true?
(*a*) Sky wave absorption increases as the distance from transmitter to receiver increases
(*b*) Sky wave absorption decreases as the distance from transmitter to receiver decreases
(*c*) Sky wave absorption does not depend on the distance between transmitter and receiver
(*d*) Sky wave absorption is always constant

**367.** The day time skywave absorption increases down to frequencies of the order of

(*a*) 1 kHz (*b*) 1 MHz
(*c*) 100 kHz (*d*) 10 kHz

**368.** The effect of ionospheric storms is more severe where the transmission path passes near

(*a*) the Earth's surface
(*b*) the Earth's magnetic pole
(*c*) 10 km height from the Earth's surface
(*d*) 1 km height from the ionosphere

**369.** The radio waves generated by natural causes are known as

(*a*) dynamic (*b*) noise
(*c*) static (*d*) natural noise

**370.** The Rayleigh-Carson Reciprocity Theorem fails when

(*a*) the propagation of radio waves is not affected by the presence of the Earth's magnetic field
(*b*) the propagation of radio waves is affected by presence of the Earth's magnetic field
(*c*) the propagation of radio waves is very much affected by the ionosphere
(*d*) the propagation of radio waves is through an elliptical path

**371.** "The ratio of power that must be radiated by the comparison antenna to develop a field strength in the direction of maximum radiation to the power that must be radiated by the directional antenna system to obtain the same field strength in the same direction." The above statement is known as

(*a*) direct gain (*b*) directive gain
(*c*) indirect gain (*d*) power gain

**372.** Directive gain depends on

(*a*) radiated power distribution in space
(*b*) radiated power distribution in the Earth
(*c*) (*a*) and (*b*) both
(*d*) (*a*) or (*b*)

**373.** The typical gain of an amplifier for the ultra-high frequency will be

(*a*) 1 dB (*b*) –10 dB

(*c*) 40 dB (*d*) 440 dB

**374.** The performance of an amplitude modulated transmitter can be improved by introducing

(*a*) positive feedback

(*b*) negative feedback

(*c*) positive feed forward

(*d*) negative feed forward

**375.** Frequency modulated transmitters find extensive use

(*a*) at 40 MHz frequency

(*b*) below 40 MHz frequencies

(*c*) above 40 MHz frequencies

(*d*) at 40 Hz to 40 kHz frequencies

**376.** If a radar produces 1-μ sec pulses at the rate of 100 per second, what will be the duty cycle of the radar?

(*a*) 0.001 sec (*b*) 0.01 sec

(*c*) 1 sec (*d*) 0.0001 sec

(*e*) None of the above

**377.** If a radar is producing 1-μ sec pulses at the rate of 10000 per sec with peak power of 400 kW, what will be the average power?

(*a*) 500 watts (*b*) 400 watts

(*c*) 4 kW (*d*) 40 kW

**378.** Practice radar pulse lengths usually lie in the range of

(*a*) 1 to 10 μ secs (*b*) 0.1 to 10 μ secs

(*c*) 10 to 100 μ secs (*d*) 0.01 to 1 μ sec

**379.** The antenna used for both transmission and reception in a radar system is known as a

(*a*) duplexer (*b*) diplexer

(*c*) dual antenna (*d*) bi-antenna

**380.** A transponder includes a
(*a*) radar and receiver
(*b*) receiver and pulse transformer
(*c*) receiver, pulse transmitter, and antenna
(*d*) (*a*) and (*b*) both

**381.** Cd band lies between
(*a*) 2000 to 3000 MHz
(*b*) 1000 to 4000 MHz
(*c*) 5000 to 8000 MHz
(*d*) 40 to 400 MHz

**382.** The pulse transformer for a pulse liner is designed for
(*a*) preserving the shape of the phase
(*b*) handlink high power and high voltage without saturation and insulation breakdown
(*c*) (*a*) and (*b*) both
(*d*) (*a*) or (*b*)

**383.** Which of the following is used for a pulse transformer?
(*a*) Ferrite core
(*b*) Iron core
(*c*) Copper core
(*d*) None of the above

**384.** Which of the following oscillators is used for the audio frequency range?
(*a*) Blocking oscillator
(*b*) Klystron oscillator
(*c*) RC phase shift oscillator
(*d*) (*b*) or (*c*)

**385.** The instrument landing of an airborne system uses a
(*a*) glide path localizer
(*b*) master and slave stations
(*c*) hamming path
(*d*) pulse radar

**386.** The linear velocity of a satellite in a circular orbit is independent of its mass.
(*a*) true
(*b*) false

**387.** Which of the following systems uses the sampling theorem?
(*a*) Pulse code modulation
(*b*) Amplitude modulation
(*c*) Frequency modulation
(*d*) Analog system

**388.** A transmitted signal can largely be affected by noise in the
(*a*) channel
(*b*) way
(*c*) transmitter
(*d*) receiver

**389.** Frequency shift keying is mostly used in telephonic transmission.
(*a*) true (*b*) false

**390.** The audio stage in a communication receiver offers fidelity.
(*a*) true (*b*) false

**391.** The Earth acts as a dielectric at
(*a*) very high frequencies (*b*) very low frequencies
(*c*) any frequency (*d*) none of the above

**392.** The Telex can be well related to
(*a*) television communication
(*b*) telephonic communication
(*c*) radio communication
(*d*) computer communication

**393.** Frequency modulation is used extensively in the range of
(*a*) 20 to 40 MHz (*b*) 40 to 1000 MHz
(*c*) 10 to 100 MHz (*d*) 10 to 100 kHz

**394.** The antenna used with a television transmitter is normally arranged to have directivity in the vertical plane that concentrates the radiated energy along the horizon.
(*a*) true (*b*) false

**395.** The "White Clipper" associated with the final video stage is a
(*a*) positive peak clipper
(*b*) negative peak clipper
(*c*) either (*a*) or (*b*) but not both simultaneously
(*d*) (*a*) and (*b*) both

**396.** The energy loss in a cubic meter of ionosphere in the absence of magnetic fields is proportional to
(*a*) electron density
(*b*) atmospheric pressure
(*c*) the square of the wavelength of the radio wave
(*d*) the product of (*a*), (*b*), and (*c*)

**397.** The location of a high distortion region about a broadcast transmitter varies somewhat during

(*a*) night (*b*) night to night

(*c*) season to season (*d*) (*a*), (*b*), and (*c*)

**398.** The ratio of lower frequency limit to maximum usable frequency for carrying on radio communication at short wave frequencies is generally smaller at night than daytime.

(*a*) true (*b*) false

**399.** When precipitation static is serious, its intensity can be reduced by

(*a*) increasing the speed of the airplane

(*b*) lowering the speed of the airplane

(*c*) landing the airplane

(*d*) using the instrumentation landing for the airplane

**400.** Even when the antenna is underground the resistance of the nearby ground causes the antenna to possess the loss resistance.

(*a*) true (*b*) false

**401.** If two quarter-wave grounded vertical antennas are located at the same distance as two parallel half-wave antennas located remotely from ground, the mutual impedance in the latter case between antennas shall be

(*a*) one-half of the first case

(*b*) double the first case

(*c*) same as for the first case

(*d*) 4 times the first case

**402.** Detuning a parasitic radiator such that it is resonant at a higher frequency than that being radiated will cause the radiator to act as a director.

(*a*) true (*b*) false

**403.** If the individual antennas of a turnstile array are short doublet antennas, then the combined pattern is exactly circular in the plane of the turnstile.

(*a*) true (*b*) false

**404.** It is possible to achieve frequency shift keying using a plane shift modulator.

(*a*) true (*b*) false

**405.** One stage of intermediate frequency amplification ordinarily contributes more to the sensitivity of the receiver than one stage of tuned radio frequency amplification employing the same amplifier.

(*a*) true (*b*) false

**406.** The hum appearing in a loudspeaker is relatively small if the triode is replaced by a

(*a*) diode (*b*) tetrode
(*c*) beam power tube (*d*) transmitter

**407.** The intermediate frequency amplification per stage in an amplitude modulation is more than the frequency of a modulation-broadcast receiver using the same amplifier tubes.

(*a*) true (*b*) false

**408.** The suppression of the image signals in radios will be more effective if the

(*a*) ratio of intermediate to signal frequencies is lower
(*b*) ratio of intermediate to signal frequencies is higher
(*c*) ratio of intermediate to signal frequencies is constant
(*d*) signal frequencies are very low

**409.** In pulse position modulation, the amount of noise power present is proportional to the bandwidth.

(*a*) true (*b*) false

**410.** Interlacing in TV systems will not give a useful result if the eye were

(*a*) as responsive to flicker in a small area as it is to flicker in a large area
(*b*) more responsive to flicker in a large area than small area
(*c*) more responsive to flicker in a small area than large area
(*d*) not responsive to flicker at all

**411.** It is desirable to use a sine wave for scanning in a TV system instead of a sawtooth wave if the sine waves are employed at both transmitter and receiver and are carefully synchronized.

(*a*) true (*b*) false

**412.** If the vertical synchronizing blocks have a length of nearly one horizontal line and a repetition frequency equal to the line frequency, instead of half this length and twice the frequency, then the horizontal line synchronization would be interrupted during the vertical return of every other field.

(*a*) true (*b*) false

**413.** If the actual transfer characteristic of a television system is a straight line, then superimposing a constant amount of light upon the reproduced picture will cause the transfer characteristic to be curved in such a manner as to reduce the gamma for the portions of the picture that are the least bright.

(*a*) true (*b*) false

**414.** The maximum range of a radar operating at a given frequency is

(*a*) inversely proportional to the linear dimension of the antenna

(*b*) directly proportional to the linear dimension of the antenna

(*c*) independent of the dimensions of the antenna

(*d*) none of the above

**415.** Long-wave radio-range signals are

(*a*) more dependable over earth of good conductivity than earth of poor conductivity

(*b*) more dependable over earth of poor conductivity than earth of good conductivity

(*c*) independent of earth conductivity

(*d*) independent of earth resistivity

**416.** What will happen if a truck is parked close to either the localizer or the glide path antennas of an instrumentation landing system?

(*a*) Distortion of the equisignal paths will result

(*b*) A false equisignal will be created

(*c*) (*a*) and (*b*) both

(*d*) The truck will not distort the equisignal

**417.** The zero-signal position in a vertical loop in radio direction finding is not affected by

(*a*) horizontally polarized waves travelling parallel to the ground

(*b*) vertically polarized waves travelling downward

(*c*) (*a*) and (*b*) both

(*d*) horizontally polarized down coming waves

**418.** The zero-signal position vertical loop in radio direction finding is affected by horizontally polarized down-coming waves.

(*a*) true (*b*) false

**419.** The rotation of the goniometer pick-up coil is equivalent to rotating a single loop antenna as far as the function of wave direction is concerned.

(*a*) true (*b*) false

**420.** Which of the following scanning systems will be used where it is necessary to make angle measurements in both vertical and horizontal planes?

(*a*) Spiral scanning (*b*) Parabolic scanning

(*c*) Mechanical scanning (*d*) None of the above

**421.** One can change a (Transmit-Receive) TR box to an anti-TR box by omitting output leads.

(*a*) true (*b*) false

**422.** The "Night Effect" in loop direction finding becomes eminent at

(*a*) higher frequency and greater distance

(*b*) lower frequency and greater distance

(*c*) lower frequency and lower distance

(*d*) higher frequency and lower distance

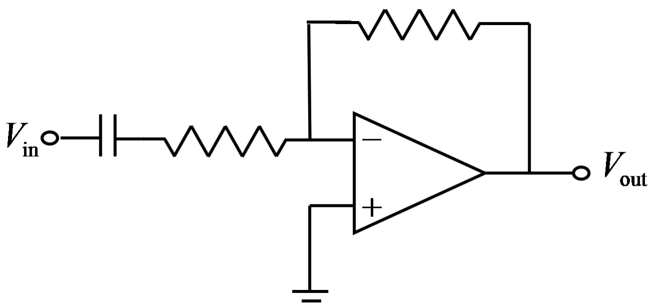


**Fig. Q. 423.**

**423.** The operational amplifier circuit above

(*a*) integrates the input signal

(*b*) differentiates the input signal

(*c*) is a high pass filter

(*d*) is a low pass filter

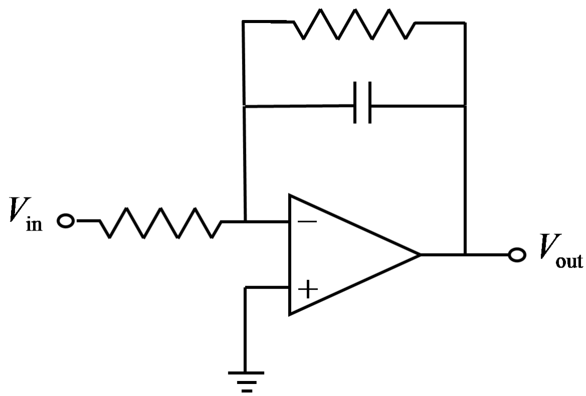


**Fig. Q. 424.**

**424.** The operational amplifier circuit above
   (*a*) integrates the input signal
   (*b*) differentiates the input signal
   (*c*) is a high pass filter
   (*d*) is a low pass filter

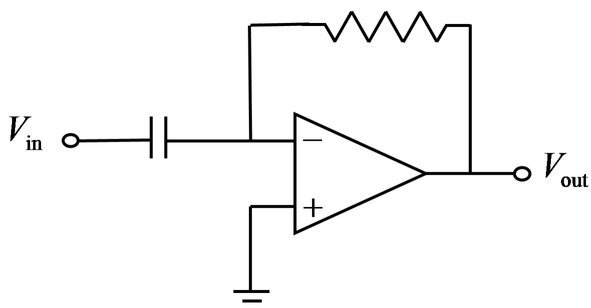


**Fig. Q. 425.**

**425.** The operational amplifier circuit above
   (*a*) integrates the input signal
   (*b*) differentiates the input signal
   (*c*) is a high pass filter
   (*d*) is a low pass filter

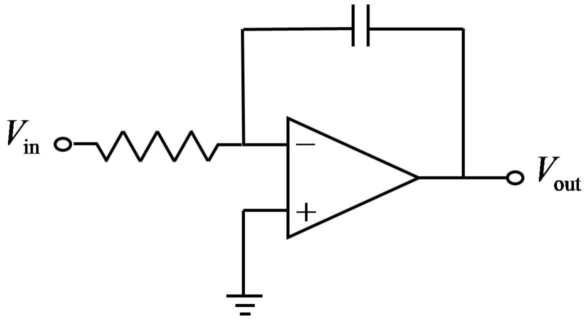


**Fig. Q. 426.**

**426.** The operational amplifier circuit above
- (*a*) integrates the input signal
- (*b*) differentiates the input signal
- (*c*) is a high pass filter
- (*d*) is a low pass filter

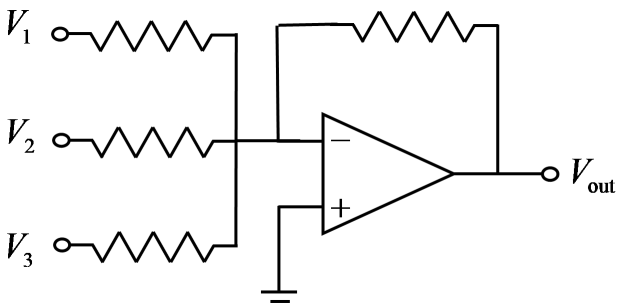


**Fig. Q. 427.**

**427.** The operational amplifier circuit above
- (*a*) sums the input voltages
- (*b*) averages the input voltages
- (*c*) differentiates the input voltages
- (*d*) integrates the input voltages

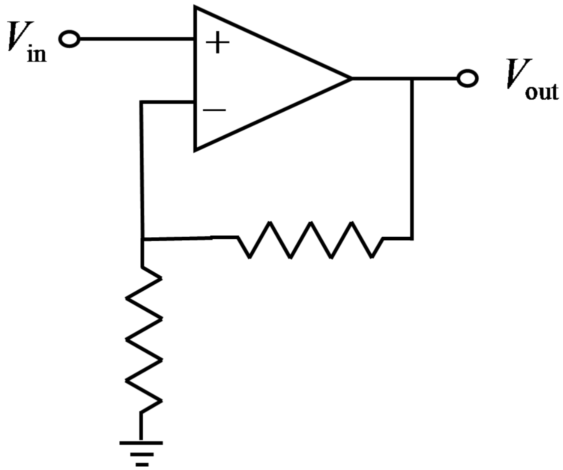


**Fig. Q. 428.**

**428.** The operational amplifier circuit above

(*a*) is an inverting amplifier

(*b*) is a non-inverting amplifier

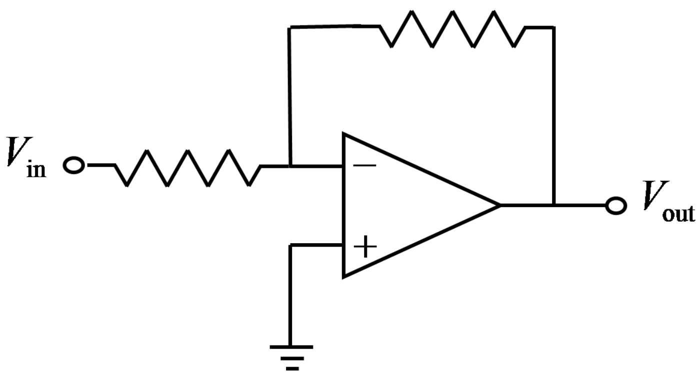


**Fig. Q. 429.**

**429.** The operational amplifier circuit above

(*a*) is an inverting amplifier

(*b*) is a non-inverting amplifier

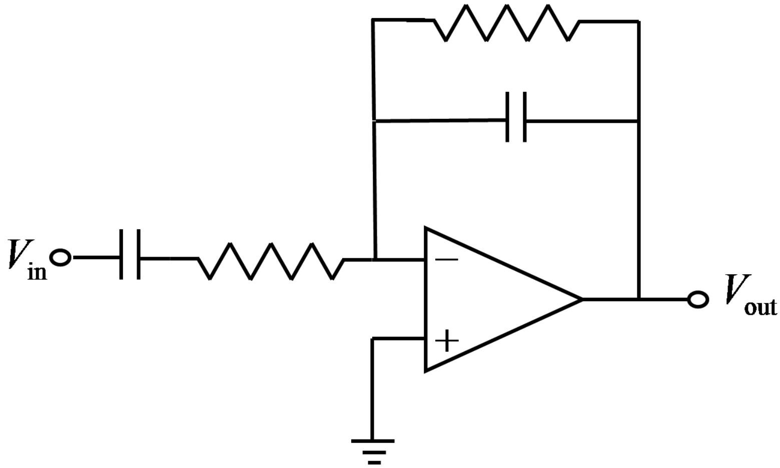


**Fig. Q. 430.**

**430.** The operational amplifier circuit above

(*a*) is a band pass filter

(*b*) is a band stop filter

**431.** According to Shockley's diode equation $I \simeq I_0\left(e^{\frac{qV}{k_B T}} - 1\right)$

(*a*) $V = \frac{k_B T}{q}\ln\left(\frac{I}{I_0} + 1\right)$

(*b*) $V = -\frac{k_B T}{q}\ln\left(\frac{I_0}{I + I_0}\right)$

(*c*) both (*a*) and (*b*)

(*d*) neither (*a*) nor (*b*)

**432.** Given a supply voltage in the four-diode circuit above is $V(t) = V_0 \cos(\omega t)$. The voltage across the resistor is proportional to

(*a*) $\cos(\omega t)$

(*b*) $|\cos(\omega t)|$

(*c*) $-\omega \sin(\omega t)$

(*d*) $\cos(\omega t)$ if $0 \le \omega t \le \pi$ and 0 otherwise

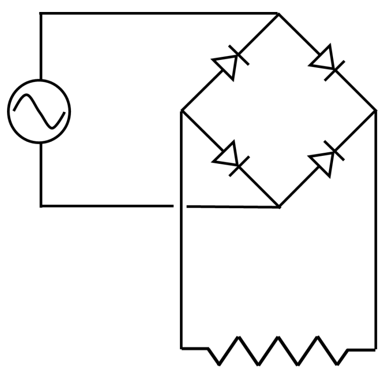

**Fig. Q. 432.**

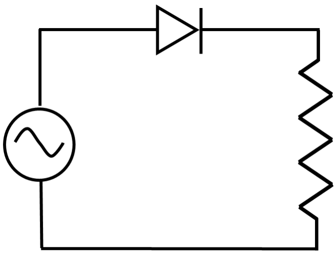

**Fig. Q. 433.**

**433.** Given a supply voltage in the single diode circuit is $V(t) = V_0 \cos(\omega t)$. The voltage across the resistor is proportional to

$(a)$ $\cos(\omega t)$

$(b)$ $|\cos(\omega t)|$

$(c)$ $-\omega \sin(\omega t)$

$(d)$ $\cos(\omega t)$ if $0 \le \omega t \le \pi$ and 0 otherwise

# 8

# COMPUTER SCIENCE

**1.** The system where only two states exist either conducting or non-conducting is called

(*a*) on-line computer system (*b*) bilateral system

(*c*) unilateral system (*d*) binary system

**2.** What will be the binary code of $(26)_{10}$?

(*a*) 11101 (*b*) 11001

(*c*) 11010 (*d*) 10101

**3.** Trace the equivalent decimal number for $(10011)_2$.

(*a*) 26 (*b*) 18

(*c*) 19 (*d*) 20

**4.** The octal system has the radix of

(*a*) 6 (*b*) 2

(*c*) 8 (*d*) 10

**5.** The binary system has the radix of

(*a*) 1 (*b*) 2

(*c*) 8 (*d*) 10

**6.** What is the equivalent octal number of $(492)_{10}$?

(*a*) 574 (*b*) 457

(*c*) 754 (*d*) 758

**7.** Trace the binary number for $(0.27)_{10}$.

(*a*) 0.010001 (*b*) 0.010101

(*c*) 0.010110 (*d*) 0.10110

**8.** What is the equivalent decimal number for octal number 0.436?

(*a*) 0.558 (*b*) 0.5585

(*c*) 0.54859 (*d*) 0.5859

**9.** We cannot obtain an equivalent octal number directly from the binary number of a given decimal number.

(*a*) true (*b*) false

**10.** To convert a decimal number to excess 3-code

(*a*) add the binary number of $(3)_{10}$ to the decimal number

(*b*) add the binary number of $(3)_{10}$ to any one digit of the decimal number

(*c*) add binary numbers of $(3)_{10}$ to the binary number of the given decimal number

(*d*) convert numbers of two or more digits to binary coded decimal and then add the binary number of $(3)_{10}$ of four bits to each binary coded decimal

**11.** Binary numbers cannot be obtained from excess 3-code.

(*a*) true (*b*) false

**12.** The excess 3-code of $(21)_{10}$ is

(*a*) 101100 (*b*) 110100

(*c*) 101101 (*d*) 111001

**13.** Parity check code is used in the digital computer system to

(*a*) detect the error (*b*) correct the error

(*c*) (*a*) and (*b*) both (*d*) either (*a*) or (*b*)

**14.** Hamming code is used in the digital computer to

(*a*) detect the error position

(*b*) correct the error in the right position of the error

(*c*) (*a*) and (*b*) both

(*d*) either (*a*) and (*b*)

**15.** Trace the Gray code for $(1101)_2$.

(*a*) 1110 (*b*) 1010

(*c*) 1011 (*d*) 1001

**16.** Trace the Gray code for $(13)_{10}$.

(*a*) 1110 (*b*) 1010

(*c*) 1011 (*d*) 1001

**17.** Trace the decimal number of Gray code 1011.

(*a*) 12 (*b*) 13

(*c*) 14 (*d*) 31

**18.** Trace the binary number for Gray code, 1011.

(*a*) 1110 (*b*) 1010

(*c*) 1011 (*d*) 1001

(*e*) 1101

**19.** "Boolean Algebra" is based on the premise that

(*a*) a statement is false

(*b*) a statement is true

(*c*) either a statement is true or false

(*d*) none of the above

**20.** Which of the following statements is true?

(*a*) Compiler is the name given to the computer operator

(*b*) Compiler is the part of the digital machine that stores the information

(*c*) Compiler is the translator of the source program to the object program

(*d*) Compiler is the name given to the punched tape

**21.** The output will be one if all inputs go to one for

(*a*) OR gate (*b*) AND gate

(*c*) NAND gate (*d*) NOT gate

**22.** Trace the value for binary addition, (1 + 1)

(*a*) 0 with a carry of 1 (*b*) 1 with a carry of 1

(*c*) 1 with no carry (*d*) 0 with no carry

(*e*) 2

**23.** Which of the following circuits is known as half adder?

(*a*) AND circuit (*b*) OR circuit

(*c*) INCLUSIVE OR circuit (*d*) EXCLUSIVE OR circuit

(*e*) NAND circuit

**24.** Which of the following functions is referred as the complementary?

(*a*) NOR function (*b*) NOT function
(*c*) NAND function (*d*) AND function

**25.** Which of the following statements represents NOR function?

(*a*) $\overline{ABCD} = \overline{E}$ (*b*) $\overline{A} + \overline{B} + \overline{B} + \overline{C} + \overline{D} = \overline{E}$
(*c*) $A + B + C + D = \overline{E}$ (*d*) $A.B.C. = \overline{D}$

**26.** What will be the complement of the expression $A + (0.\overline{B})$?

(*a*) $(A\overline{B}) + 0$ (*b*) $(\overline{A} + B).1$
(*c*) $\overline{A}\,(1 + B)$ (*d*) $\overline{A}\,(0 + B)$

**27.** What will be the dual of the expression $A + (0.B)$?

(*a*) $(\overline{A}B) + 0$ (*b*) $A\,(1 + B)$
(*c*) $A\,(1 + \overline{B})$ (*d*) $\overline{A}\,(1 + B)$

**28.** The complement of a product of literals equivalent to the sum of the separate literal components of a sum of literals is equivalent to the product of the separate literal components. The above statement is called the

(*a*) law of dualization
(*b*) law of complementation
(*c*) law of equivalence or De Morgan's theorem
(*d*) law of involution

**29.** Which of the following statements illustrates the distribution law?

(*a*) $(A + B) + C = A + (B + C) = A + B + C$
(*b*) $(AB)C = \cdot A(BC) = ABC$ (*c*) $A + B = B + A$
(*d*) $A(B + C) = (AB) + (AC)$ (*e*) $AB = BA$

**30.** The Gray code is only the tool which is being used as weighted code.

(*a*) true (*b*) false

**31.** Which of the following is called minimum error code?

(*a*) Binary code (*b*) Gray code
(*c*) Excess 3-code (*d*) Octal code

**32.** If $A$, $B$, and $C$ are the literals, which of the following statements is true?

(*a*) $(A + B)(A + C) = AC + A$ (*b*) $(A + B)(A + C) = A + BC$
(*c*) $(A + B)(A + C) = AB + B$ (*d*) $(A + B)(A + C) = AC = B$

**33.** Which of the following statements is false?

($a$) $\overline{AB} = \overline{A} + \overline{B}$ ($b$) $\overline{A + B} = \overline{A}.\overline{B}$

($c$) $\overline{AB} = \overline{A}.\overline{B}$ ($d$) $A + A = A$

**34.** The minimum form of the expression, $(A + \overline{B})\,(A + B + C)$ will be

($a$) $A + C$ ($b$) $A + \overline{B}$

($c$) $AC + B$ ($d$) $A + \overline{B}C$

**35.** A flip-flop is a

($a$) monostable device ($b$) bistable device

($c$) astable device ($d$) none of the above

**36.** The flip-flop has two output signals, one of which is not a complement of other.

($a$) true ($b$) false

**37.** The output impedance of an ideal operational amplifier is

($a$) infinity ($b$) zero

($c$) unity ($d$) 600 ohms

**38.** The input impedance of an ideal operational amplifier is

($a$) zero ($b$) infinity

($c$) unity ($d$) 600 ohms

**39.** The gain of an ideal amplifier must be

($a$) infinity ($b$) zero

($c$) unity ($d$) of the order of $10^{-10}$

**40.** The time scaling of the differential equation is necessary when

($a$) the bandwidth of the $X$-$Y$ plotter of an analog computer is limited

($b$) fast response is required

($c$) the analog computer is made of discrete components

($d$) the analog computer is made of integrated circuits

**41.** In computers the negative values are identified by using an additional left-most bit which indicates

($a$) a logic 1 ($b$) a logic 0

($c$) either logic 1 or 0 ($d$) none of the above

**42.** In computers the negative values are identified by using an additional right-most bit to indicate negative values by a logic 1 representation for the sign bit.

(*a*) true (*b*) false

**43.** The MATLAB software developed by MathWorks

(*a*) is an abbreviation for matrix laboratory

(*b*) is widely used for numerical computing

(*c*) performs symbol computations using the MuPad symbolic engine

(*d*) all the above

**44.** Give the output of the following Python script

```
x = 5
x + = 5
print(x)
```

(*a*) 5 (*b*) 10

(*c*) 1 (*d*) 0

**45.** Give the output of the following Python script

```
x = 10
y = 5
print(x%y)
```

(*a*) 5 (*b*) 10

(*c*) 1 (*d*) 0

**46.** Give the output of the following Python script

```
z = 3 + 2j
type(z)
```

(*a*) complex (*b*) 3+2j

(*c*) z (*d*) integer

**47.** Give the output of the following Python script

```
z = 3 + 2j
z * z
```

(*a*) 13 (*b*) (3 + 2j) (3 + 2j)

(*c*) 5 + 12j (*d*) 5 – 12j

**48.** Give the output of the following Python script

```
def add_input(a,b,c):
   z = a + b + c
   return z
add_input(1,1,1)
```

(*a*) 3 (*b*) 1

(*c*) a + b + c (*d*) z

**49.** Give the output of the following Python script

```
for n in range(1,5):
     print(n)
```

(*a*) 1 2 3 4 5 (*b*) 0 1 2 3 4

(*c*) 1 2 3 4 (*d*) 5

**50.** Give the output of the following Python script

```
for n in range(5):
     print(n)
```

(*a*) 1 2 3 4 5 (*b*) 0 1 2 3 4

(*c*) 1 2 3 4 (*d*) 5

**51.** Give the output of the following Python script

```
z = 5 + 2j
z.conjugate()
```

(*a*) 29 (*b*) (5 + 2j) (5 – 2j)

(*c*) 5 – 2j (*d*) 5.385164807134504

**52.** Give the output of the following Python script

```
z = 5 + 2j
abs(z)
```

(*a*) 29 (*b*) (5 + 2j) (5 – 2j)

(*c*) 5 – 2j (*d*) 5.385164807134504

**53.** Give the output of the following Python script

```
z = 5+2j
z.real
```

(*a*) (5,0) (*b*) 5

**54.** Give the output of the following Python script

```
z = 5 + 2j
z.imag
```

(*a*) (0,2) (*b*) 2

**55.** Asynchronous circuits are usually faster than synchronous circuits because

(*a*) the frequency of the clock used is very high

(*b*) they are free running and do not depend on the frequency of the clock

(*c*) the orderly execution of operations in these circuits is controlled by clock pulses

(*d*) the completion and initiation signals are not needed

**56.** Which of the following statements is true?

(*a*) $A\overline{B} + \overline{A}B = AB(\overline{A} + \overline{B})$ (*b*) $\overline{AB} + AB = (\overline{A} + \overline{B})(AB)$

(*c*) neither (*a*) nor (*b*) (*d*) both (*a*) and (*b*)

**57.** When the following device is used for control purposes, which of the following statements is true?

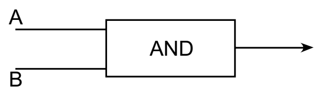


**Fig. Q. 57.**

(*a*) If $A$ and $B$ are applied there will be no output

(*b*) If neither input is applied there will be an output

(*c*) If one input is applied there will be no output

(*d*) If one input is applied there will be an output

**58.** The operation of a bistable element will depend upon

(*a*) surface friction

(*b*) eddy currents

(*c*) jet interaction

(*d*) conada effect

**59.** The truth table shown is for one of the following units

| $X$ | $Y$ | $S$ |
|---|---|---|
| 1 | 0 | 1 |
| 0 | 1 | 1 |
| 1 | 1 | 1 |

(*a*) NAND (*b*) NOR

(*c*) OR (*d*) exclusive OR

**60.** The logic unit shown below is of the type

(*a*) AND (*b*) OR

(*c*) NAND (*d*) NOT

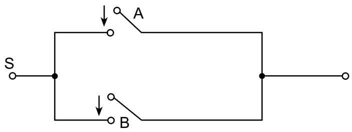


**Fig. Q. 60.**

**61.** In the unit shown below there will be a signal output when the inputs applied are

(*a*) *A* and *B* only (*b*) *B* and *C*

(*c*) *A* and *C* only (*d*) *A* and *B* or *C*

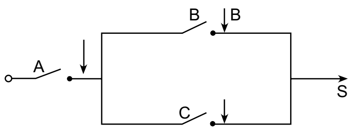


**Fig. Q. 61.**

**62.** The truth table shown below is for one of the following units

| *X* | *Y* | *S* |
|---|---|---|
| 1 | 1 | 0 |
| 1 | 0 | 1 |
| 0 | 1 | 1 |
| 0 | 0 | 1 |

(*a*) NAND (*b*) AND

(*c*) exclusive OR (*d*) NOT

**63.** Which of the following statements is true?

(*a*) The output of the sequential switching system at any instant of time depends only on the input at that time

(*b*) In a sequential switching system, the present output also depends on the past history of the system, that is, inputs at earlier time

(*c*) The output of the combinational switching system at any instant of time will not depend on the inputs at that time

(*d*) In a combinational switching system, the present output depends on inputs at an earlier time

**64.** The Karnaugh map shown below represents the function

| yz \ wx | 00 | 01 | 11 | 10 |
|---|---|---|---|---|
| 00 | | | | |
| 01 | 1 | | | 1 |
| 11 | 1 | | | 1 |
| 10 | | | | |

(*a*) $wxz'$ (*b*) $w'x'z'$

(*c*) $w'z'$ (*d*) $x'z$

(*e*) $z'x$

**65.** What will be the minimum sum of products of the function, $f(w, x, y, z) = \Sigma 1, 3, 4, 5, 6, 7, 9, 12, 13$

(*a*) $w'x + y'z$

(*b*) $w'x + y'w + xy' + w'z$

(*c*) $w'x' + y'w' + z'x$

(*d*) $z'y + w'x + x'y + y'z$

**66.** For which of the following flip-flops is the output clearly defined for all combinations of two inputs?

(*a*) D-type flip-flop (*b*) R-S flip-flop

(*c*) JK flip-flop (*d*) None of the above

**67.** The following truth table is for which of the units shown below?

| $T$ | $Q$ | $Q$ |
|---|---|---|
| 0 | 0 | 0 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |
| 0 | 1 | 1 |

(*a*) RS flip-flop (*b*) JK flip-flop

(*c*) T flip-flop (*d*) RST flip-flop

**68.** The JK flip-flop can do anything that the RS flip-flop can.

(*a*) true (*b*) false

**69.** Which of the following memories has got equal access time for all locations of the memory limit?

(*a*) Read Only Memory (ROM)

(*b*) Programmable Read Only Memory (PROM)

(*c*) Random Access Memory (RAM)

(*d*) Erasable ROM

**70.** Microcomputer is faster device than minicomputer.

(*a*) true (*b*) false

**71.** Microprocessor will essentially consist of

(*a*) Central Processing Unit (CPU)

(*b*) Random Access Memory (RAM)

(*c*) RAM and CPU

(*d*) (*a*), (*b*), and (*c*)

(*e*) none of the above

**72.** For which of the following computers is programming a difficult task?

(*a*) Analog computer

(*b*) Digital computer

(*c*) Microprocessor or microcomputer

(*d*) Minicomputer

**73.** If one bit is used to control one parameter of an engineering process, approximately how many parameters can be controlled by a digital computer of 4 K words memory with 16-bit word length?

(*a*) 4096 (*b*) 1024

(*c*) 65000 (*d*) 6500

**74.** "Non-volatile memory" states

(*a*) that memory is retained in the memory unit for some time even after power failure to the memory unit

(*b*) that memory is lost by power failure but regained as soon as power is restored

(*c*) that memory is retained in the memory unit at higher temperature

(*d*) that memory is retained in the memory unit for years after power failure to the memory unit

**75.** Which of the following memories will be used to store variable quantities or data?

(*a*) RAM (*b*) ROM

(*c*) PROM (*d*) EPROM

**76.** The term "softwire" is related to

(*a*) electronic contactors

(*b*) electrical circuits

(*c*) programming

(*d*) electromechanical relays

**77.** The "access time" for semiconductor memories is of the order of

(*a*) a few milliseconds (*b*) a few microseconds

(*c*) a few nanoseconds (*d*) a few seconds

**78.** If an odd decimal number is to be converted into a binary number, the last digit of the binary number will always be 1.

(*a*) true (*b*) false

**79.** The binary number of the Roman alphabet requires 5 bits of the combinations $2^5 = 32$ which this represents, of which only 26 are used; the excess of 6 combinations corresponds to a redundancy of

(*a*) 0.7 bit (*b*) 0.5 bit

(*c*) 0.3 bit (*d*) 0.4 bit

**80.** Microcomputer is the same as microprocessor.

(*a*) true (*b*) false

**81.** Which of the following memory chips will one use for character generation after considering size, economy, speed, and power consumption?

(*a*) ROM (*b*) RAM

(*c*) PROM (*d*) Dynamic RAM

**82.** If the input impedance of a NOR (RTL) logic circuit is increased, the fan-out of the driving circuit is

(*a*) increased

(*b*) decreased

(*c*) not changed

(*d*) independent of input impedance

**83.** A computer uses 500 characters. How many bits does this system require to give a different code to all characters?

(*a*) 5 bits (*b*) 7 bits

(*c*) 8 bits (*d*) 9 bits

(*e*) 10 bits

**84.** The Raspbian operating system for Raspberry Pi is freely distributed and includes the

(*a*) Mathematica computer algebra program

(*b*) Mathcad Prime program

(*c*) MATLAB program

(*d*) Maple program

**85.** Freely distributed Python library for symbolic mathematics

(*a*) SymPy

(*b*) Symphony

(*c*) ZenPy

(*d*) Starfish Prime

**86.** CPython is an implementation of Python written in C and Python

(*a*) true (*b*) false

**87.** MicroPython is an implementation of Python 3 written in C to run on

(*a*) supercomputers

(*b*) quantum computers

(*c*) desktop and laptop computers

(*d*) microcontrollers

**88.** SPYDER is a freely distributed scientific Python development environment

(*a*) true (*b*) false

**89.** Which of the following statements is true?

(*a*) A digital computer is a solid-state device whereas a desk calculator is not

(*b*) A digital computer is used for business-oriented tasks whereas a desk calculator is not

(*c*) A computer is controlled by the programs stored in its memory whereas a calculator requires step by step manual control

**90.** While writing a computer program, which of the following procedures does one adopt?

(*a*) Translation of problems into mathematical language

(*b*) Describing the problems as they are and leaving the to the computer to solve

(*c*) Writing the sequences of all operations the computer must carry out

(*d*) Writing the problem in program language using all the basic logical operations available for the computer

**91.** Which of the following statements is true?

(*a*) A program is restricted to a given set of data; if there is any change in data the programmer must change his program accordingly

(*b*) Usually the programs are versatile, and any computer can handle the data.

(*c*) The program is useful in solving a specific problem and can always be useful for different sets of data for the problem the program is meant to address

(*d*) The application of a program depends on its programming language

**92.** Which of the following memories has greater density of storage cell in the same chip area?

(*a*) Stable MOS RAM (*b*) Dynamic MOS RAM

(*c*) Core memory (*d*) RAM

**93.** Static MOS shift resistors consume more power than Dynamic MOS shift registers.

(*a*) true (*b*) false

**94.** How do you find out if the program prepared for a specific task does precisely what it is supposed to do?

(*a*) The compiler will scan all the programming errors to keep you informed

(*b*) By verifying the results with manual calculations

(*c*) The computer will report any programming error

(*d*) Designed tests with trial input data are used

**95.** Bipolar RAM usually makes use of

(*a*) TTL high speed circuits (*b*) DTL circuits

(*c*) RTL high speed circuits (*d*) any of them

**96.** Which of the statements is true?

(*a*) When two or more numbers are multiplied in a computer, the product is accurate only to the first ten (5 to 15) decimal places

(*b*) When two numbers are multiplied in a computer, a very accurate operation takes place without any error

(*c*) When many numbers are multiplied, no error will arise, unless one of the numbers is zero

(*d*) When only two numbers are multiplied, error will be negligible

**97.** A lift is operated by a centralized controller which receives signals from the push buttons and sends signals to motors and indicators. What kind of controller is this?

(*a*) The controller is a general-purpose computer programmed for lift control

(*b*) Lift control does not involve any mathematical computation and hence the use of computer or software is not desirable

(*c*) If the control functions are implemented in the software, there will have to be a computer in the controller

(*d*) A computer cannot control the lift

**98.** A liquid crystal display is as clearly visible in the dark as in the light.

(*a*) true (*b*) false

**99.** MOS ROMs offer an extremely versatile approach to character generation which can be used advantageously in terminal systems.

(*a*) true (*b*) false

**100.** ROMs cannot be used for character generation in non-CRT application such as billboard displays.

(*a*) true (*b*) false

**101.** Binary information can be stored in

(*a*) a flip-flop (*b*) a register

(*c*) a latch (*d*) (*a*), (*b*) and (*c*)

**102.** Which of the following equations can be solved numerically by the Runge-Kutta method?

(*a*) Differential equations (*b*) Partial differential equations

(*c*) Integral equations (*d*) None of the above

**103.** Which numerical method has greater accuracy?

(*a*) Runge-Kutta method (*b*) Euler method

**104.** Numerical method for calculating electric or magnetic potentials at rectangularly spaced grid points over a region of space

(*a*) Finite Element Method (*b*) Finite Difference Method
(*c*) Monte Carlo Method (*d*) Method of Moments

**105.** Numerical method for calculating electric or magnetic potentials over a region of space meshed into triangular or tetrahedral elements.

(*a*) Finite Element Method (*b*) Finite Difference Method
(*c*) Monte Carlo Method (*d*) Method of Moments

**106.** Numerical method for calculating electric or magnetic potentials at specific locations using random walkers that begin at specific points and terminate on boundaries of given potential.

(*a*) Finite Element Method (*b*) Finite Difference Method
(*c*) Monte Carlo Method (*d*) Method of Moments

**107.** Which of the following is a fundamental building block in an electronic analog computer?

(*a*) High-pass filter (*b*) Low-pass filter
(*c*) Operational amplifier (*d*) Integrator

**108.** The circuit shown functions as

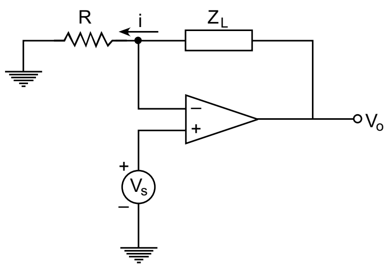


**Fig. Q. 108.**

(*a*) current to voltage converter
(*b*) voltage to current converter
(*c*) voltage to current converter with floating load
(*d*) hall adder

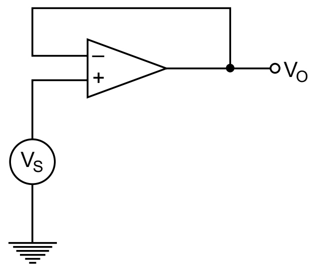


Fig. Q. 109.

**109.** The circuit shown behaves like a

(*a*) voltage to current converter
(*b*) current to voltage converter
(*c*) D.C. voltage amplifier
(*d*) D.C. voltage follower

**110.** In Question 108, the current $i$ is

(*a*) dependent on load $Z_L$
(*b*) independent of load $Z_L$
(*c*) independent of resistance $R$
(*d*) independent of voltage source $V_S$

**111.** In Question 109, what is the relation between input voltage $V_S$ and output voltage $V_o$?

(*a*) $V_S > V_o$ (*b*) $V_S < V_o$
(*c*) $V_S \le V_o$ (*d*) $V_S = V_o$

**112.** How many bits are required to represent decimal number 20?

(*a*) 3 (*b*) 4
(*c*) 5 (*d*) 2

**113.** How many alphanumeric characters can be stored by a $5 \times 7$ dot matrix if the number of bits required is 2240?

(*a*) 32 (*b*) 16
(*c*) 64 (*d*) 128

**114.** If the quantization error is 0.1%, which of the following A/D converters does it belong to?

(*a*) 10-bit A/D converter (*b*) 5-bit A/D converter
(*c*) 1-bit A/D converter (*d*) 20-bit A/D converter

**115.** Which of the following gates is a two-level logic gate?

(*a*) OR gate (*b*) NAND gate
(*c*) EXCLUSIVE OR gate (*d*) NOT gate

**116.** An AND gate will function as OR if

(*a*) all the inputs to the gates are "1"
(*b*) all the inputs are "0"
(*c*) either of the inputs is "1"
(*d*) all the inputs and outputs are complemented

**117.** In the circuit shown below, the resultant topology is referred to as

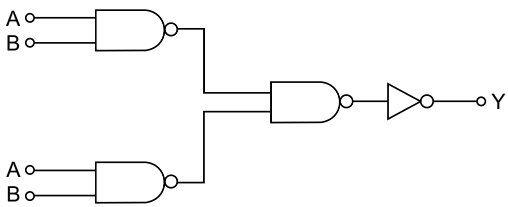


**Fig. Q. 117.**

(*a*) single-level logic (*b*) two-level logic
(*c*) three-level logic (*d*) none of the above

**118.** Which of the following IC logic families has maximum fan out capacity?
(*a*) TTL (*b*) DTL
(*c*) MOS (*d*) CMOS

**119.** How many input leads will be required for a chip containing four two-input NOT gates?
(*a*) 7 (*b*) 14
(*c*) 12 (*d*) 13

**120.** If $A$ and $B$ are two 1-bit numbers, what logic gates will be required to test for $A = B$?
(*a*) NOR gate (*b*) EXCLUSIVE OR gate
(*c*) EXCLUSIVE NOR gate (*d*) OR gate

**121.** In the above question, if $A > B$ which gate logic will be used?
(*a*) NOR gate (*b*) EXCLUSIVE OR gate
(*c*) EXCLUSIVE NOR gate (*d*) INCLUSIVE OR gate

**122.** The half adder has
(*a*) one input (*b*) two inputs
(*c*) three inputs (*d*) always more than two inputs

**123.** Two multidigit numbers can be added serially (one column at a time) or in parallel (all columns simultaneously) by using half adders.
(*a*) true (*b*) false

**124.** The truth table is shown below for the half adder. The output $D$ can be realized with a

(*a*) AND gate
(*b*) OR gate
(*c*) EXCLUSIVE OR gate
(*d*) NAND gate
(*e*) (*c*) or (*d*)

| *Input* | | *Output* | | | |
|---|---|---|---|---|---|
| *A* | *B* | *Sum D C* | | | |
| 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 1 | 0 | 1 | 1 | 0 |
| 1 | 0 | 0 | 1 | 1 | 0 |
| 1 | 1 | 1 | 0 | 0 | 1 |

**125.** A BCD to decimal decoder having 4 inputs and 10 outputs will have a minimum of

(*a*) 14 pins
(*b*) 15 pins
(*c*) 10 pins
(*d*) 4 pins
(*e*) 16 pins

**126.** Which of the following ICs has only one input line?

(*a*) Multiplexer
(*b*) Demultiplexer
(*c*) AND gate
(*d*) BCD to decimal decoder

**127.** Which of the following units will one choose to transform decimal number to binary code?

(*a*) Encoder
(*b*) Decoder
(*c*) Multiplexer
(*d*) Demultiplexer

**128.** If a 4-bit encoder is to be implemented with transistors, how many emitters will be required?

(*a*) Only one
(*b*) Only two
(*c*) Three
(*d*) Four

**129.** If a computer must do routine calculations like trigonometric function, square rooting, logarithms, etc., and these are repeated often, which of the following items will perform the calculations most economically?

(*a*) ROM as look-up tables
(*b*) Software programs
(*c*) Subroutine programs
(*d*) Any of the above

**130.** If in combinational logic, the outputs at a given instant of time depend only upon the values of the inputs at the same moment, such system will have

(*a*) memory
(*b*) no memory
(*c*) software
(*d*) none of the above

**131.** ROM does not store bits of information but only memorizes the functional relationship between the output variables and input variables.

(*a*) true (*b*) false

**132.** The circuit shown below has

(*a*) 1-bit memory

(*b*) 2-bit memory

(*c*) 3-bit memory

(*d*) 4-bit memory

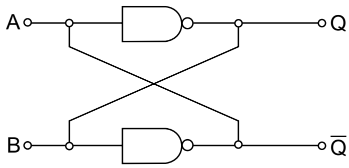


**Fig. Q. 132.**

**133.** What will happen to a flip-flop if the clock pulse is zero or invariant within a bit time?

(*a*) The flip-flop will change its state

(*b*) The flip-flop will not change its state

(*c*) Both the outputs will be reset

(*d*) Both the outputs will be one

**134.** A S-R flip-flop can be used as a *J*-*K* flip-flop and $Q$ and $\overline{Q}$ are fed back to the inputs

(*a*) true (*b*) false

**135.** The preset and clear data applied to a J-K flip-flop are called

(*a*) synchronous inputs (*b*) asynchronous inputs

(*c*) direct inputs (*d*) indirect inputs

(*e*) either (*b*) or (*c*)

**136.** Which of the following flip-flops does not have race-round difficulty?

(*a*) J-K flip-flops

(*b*) Master Slave J-K flip-flop

(*c*) S-R flip-flop converted to J-K flip-flop

(*d*) None of the above

**137.** An S-R type flip-flop can be converted into a D-type flip-flop if S is connected to R through an inverter.

(*a*) true (*b*) false

**138.** Toggle flip-flops are not commercially available because

(*a*) they are not economic

(*b*) a J-K flip-flop can be used as a toggle flip-flop by connecting J and K together

(*c*) a J-K flip-flop can be used as a toggle flip-flop by connecting J and K through an inverter

(*d*) they are not required in digital circuits

**139.** A ring counter is analogous to a

(*a*) toggle switch (*b*) latch

(*c*) stepping switch (*d*) S-R flip-flop

**140.** The right-shift-shift-register can be used to perform multiplication by multiples a of

(*a*) 2 (*b*) 6

(*c*) 8 (*d*) 4

(*e*) none of the above

**141.** The left-shift-shift-register can be used to perform division by multiples of

(*a*) 2 (*b*) 6

(*c*) 8 (*d*) 4

(*e*) none of the above

**142.** What will be the minimum number of NAND gates equivalent to two input OR gates?

(*a*) 1 (*b*) 2

(*c*) 3 (*d*) 4

**143.** What will be the output *F* in the circuit shown below?

(*a*) $S = A + B$

(*b*) $S = AB + \overline{A}\,\overline{B}$

(*c*) $S = \overline{A}B + A\overline{B}$

(*d*) $S = (A + B) \cdot (\overline{A} + \overline{B})$

(*e*) $S +$ (*c*) or (*d*)

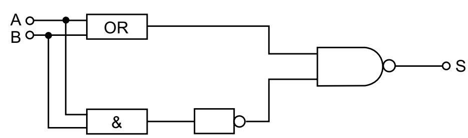


**Fig. Q. 143.**

**144.** How many cells will be required in a Karnaugh map if 4 variables are involved in preparing the map for function minimization?

(*a*) 4 (*b*) 8

(*c*) 12 (*d*) 16

(*e*) 32

**145.** Which of the following memories requires refreshing data with clock pulses to store data permanently?

(*a*) ROM (*b*) RAM

(*c*) Dynamic MOS memories (*d*) Static memories

**146.** Which of the following memories makes use of parasitic capacitance to store data temporarily?

(*a*) Static ROM (*b*) Static RAM

(*c*) Dynamic ROM (*d*) Dynamic MOS memories

**147.** In which of the following devices is minimum power dissipated if the devices are used for the same object and same operational condition?

(*a*) Bipolar shift registers (*b*) Dynamic MOS shift registers

(*c*) Static MOS shift registers (*d*) (*b*) and (*c*) both

**148.** Static MOS shift registers can store data for an indefinite time even if power is lost to the circuit.

(*a*) true (*b*) false

**149.** For which of the following circuits it is necessary to use the minimum clock rate to refresh the stored data?

(*a*) Static MOS circuits (*b*) Dynamic MOS circuits

(*c*) Bipolar circuits (*d*) Static RAMs

**150.** If the MOSFET has a thicker oxide gate than the normal thin oxide gate, the threshold voltage will be

(*a*) more or thicker oxide gate than a normal one

(*b*) less for the thicker oxide gate than the normal one

(*c*) remain unchanged for thick and thin oxide gates

(*d*) zero

**151.** The power dissipation in dynamic ROM is relatively higher than static ROM for the same capacity.

(*a*) true (*b*) false

**152.** Two-phase MOS circuits have the significant advantage over single-phase MOS circuits that

(*a*) they dissipate almost no power

(*b*) their output does not depend on the resistance of any of the devices

(*c*) their output depends on the resistance of any of the devices

(*d*) (*a*) and (*b*) both

**153.** Which of the following memory devices will have larger memory cells?

(*a*) Dynamic shift-registers

(*b*) Static shift-registers

(*c*) Two-phase dynamic inverters

(*d*) None of the above

**154.** The minimum power dissipation in ROM will occur when all the outputs are

(*a*) at their most positive voltage (*i.e.*, logic 1)

(*b*) at their most negative voltage (*i.e.*, logic 0)

(*c*) either (*a*) or (*b*)

(*d*) de-energized

**155.** Which of the following counters is known as a ripple-through counter?

(*a*) Asynchronous counter (*b*) Serial counter

(*c*) (*a*) or (*b*) (*d*) Synchronous counter

**156.** Which of the following conditions in a J-K flip-flop will lead to an intermediate state that's output may be zero or one
where, $C_r$ = Clear input, $P_r$ = Preset input, and $C_k$ = Clock input

(*a*) $C_r = P_r = C_k = 1$ (*b*) $C_r = P_r = 0$ and $C_k = 1$

(*c*) $C_r = P_r = C_k = 0$ (*d*) $C_r = P_r = 0$ and $C_k = 1$

**157.** An S-R flip-flop can be converted to a T type flip-flop if S is connected to $\overline{Q}$ and $R$ to $Q$ of the flip-flop.

(*a*) true (*b*) false

**158.** SiO is a conductor.

(*a*) true (*b*) false

**159.** In semiconductor integrated circuits, a diode is like a capacitor.

(*a*) true (*b*) false

**160.** Hybrid integrated circuits are generally cheaper than other types of integrated circuits.

(*a*) true (*b*) false

**161.** Most of the program controllers for digital computers work

(*a*) without clock or asynchronously

(*b*) with clock or synchronously

(*c*) with either (*a*) or (*b*)

(*d*) with random pulse generator

**162.** A digital computer can be freely programmed if

(*a*) the program consists of branch instructions

(*b*) the computer has random access memory (RAM)

(*c*) the computer has read only memory (ROM)

(*d*) the computer has erasable programable read only memory (EPROM)

**163.** Which of the following statements is true?

(*a*) Running programs are stored in the central processor in the computer

(*b*) The instructions being processed are stored in the central processor of the computer

(*c*) The control processor functions under clock control in the computer

(*d*) The control processor is a part of the main memory of the computer

(*e*) (*b*) and (*c*) both

**164.** In digital computers, the priority control monitors the sequence in which the central processor has

(*a*) programs (*b*) arithmetic functions

(*c*) microprograms (*d*) any logical functions

**165.** The input information located in the storage memory in the computer is called

(*a*) reading the contents of the information

(*b*) writing the contents of the information

(*c*) (*a*) or (*b*)

(*d*) address

**166.** Which of the following statements is true?

(*a*) The information stored in random access memory can be changed by overwriting with new information

(*b*) The information stored in read only memory can be changed by overwriting with new information

(*c*) Information can be written in any location of random access memory

(*d*) (*a*) and (*c*) both

**167.** Addressing the main memory means

(*a*) informing the memory in which location something is to be written

(*b*) informing the memory which location is to be read

(*c*) (*a*) or (*b*)

(*d*) execution of program

**168.** Which of the following statements is true if referring to the semiconductor RAM of a computer?

(*a*) Access time is more than cycle time

(*b*) Cycle time is more than access time

(*c*) Access time is the sum of cycle time and recovery time

(*d*) Cycle time is the sum of access time and recovery time

(*e*) (*b*) and (*d*)

**169.** Data transfer on the data bus in the computer is controlled by the

(*a*) central or input/output processor

(*b*) direct memory access (DMA)

(*c*) main memory

(*d*) (*a*) or (*b*)

**170.** If the storage capacity of the main memory is large, the central process unit will be proportionately slow.

(*a*) true (*b*) false

**171.** The main memory requirements and running time of programs written in a high-level language are higher than for the programs written in assembly language.

(*a*) true (*b*) false

**172.** For which of the following cases will one require an intensive knowledge of computer? While programming

(*a*) problem-oriented language

(*b*) machine-oriented language

(*c*) sources-oriented language

(*d*) object-oriented language

**173.** The multiplying of two numbers in the computer is carried out by

(*a*) multiplying these numbers directly

(*b*) repeated addition of either number

(*c*) repeated subtraction of numbers

(*d*) either (*b*) or (*c*)

**174.** Which of the following IC units has only one output?

(*a*) Demultiplexer

(*b*) Multiplexer

(*c*) Decoder

(*d*) None of them

**175.** How many bits output code will be required to transform 0.9 decimal numbers in binary code?

(*a*) 4 (*b*) 2

(*c*) 3 (*d*) 10

(*e*) 9

**176.** ROM can be used as

(*a*) sequence generator (*b*) decoder

(*c*) lock-up tables (*d*) (*a*), (*b*) and (*c*)

**177.** ROM is basically a code conversion unit.

(*a*) true (*b*) false

**178.** Which of the following circuits is called a latch?

(*a*) AND circuit (*b*) NAND circuit

(*c*) Flip-flop (*d*) ROM circuit

**179.** Which of the following statements is true for the circuit shown below?

(*a*) $S = R = 1$ is not allowed

(*b*) $S = 1, R = 0$ then $Q = 1, \overline{Q} = 0$

(*c*) $S = 0, R = 1$ then $R = 0, \overline{Q} = 0$

(*d*) $S = R = 0$ leads to an undetermined state so $Q$ could be either 1 or 0

(*e*) All the above statements are true

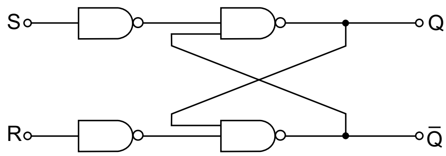


**Fig. Q. 179.**

**180.** If the input J is connected through the K input of a J-K flip, the flip-flop will behave as a

(*a*) D (delay) type flip-flop
(*b*) T-type flip-flop
(*c*) toggle switch
(*d*) (*b*) or (*c*)

**181.** The parasitic capacitance in an integrated circuit is of the order of

(*a*) micro-farads
(*b*) farads
(*c*) pico-farads
(*d*) nano-farads

**182.** The diodes utilized in integrated circuits are made by using

(*a*) *p-n* junction diodes

(*b*) *n-p* junction diodes

(*c*) transistors in one of the five different connections

(*d*) resistors only

**183.** Large-scale integrated (LSI) circuits usually contain

(*a*) more than 10 gates

(*b*) more than 100 gates

(*c*) 10 to 100 gates

(*d*) above 1000 gates

**184.** Medium-scale integrated (MSI) circuits usually contain

(*a*) more than 10 gates
(*b*) 10 to 100 gates
(*c*) 100 to 1000 gates
(*d*) about 10 gates

**185.** The resistor in monolithic integrated circuits is obtained by

(*a*) diffusing carbon in the circuits

(*b*) diffusing any semiconductor in the circuit

(*c*) utilizing the bulk resistivity of one of the diffused areas

(*d*) thin-film techniques

(*e*) utilizing *P*-type base diffusion only

(*f*) (*c*) or (*d*) depending on application

**186.** Which of the following methods is most commonly used to obtain the resistor in monolithic integrated circuits?

(*a*) *p*-type base diffusion

(*b*) *n*-type emitter diffusion

(*c*) *n*-type collector diffusion

(*d*) (*a*) or (*b*)

**187.** The capacitors in integrated circuits may be obtained by utilizing

(*a*) diffusing any semiconductor in the circuit

(*b*) the transition capacitance of a reverse *p*-*n* junction

(*c*) thin film techniques

(*d*) (*b*) or (*c*)

**188.** The MOS integrated transistor typically occupies only

(*a*) 10% of the surface required by an epitaxial double-diffused transistor in a conventional integrated circuit

(*b*) 5% of the surface required by an epitaxial double-diffused transistor in a conventional integrated circuit

(*c*) 25% of the surface required by an epitaxial double-diffused transistor

(*d*) 2% of the surface required by an epitaxial double-diffused transistor in a conventional integrated circuit

**189.** What will be the output Q for the following circuit?

(*a*) $\overline{A} + B = C$

(*b*) $\overline{A}C + \overline{B}C$

(*c*) $A \cdot \overline{B \cdot C}$

(*d*) (*a*) or (*b*)

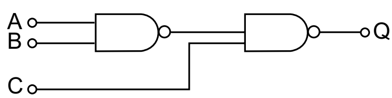


**Fig. Q. 189.**

**190.** If A is the literal, which of the following statements is true?

(*a*) $A + 0 = A.\ 0$  (*b*) $A + A = A.\ A$

(*c*) $A + \overline{A} = A.\ A$  (*d*) $A + 1 = A.\ 1$

**191.** TTL chips normally have fan out capacity of

(*a*) 30 outputs  (*b*) 10 outputs

(*c*) 14 outputs  (*d*) 40 outputs

**192.** The race condition is related to

(*a*) sequential circuits  (*b*) digital circuits

(*c*) asynchronous circuits  (*d*) synchronous circuits

**193.** If a clock with time period "*T*" is used with "*n*" stage shift register, the output of the final stage will be delayed by

(*a*) $nT$ seconds  (*b*) $(n - 1)\ T$ seconds

(*c*) $n/T$ seconds  (*d*) $2n - 1$ seconds

**194.** Buses that link the CPU to internal components in a computer

(*a*) hardware  (*b*) software

(*c*) compiler  (*d*) core memory

**195.** The successive approximation method is used for

(*a*) analog to digital conversion

(*b*) digital to analog conversion

(*c*) digital to digital conversion

(*d*) none of them

**196.** The sheet resistance of an emitter diffusion in an integrated resistor has a typical value of

(*a*) 200 ohms  (*b*) 200 ohms/square

(*c*) 2 ohms/square  (*d*) 2.2 ohms

**197.** The typical value of sheet resistance of base diffusion in an integrated circuit is

(*a*) 200 ohms  (*b*) 200 ohms/square

(*c*) 2.2 ohm/square  (*d*) 2.2 ohms

# 9

# *PROCESS INSTRUMENTATION*

**1.** If pressure of 12 $kg/cm^2$ is to be measured by an electrical indicator, then the calibration range of scale shall be

(*a*) 0–12 $kg/cm^2$ (*b*) 0–18 $kg/cm^2$

(*c*) 0–30 $kg/cm^2$ (*d*) 0–25 $kg/cm^2$

**2.** An electrical transducer gives an output when input applied to the transducer is zero. The output of the transducer in such a condition is known as

(*a*) zero balance (*b*) offset

(*c*) zero unbalance (*d*) (*a*) or (*b*)

**3.** The lowest level of measured variable which produces effective response of the instrument is called

(*a*) resolution sensitivity (*b*) threshold sensitivity

(*c*) hysteresis (*d*) scale sensitivity

**4.** Thermocouples can be used to measure the temperature up to

(*a*) 1600°C (*b*) 1200°C

(*c*) 500°C (*d*) 150°C

**5.** A platinum resistance thermometer can be used to measure the temperature up to

(*a*) 0–500°C (*b*) 0–100°C

(*c*) 0–800°C (*d*) 0–150°C

**6.** A potentiometer cannot be used to detect the linear motion of a moving component.

(*a*) true (*b*) false

**7.** Which of the following does not require auxiliary circuitry if used as transducer?

(*a*) Capacitance (*b*) Photocell
(*c*) Resistance (*d*) Inductance

**8.** If the output of an electrical pressure transducer is 4–20 mA corresponding to 0–50 $kg/cm^2$, then the span of the transducer in terms of current will be

(*a*) 20 mA (*b*) 24 mA
(*c*) 16 mA (*d*) 50 mA

**9.** Four-wire transmitters differ from two-wire transmitters in a manner that

(*a*) the power supply to four wire transmitters is same as the output of two wire transmitters
(*b*) the four-wire transmitters do not require auxiliary power supply
(*c*) the two-wire transmitter uses common wires for power supply as well as output signal
(*d*) the two-wire transmitters are a self-generating type and do not require power supply

**10.** How is the response of thermocouple output affected if thermosheath is used for its protection?

(*a*) The response time of thermocouple decreases
(*b*) The response time of thermocouple increases
(*c*) The millivolt output of thermocouple decreases
(*d*) The millivolt output of thermocouple increases

**11.** Which of the following alloys are for suited for bimetallic thermometers?

(*a*) Steel and invar (*b*) Steel and tin
(*c*) Invar and tin (*d*) Inconel and tin

**12.** Which of the following materials of RTD has 100 ohms resistance at 0°C for temperature measuring range of –200 to 500°C?

(*a*) Copper (*b*) Iron
(*c*) Platinum (*d*) Steel

**13.** If the range of a voltmeter is –100 V to +100 V, then the span of the voltmeter will be

(*a*) 100 V (*b*) zero
(*c*) 200 V (*d*) 50 V

**14.** The accuracy of measuring instruments corresponds to

(*a*) full scale deflection (*b*) span
(*c*) half scale deflection (*d*) any of the above

**15.** An ammeter is required to read 200 A current whose range is 0–300 A. The actual reading of the ammeter falls between 197 and 203 A. What is the accuracy of the ammeter?

(*a*) 5% FSD (*b*) 2% FSD
(*c*) 1% FSD (*d*) 3% FSD

**16.** The accuracy class 1 of industrial instruments indicate an accuracy of

(*a*) 0.5% FSD (*b*) 1% FSD
(*c*) 5% FSD (*d*) 2.5% FSD

**17.** The smallest input signal to an instrument which produces detectable output of the instrument is termed as

(*a*) sensitivity (*b*) threshold sensitivity
(*c*) resolution (*d*) (*a*) or (*b*)

**18.** Which of the following best defines hysteresis?

(*a*) The dead-band
(*b*) Output variation of the instrument with different inputs
(*c*) The inaccuracy of scale reading of the instrument
(*d*) The variation of the instrument reading with same input being applied in ascending and descending mode

**19.** Find out the odd man out:

(*a*) Thermocouple (*b*) RTD
(*c*) Pyrometer (*d*) Load cell

**20.** The load cell cannot be used to measure the

(*a*) pressure (*b*) weight
(*c*) level (*d*) volume

**21.** If the zero-adjustment knob is turned to the right, the needle of the instrument will move

(*a*) to the right on the scale (*b*) to the left on the scale

(*c*) to the extreme of the scale (*d*) to the middle of the scale

**22.** Which of the following voltmeters will have negligible effect on the circuit whose voltage is being tested?

(*a*) Voltmeter with low resistance

(*b*) Voltmeter with very high internal resistance

(*c*) Voltmeter with zero internal resistance

(*d*) None of the above

**23.** The moving iron ammeter is connected in a circuit shown below. What happens if the terminal connections of the ammeter are interchanged?

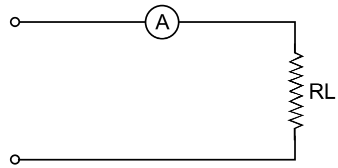


**Fig. Q. 23.**

(*a*) It will not indicate the reading

(*b*) It will indicate the same reading

(*c*) The pointer will be deflected in the opposite direction

(*d*) It will indicate the full-scale reading

**24.** Ultrasonic level sensors are used for measuring the level of material in a hopper only when material is

(*a*) solid (*b*) liquid

(*c*) (*a*) or (*b*) (*d*) none of them

**25.** An ultrasonic level switch consists of

(*a*) transmitter and electrode (*b*) receiver and electrode

(*c*) transmitter and receiver (*d*) electrode and receiver

**26.** The continuous ultrasonic level controller functions on the principle of

(*a*) obstruction of ultrasonic sound by material

(*b*) transmission of ultrasonic sound and reflection of the same by material to the sensor

(*c*) capacitance change in the hopper

(*d*) sound intensity

**27.** Which of the following level sensors is most economical?

(*a*) Capacitance type (*b*) Electromechanical type

(*c*) Ultrasonic type (*d*) Gamma rays type

**28.** Which of the flow elements will one choose if the net pressure loss in the flow line because of flow element is of importance?

(*a*) Orifice plate (*b*) Venturimeter

(*c*) Flow nozzle (*d*) Intake cone

**29.** If the capacitive method of level measurement of the solid material in a tank is used, which of the following parameters is variable?

(*a*) Distance between probe and wall of tank

(*b*) Area of the probe

(*c*) Dielectric formed by material between probe and wall of the tank

(*d*) Dielectric of air

**30.** Tuning Fork type vibration limit switches are used to measure

(*a*) pressure (*b*) load

(*c*) vibration (*d*) level

**31.** Find out the odd man out:

(*a*) Orifice plate (*b*) Intake cone

(*c*) Piston type flow meter (*d*) Venturimeter

**32.** An electronic pressure transmitter is calibrated for 20–100 mm Wg against 0–100 mm Wg. The transmitter has

(*a*) elevated zero range (*b*) suppressed zero range

(*c*) suppressed span range (*d*) elevated span range

**33.** In the above question, the suppression RATIO of the range is

(*a*) 20% (*b*) 80%

(*c*) 25% (*d*) 10%

**34.** If the electronic pressure transmitter is calibrated for range –25 to +100 mm Wg, the transmitter has

(*a*) elevated zero range (*b*) suppressed zero range

(*c*) suppressed span range (*d*) elevated span range

**35.** If the electronic transmitter is calibrated for range –100 to –20 mm Wg, what are the upper and lower range values

(*a*) –100 and 0 (*b*) –100 and 20

(*c*) –20 and –100 (*d*) –20 and 100

**36.** A thermistor is used to sense the temperature. What happens if the temperature increases gradually?

(*a*) The resistance of the thermistor increases

(*b*) The resistance of the thermistor decreases

(*c*) The thermistor expands gradually

(*d*) The thermistor does not sense any decrease in temperature

**37.** Thermistors are ideally suited to measure

(*a*) the temperature over short spans

(*b*) the temperature over long spans

(*c*) the temperature of bearings of motors

(*d*) the temperature of motor winding

**38.** Why we do not require the compensation for extension wire resistance which is used with thermistor?

(*a*) The values of thermistor resistance vary up to the milliohm range

(*b*) The values of thermistor resistance vary up to the megaohm range

(*c*) The resistance of extension wire is very large in comparison to the resistance of a thermistor

(*d*) Thermistors are normally self-compensated

**39.** The sensing element of a Resistance Temperature Detector may consist of

(*a*) coil (*b*) foil

(*c*) thin film deposited material (*d*) either (*a*) or (*b*) or (*c*)

**40.** The third wire in 3-wire RTD is used for

(*a*) dropping the voltage across RTD

(*b*) increasing the life of RTD

(*c*) providing better connection to the process

(*d*) compensation of lead wire resistance

**41.** Four leads in the RTD are used with

(*a*) single element RTD (*b*) dual element RTD

(*c*) three element RTD (*d*) four element RTD

**42.** What will be the resistance of 100-ohm Nickel RTD at 0°C?

(*a*) 100 ohms (*b*) 90 ohms
(*c*) 92.5 ohms (*d*) 72.5 ohms

**43.** Which of the following materials for thermocouple sheaths withstand the highest temperature?

(*a*) Alumina (*b*) Tantalum
(*c*) Zirconia (*d*) Molybdenum

**44.** Which thermocouple is for suitable the highest range of temperature?

(*a*) Platinum/platinum 10% rhodium
(*b*) Platinum/platinum 13% rhodium
(*c*) Platinum 6% rhodium/platinum 30% rhodium
(*d*) Tungsten 3% rhenium/tungsten 25% rhenium

**45.** If an equipment is incapable of releasing sufficient electrical energy under normal or abnormal conditions to cause ignition of a specific hazardous atmospheric mixture, then the equipment

(*a*) is called extrinsically safe (*b*) is called intrinsically safe
(*c*) will have explosion proof housing (*d*) will have flame proof housing

**46.** A rotameter is used to measure

(*a*) rotary motion (*b*) linear motion
(*c*) flow (*d*) level

**47.** Flow of liquid or gas in a pipeline is

(*a*) proportional to pressure in the pipeline
(*b*) proportional to differential pressure across the restriction introduced in the pipeline
(*c*) inversely proportional to the square root of differential pressure across restriction in the pipeline
(*d*) proportional to the square root of differential pressure across the restriction in the pipeline

**48.** The differential pressure transmitter with a square root extractor used for flow measurement will have

(*a*) non-linear scale (*b*) linear scale
(*c*) flow rate scale (*d*) mass flow

**49.** Which of the flow elements will be used to measure flow of fluid which is not enclosed in a pipe or duct?

(*a*) Venturimeter (*b*) Flow nozzle
(*c*) Intake cone (*d*) Pitot tube

**50.** How many minimum wattmeters will be required to measure power in a 4-wire unbalanced circuit?

(*a*) 2 (*b*) 1
(*c*) 3 (*d*) 4

**51.** The down scale reading of a wattmeter can be changed to upscale by

(*a*) interchanging voltage coil terminals
(*b*) interchanging current coil terminals
(*c*) interchanging voltage and current coil terminals
(*d*) (*a*) or (*b*)

**52.** The energy meter used for domestic power consumption indicates

(*a*) $VI \cos \phi$ (*b*) $VI \sin \phi$
(*c*) $VI$ (*d*) apparent power

**53.** Which of the following parameters cannot be measured by a ring-balance meter?

(*a*) Differential pressure (*b*) Pressure
(*c*) Mass-flow rate (*d*) Flow

**54.** Which of the following properties are important while selecting alloys for bimetallic thermometers?

(*a*) Coefficient of expansion (*b*) Electrical conductivity
(*c*) Modulus of elasticity (*d*) All of the above

**55.** The coefficient of expansion of $0.189 \times 10^{-4}$ is for

(*a*) tin (*b*) invar
(*c*) copper (*d*) platinum

**56.** The variation in ambient temperature will affect the accuracy of

(*a*) RTD (*b*) thermocouples
(*c*) thermistors (*d*) thermometers

**57.** Thermocouples have better response time than resistance temperature detectors.

(*a*) true (*b*) false

**58.** A thermistor can be used to control the

(*a*) level of water in tank (*b*) altitude

(*c*) temperature (*d*) all the above

**59.** Which of the following sources of error may exist when the temperature of a body is measured with the contact method?

(*a*) The testing body has high mass

(*b*) The testing body is affected chemically by a hot body

(*c*) There is a condensation of water on the testing body

(*d*) All of the above

**60.** Theoretically exact temperature by a non-contact method can be measured only if the body whose temperature is to be measured is perfectly black and intervening space is perfectly transparent.

(*a*) true (*b*) false

**61.** The presence of $CO_2$ in the intervening space of radiation pyrometers will

(*a*) affect the reading of the pyrometer

(*b*) not affect the reading of the pyrometer

(*c*) make the pyrometer read more than the desired value of temperature

(*d*) increase the sensitivity of the pyrometer

**62.** Pneumatic pressure transmitters are applicable to a standardized signal of

(*a*) 3 to 150 PSI (*b*) 3 to 15 PSI

(*c*) 15 to 150 PSI (*d*) 3 to 5 PSI

**63.** The pressure measured above total vacuum is called

(*a*) absolute pressure (*b*) atmospheric pressure

(*c*) barometric pressure (*d*) gauge pressure

**64.** The force per unit area exerted on a surface by a fluid flowing parallel to a pipe wall is called

(*a*) line pressure (*b*) static pressure

(*c*) working pressure (*d*) any of the above

**65.** When a pressure transmitter is used to sense the pressure of fluid flowing in a pipe, it transmits

(*a*) the absolute pressure (*b*) the gauge pressure
(*c*) the atmospheric pressure (*d*) any of the above

**66.** Pressure of 1 kg/cm$^2$ is equivalent to

(*a*) 1 bar (*b*) 0.1 bar
(*c*) 10 bars (*d*) 100 bars

**67.** Pressure of 1 kg/cm$^2$ is equivalent to

(*a*) 100 mm Wg (*b*) 1000 mm Wg
(*c*) 10000 mm Wg (*d*) 10 mm Wg

**68.** Nucleonic level gauge operates on the principle of

(*a*) gamma ray absorption (*b*) ultrasonic waves
(*c*) microwave waves (*d*) radiation method

**69.** An electronic ear is a device which is used to measure

(*a*) vibrations (*b*) sound level
(*c*) temperature (*d*) pressure

**70.** Three diagrams for orifice plates are shown below. Which of them is an eccentric orifice plate?

(*a*) A (*b*) B
(*c*) C (*d*) A and B

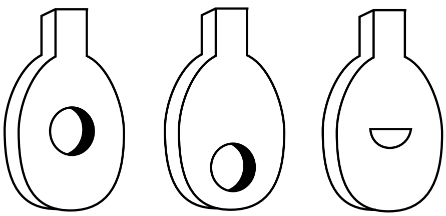

**Fig. Q. 70.**

**71.** In the above question, which of them is a concentric orifice plate?

(*a*) A (*b*) B
(*c*) B and C (*d*) C

**72.** In Question 70, which figure belongs to a segmental orifice plate?

(*a*) A (*b*) B

(*c*) C (*d*) A and B

**73.** Potentiometric instruments are normally

(*a*) high frequency devices

(*b*) low frequency devices

(*c*) low frequency devices with frequency limit to 10 Hz

(*d*) high frequency devices with frequency limit to 100 kHz

**74.** A light beam galvanometric recorder uses the

(*a*) ink pen to trace the parameter

(*b*) stylus tracing on carbon coated film

(*c*) heated stylus tracing on heat-sensitive paper

(*d*) photosensitive paper or film for tracing

**75.** What is the source of tracing the parameter on paper in a light beam galvanometric recorder?

(*a*) Pen

(*b*) Stylus

(*c*) Fiber tip stylus

(*d*) Reflected light from mirror incorporated in the recorder

**76.** A potentiometric recorder, if compared to the galvanometric recorder, has

(*a*) high sensitivity

(*b*) high response time

(*c*) independence of lead lengths

(*d*) (*a*) and (*b*)

**77.** A capacitance type pressure transmitter is used to measure pressure. Which of the parameters of the capacitor varies to indicate the pressure?

(*a*) Plate area (*b*) Dielectric between plates

(*c*) Distance between plates (*d*) None of them

**78.** Galvanometric recorders have better speed response than potentiometric recorders.

(*a*) true (*b*) false

**79.** LVDT is a

(*a*) capacitive transducer
(*b*) resistive transducer
(*c*) inductive transducer
(*d*) none of them

**80.** Which of the following controllers will one choose to control a motorized valve, keeping in view economy and operation?

(*a*) PI controller with continuous output
(*b*) PI controller with pulse output
(*c*) PID controller with continuous output
(*d*) PID controller with step output

**81.** The Teflon used for lead wire insulation can withstand temperatures up to

(*a*) 80°C (*b*) 250°C
(*c*) 120°C (*d*) 380°C

**82.** The resistance elements used for temperature measurement have response time of the order of

(*a*) 2 to 10 m secs (*b*) 2 to 10 secs
(*c*) 10 m secs to 20 m secs (*d*) 2 to 20 secs

**83.** Pilot switches are operated

(*a*) manually
(*b*) in response to specified conditions of an actuating quantity
(*c*) automatically
(*d*) none of the above

**84.** Which of the following are classified as pilot switches?

(*a*) Pressure switch (*b*) Position switch
(*c*) Level switch (*d*) All of them

**85.** A contact element in which the velocity of contact motion is substantially independent of the velocity of the actuating system is termed a

(*a*) snap action contact (*b*) instantaneous action contact
(*c*) pulse contact (*d*) change-over contact

**86.** The configuration of a switch is shown below. What kind of contact element is this?

(*a*) Change-over contact with two contact element

(*b*) Double-break contact element

(*c*) Single-break contact element

(*d*) Change-over contact with three terminals

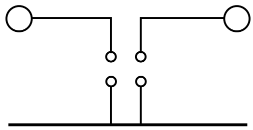

**Fig. Q. 86.**

**87.** Which of the following devices will one choose to measure the flow of fluid in an open channel?

(*a*) Piston flow meter

(*b*) Ring balance flow meter

(*c*) Pitot tube

(*d*) Rotameter

**88.** Passive integrators have the major problem of

(*a*) high $Q$ factor

(*b*) low input impedance

(*c*) low output impedance

(*d*) low output and input impedance

**89.** Passive differentiators have the major problem of

(*a*) low $Q$ factor

(*b*) high input resistance

(*c*) low output resistance

(*d*) high $Q$ factor

**90.** The conventional low component count active integrator has the limitation of

(*a*) capacitor leakage

(*b*) D.C. stability

(*c*) large time constant realization

(*d*) all of the above

**91.** Active integrators can be used in

(*a*) compensating networks

(*b*) electronic controllers

(*c*) phase compensation

(*d*) all the above applications

**92.** Active differentiators can be used in

(*a*) compensating networks
(*b*) electronic controllers
(*c*) phase compensation
(*d*) all the above applications

**93.** The static pressure of fluid which is obstructed by an orifice plate is measured

(*a*) in the plane of upstream tape
(*b*) in the plane of downstream tape
(*c*) in either of the above streams
(*d*) 10 meters away from orifice plate

**94.** The temperature of the fluid in the above question should preferably be measured

(*a*) in downstream of orifice plate
(*b*) in upstream of orifice plate
(*c*) in either stream of orifice plate
(*d*) none of the above

**95.** Which of the following flowmeters are classified as area meters?

(*a*) Rotameters
(*b*) Piston type meters
(*c*) Orifice and plug type
(*d*) All above

**96.** The pressure taps for measuring flow of gases should preferably be

(*a*) raised above 0.5 meters vertically up from the flow element and the continuous slope of not less than 1 : 10 to the transducer should be given
(*b*) lowered 0.5 meters vertically down from the flow element and then continuous slope of 1 : 10 to the transducer should be given
(*c*) raised by 1 meter vertically up from flow element
(*d*) none of the above

**97.** The distance of the transducer from the pressure taps should be approximately

(*a*) 10–15 meters
(*b*) 20–30 meters
(*c*) 20 meters
(*d*) 5 meters

**98.** Why it is necessary to fabricate condensate pots in one block if they are used while measuring stream flow?

(*a*) To avoid errors which can be caused due to difference in level in installing two separate condensation pots

(*b*) To create homogeneous condensation of steam

(*c*) To avoid presence of steam in condensed water

(*d*) To reduce the cost

**99.** Which of the following materials will be preferred for condensation pots if used at a pressure of 16 kg/cm$^2$?

(*a*) Cast iron (*b*) Carbon steel

(*c*) Stainless steel (*d*) Molybdenum

**100.** Stainless steel condensation pots are required for a pressure range of

(*a*) 0 to 16 kg/cm$^2$ (*b*) 16 to 64 kg/cm$^2$

(*c*) 64 to 100 kg/cm$^2$ (*d*) 64 to 200 kg/cm$^2$

**101.** Which of the following devices will be used to protect pressure gauges or transmitters if the same are used for carrying liquids?

(*a*) Condensation pot (*b*) Seal pot

(*c*) 3-way manifold value (*d*) Isolation valve

**102.** What is the binary material if referred to the analysis of a compound?

(*a*) If a compound is composed of many components and if only one of them is affected by method of analysis, then the compound is considered binary

(*b*) If the material exhibits two properties in analysis

(*c*) If two materials are used to get the material affected being analysed

(*d*) If the material is analysed by computer

10

# INFORMATION AND BLOCKCHAIN TECHNOLOGY

**1.** A technology common to Windows and Macintosh computers where actions are performed using a mouse is to point and click on icons and drop-down menus.

(*a*) Graphical User Interface (GUI) (*b*) ActiveX

(*c*) applets (*d*) WinCAD

**2.** A Microsoft development that enables the creation of interactive content on the World Wide Web. This technology enables viewing Microsoft Office documents within a Web browser.

(*a*) applets (*b*) ActiveX

(*c*) TurboCAD (*d*) Tumbler

**3.** An unprotected method of downloading files or programs from the Internet where a username and password is not required.

(*a*) VLC Downloader (*b*) Raspbian

(*c*) ActiveX (*d*) anonymous FTP

**4.** Downloadable Web-based programs such as QuickTime and Flash movies and Windows Media player. Many such program do not depend on the operating system.

(*a*) PhETs (*b*) applets

(*c*) Raspbian (*d*) ActiveX

**5.** A data or text file where each byte corresponds to one character. Such files may be opened using text editor programs such as Notepad.

(*a*) ASCII file (*b*) binary file

(*c*) jpeg (*d*) tiff

**6.** A file where each byte does not correspond to a given character. Such files cannot be opened using text editor programs such as Notepad.

(*a*) binary file (*b*) ASCII file

(*c*) jpeg (*d*) tiff

**7.** A short-ranged wireless technology enabling the exchange of data between devices at 2.45 GHz

(*a*) Symphony (*b*) Bluetooth

(*c*) ZenBee (*d*) answers (*a*) and (*c*)

**8.** A device that provides communication between two Local Area Networks (LANs) using the same protocol.

(*a*) IEEE-488 GPIB (*b*) rs232

(*c*) bridge (*d*) C-Net

**9.** A network management protocol where servers assign temporary IP addresses to computers on the network.

(*a*) Dynamic Host Configuration Protocol (DHCP)

(*b*) Simple Network Management Protocol (SNMP)

(*c*) Static Protocol

(*d*) Spanning Tree Protocol

**10.** Process that occurs during the deletion and writing of files resulting in parts of files being scattering over different parts of a disk

(*a*) custom controls (*b*) fragmentation

(*c*) kernel reset (*d*) answers (*a*) and (*c*)

**11.** Programing language used for the creation of web pages and applications.

(*a*) HyperText Markup Language (HTML)

(*b*) Page Plus

(*c*) Quick Basic

(*d*) Modula

**12.** Network that connects a group of computers over a small area to share computing resources, files, software and printers

(*a*) Link Array (*b*) Local area network (LAN)

(*c*) Share Net (*d*) Network Broadway

**13.** Open-sourced nonproprietary software operating system that runs on numerous hardware platforms. Popular distributions include Ubuntu and Mint.

(*a*) Mendeley (*b*) PuTTY

(*c*) LINUX (*d*) Mu

**14.** Portions of data files divided by the TCP/IP protocol for transmission over a network.

(*a*) plugins (*b*) packets

(*c*) modular file (*d*) data cache

**15.** Inexpensive miniature computer consisting of a single board with ethernet, USB, and HDMI ports.

(*a*) Raspberry Pi (*b*) Micro PC

(*c*) Flash PC (*d*) ASCIC

**16.** Rules governing the exchange of data over the internet that form the basis of FTP and HTTP protocols

(*a*) Internet Protocol Suite

(*b*) Transmission Control Protocol/Internet Protocol (TCP/IP)

(*c*) HyperText Markup Protocol

(*d*) Simple Gateway Monitoring Protocol

**17.** Windows database for the storage of configuration information

(*a*) MySQL (*b*) registry

(*c*) temporary files directory (*d*) OpenWrt

**18.** The use of a PIN combined with an identification number that is updated every few minutes for security

(*a*) PIN security check

(*b*) per-to-per authentication

(*c*) two-factor authentication

(*d*) security PIN bolt

**19.** A cryptocurrency is
(*a*) a digital medium of exchange
(*b*) stored, transferred and exchanged using encryption algorithms
(*c*) awarded or created as transaction blocks are verified
(*d*) decentralized and not controlled by a central bank or authority
(*e*) all the above

**20.** Smallest division of a bitcoin equal to $10^{-8}$ BTC
(*a*) litecoin (*b*) Satoshi
(*c*) cryptocent (*d*) nanocoin

**21.** Form of encryption used to protect Bitcoin
(*a*) SHA-256 (*b*) Scrypt
(*c*) CryptoNote (*d*) CryptoNight

**22.** The blockchain ledger solves the problem of
(*a*) anonymous transaction
(*b*) cryptocurrency double spending
(*c*) large block sizes
(*d*) orphaned blocks

**23.** Individual blocks in a blockchain are groups of transactions linked
(*a*) cryptographically (*b*) in chronological order
(*c*) both (*a*) and (*b*) (*d*) neither (*a*) nor (*b*)

**24.** A copy of the blockchain ledger stored on a computer operated on the network is called
(*a*) backup chain (*b*) node
(*c*) chain link (*d*) grid point

**25.** A blockchain ledger
(*a*) is decentralized
(*b*) grows as new transactions are made
(*c*) is available to the public
(*d*) all the above

**26.** Enables the secure exchange of data over a public network by using encryption
(*a*) Virtual Private Network (VPN) (*b*) stealth nodes
(*c*) grid points (*d*) Peer-to-peer (P2P)

**27.** File sharing without a central server where each computer on a network acts as a server for other computers on the network

(*a*) Peer-to-peer (P2P)

(*b*) Virtual Private Network (VPN)

(*c*) Cloud storage

(*d*) hash swapping

**28.** Digital cryptocurrencies lack a

(*a*) hash algorithm

(*b*) central authority

(*c*) programming language of implementation

(*d*) blockchain network

**29.** A bifurcation in a blockchain that can be intentional or accidental is known as a

(*a*) blockchain correction
(*b*) block merger
(*c*) blockchain fork
(*d*) sidechain

**30.** A blockchain hard fork occurs when

(*a*) rules are changed such that blocks created by the old software are no longer recognized as valid

(*b*) a 51% attack fails

(*c*) two blockchains are merged into one

(*d*) a blockchain segment is accidently overwritten by a sidechain

**31.** A blockchain soft fork happens when

(*a*) a change of rules such that blocks created by the old software are still recognized as valid.

(*b*) a 51% attack fails

(*c*) a block is found simultaneously by different miners

(*d*) a blockchain segment is accidently overwritten by a sidechain

**32.** An accidental blockchain fork can occur when

(*a*) indistinguishable blocks are simultaneously added to the blockchain

(*b*) a power surge temporarily disables the network

(*c*) a block is found simultaneously by different miners

(*d*) a blockchain segment is accidently overwritten by a sidechain

**33.** Segments of the blockchain may become orphaned when
(*a*) a blockchain segment is accidently overwritten by a sidechain
(*b*) the network abandons the shorter chain following a fork
(*c*) a power surge temporarily disables the network
(*d*) indistinguishable blocks are simultaneously added to the blockchain

**34.** Following a hard fork
(*a*) nodes using the old software must be updated
(*b*) orphaned blocks in the shorter chain are lost forever
(*c*) a soft fork is introduced to maintain integrity of the blockchain
(*d*) a block merger is introduced to prevent orphaned blocks

**35.** Ethereum and Ethereum Classic blockchains
(*a*) are both tethered to the USD
(*b*) Resulted from a hard fork in the Ethereum blockchain in response to a hack
(*c*) were created in parallel and never bifurcated
(*d*) answers (*a*) and (*c*)

**36.** Computer protocols that allow transactions without third parties.
(*a*) Independent contracts
(*b*) cross contracts
(*c*) Smart contracts
(*d*) virtual agreements

**37.** Smart contracts are
(*a*) digital contracts that can be executed by a distributed ledger or blockchain
(*b*) enforced by nodes on a network
(*c*) answers (*a*) and (*b*)
(*d*) neither (*a*) nor (*b*)

**38.** Smart contracts are written in the programming language called
(*a*) Oracle
(*b*) Merkle
(*c*) Block Explorer
(*d*) Solidity

**39.** A 51% attack may occur when
(*a*) a solar flare, EMP or other event impacts more than half of the nodes on the network
(*b*) more than half of the nodes on a blockchain network are operated by a single group
(*c*) a hard fork occurs
(*d*) answers (*a*) and (*c*)

**40.** Bitcoin cryptocurrency is
(*a*) open source
(*b*) decentralized
(*c*) operated on a peer-to-peer network
(*d*) all the above

**41.** Hardware specifically used to mine cryptocurrency
(*a*) Application Specific Integrated Circuit (ASIC)
(*b*) Raspberry Pi
(*c*) Oracles
(*d*) Bitcoin ATM

**42.** First segment of data recorded on a blockchain
(*a*) initial node (*b*) genesis block
(*c*) alpha quantum (*d*) test net

**43.** Refers to the number of segments or blocks in a given blockchain
(*a*) block number (*b*) block height
(*c*) block entropy (*d*) block weight

**44.** Hashing refers to
(*a*) The input of variable-length transaction strings followed by the output of fixed-length strings by a hashing algorithm such as SHA-256
(*b*) input of fixed-length transaction strings followed by random-length output strings
(*c*) input of variable-length transaction strings followed by random-length output strings
(*d*) input of fixed-length transaction strings followed by fixed-length output strings

**45.** A unique alphanumeric password that enables users to spend or transfer cryptocurrencies
(*a*) proof of authority (*b*) user script
(*c*) wallet key (*d*) private key

**46.** Bitcoin private keys are stored
(*a*) in a bitcoin wallet (*b*) on the bitcoin network
(*c*) in agreement ledgers (*d*) in permissioned ledgers

**47.** Types of cryptocurrency wallets include
(*a*) hardware wallets
(*b*) paper wallets
(*c*) online wallets
(*d*) desktop wallets
(*e*) all the above

**48.** Data string inside a wallet that allows access to cryptocurrency
(*a*) test key
(*b*) token key
(*c*) verification string
(*d*) private key

**49.** Fiat currency
(*a*) lacks a central authority
(*b*) is back by a commodity such as gold or silver
(*c*) is not back by a commodity
(*d*) is a digital currency with an expiration date

**50.** Examples of altcoins launched after bitcoin include
(*a*) Litecoin
(*b*) Ripple
(*c*) Namecoin
(*d*) all the above

**51.** Digital records stored at multiple locations
(*a*) Distributed ledgers
(*b*) Stealth addresses
(*c*) Side chains
(*d*) Smart contracts

**52.** A programming language is Turing complete if it can compute
(*a*) anything that a Turing machine can compute
(*b*) anything that any programmable computer can compute
(*c*) answers (*a*) and (*b*)
(*d*) neither (*a*) nor (*b*)

**53.** The Ethereum Virtual Machine (EVM) is Turing complete
(*a*) true
(*b*) false

**54.** The bitcoin scripting language
(*a*) is Turing complete
(*b*) is Turing incomplete
(*c*) cannot perform loops
(*d*) answers (*b*) and (*c*)

**55.** Possible applications of smart contracts include
(*a*) ledger secured voting applications
(*b*) storage and transfer of medical records
(*c*) financial loans
(*d*) all the above

**56.** Challenges to implementing blockchain technology include
(*a*) electric power consumption resulting from repetitive computations on each blockchain node
(*b*) computing requirements that increase as new blocks are added to the chain
(*c*) fragmentation of the chain resulting from hard and soft forks
(*d*) all the above

**57.** Amount of cryptocurrency a miner is awarded for finding a block
(*a*) block reward (*b*) hash cash
(*c*) bit payout (*d*) transaction fee

**58.** Computational resources required to successfully mine a block
(*a*) mining difficulty (*b*) mining reward
(*c*) Mega hash per second (*d*) oracle power

**59.** The Scrypt cryptographic algorithm
(*a*) is used by Litecoin
(*b*) is faster than the SHA-256 algorithm
(*c*) has greater energy efficiency compared to SHA-256
(*d*) all the above

**60.** ASIC miners are often controlled using
(*a*) Delta processors (*b*) Raspberry Pi
(*c*) Sigma Pi (*d*) answers (*a*) and (*c*)

**61.** Validation of block transactions and generation of transaction fees based on the amount of cryptocurrency held
(*a*) Proof of Stake (PoS)
(*b*) Testnet
(*c*) Block explorer
(*d*) Consensus protocol

**62.** Validation of block transactions based on computations performed in solving a mathematical problem

(*a*) Proof of Authority (PoA)

(*b*) digital signature

(*c*) Proof of Stake (PoS)

(*d*) Proof of Work (PoW)

**63.** Advantage of Proof of Stake (PoS) compared to Proof of Work (PoW)

(*a*) PoS eliminates the need for a blockchain

(*b*) PoS requires less power consumption and computing recourses

(*c*) PoS eliminates transaction fees

(*d*) PoS solves the problem of forks

**64.** Secure Hash Algorithms (SHAs) are published by the

(*a*) Satoshi Foundation

(*b*) Consortium of Cryptographers

(*c*) National Institute of Standards and Technology (NIST)

(*d*) Bitcoin Foundation

**65.** The output hash created by the SHA-256 algorithm is

(*a*) 256-bits for any input data

(*b*) $2^8$-bits for any input data

(*c*) a random number of bits for any 256-bit input

(*d*) answers (*a*) and (*b*)

**66.** Amount of crypto-currency received for each successively mined block

(*a*) hash cash

(*b*) transaction fee

(*c*) token

(*d*) block reward

**67.** Mathematical algorithm that produces a fixed length output for any digital input data

(*a*) cryptographic hash function

(*b*) chain linking

(*c*) Testnet

(*d*) Consensus protocol

**68.** Decrypting a hash by guessing of all possible inputs that produced a given output to a cryptographic hash function

(*a*) brute force attack

(*b*) 51% attack

(*c*) hash hack

(*d*) whisper attack

**69.** The verification of transactions that are then added to the blockchain using computational recourses to solve cryptographic problems

(*a*) halving (*b*) digital signature

(*c*) mining (*d*) consensus

**70.** Measured performance of hardware mining cryptocurrency

(*a*) hashes per second (hash rate) (*b*) steam

(*c*) gas limit (*d*) answers (*b*) and (*c*)

**71.** Combined computing power to validate cryptocurrency transactions with block rewards shared between users

(*a*) distributed ledger (*b*) mining pool

(*c*) consensus (*d*) consortium blockchains

**72.** Cryptocurrency network that uses ring signatures

(*a*) Monero (XMR) (*b*) Ripple

(*c*) Ethereum Classic (*d*) Lite Coin

**73.** Digital signature generated by an actual signer and a group of decoy signers where the identity of the actual signer remains anonymous.

(*a*) ledger stamp (*b*) oracle stamp

(*c*) ring signature (*d*) private signature

**74.** The linkage of blockchains enabling transactions between the chains

(*a*) Cloud mining (*b*) chain linking

(*c*) client sharing (*d*) reverse fork

**75.** Cryptocurrency using both Proof-of-Work and Proof-of-Stake systems

(*a*) Bytecoin (*b*) Feathercoin

(*c*) Peercoin (*d*) Primecoin

**76.** Cryptocurrency awarded for performing scientific computations on the Berkeley Open Infrastructure for Network Computing (BOINC) platform.

(*a*) Bytecoin (*b*) Feathercoin

(*c*) Peercoin (*d*) Gridcoin

**77.** Cryptocurrency that uses a Proof-of-Work system based on the search for large prime numbers.

(*a*) Primecoin (*b*) Feathercoin

(*c*) Peercoin (*d*) Gridcoin

# 11

# SUPERCONDUCTIVY AND QUANTUM COMPUTING

**1.** Most sensitive magnetometer
(*a*) fluxgate magnetometer
(*b*) SQUID (Superconducting Quantum Interference Device)
(*c*) Hall probe (*d*) compass needle

**2.** Property of superconductors where external fields are completely expelled
(*a*) Born effect (*b*) Meissner effect
(*c*) Landau effect (*d*) high permeability

**3.** Superconductor with the highest transition temperature $T_c$ where the electrical resistance drops to zero
(*a*) $YBa_2Cu_3O_7$ (YBCO)
(*b*) $Bi_2Sr_2CaCu_3O_{10+x}$ (BSCCO or Bi-2223)
(*c*) Hg
(*d*) $Nb_3Ge$
(*e*) Nb-Ti

**4.** All the superconductors below are Type-II except
(*a*) $YBa_2Cu_3O_7$ (YBCO)
(*b*) $Bi_2Sr_2Ca_2Cu_3O_{10+x}$ (BSCCO or Bi-2223)
(*c*) Hg
(*d*) $Nb_3Ge$
(*e*) Nb-Ti

**5.** Superconductor most commonly used for superconducting magnets in MRI systems and in the Large Hadron Collider (LHC)

(*a*) $YBa_2Cu_3O_7$ (YBCO)

(*b*) $Bi_2Sr_2Ca_2Cu_3O_{10+x}$ (BSCCO or Bi-2223)

(*c*) Hg

(*d*) $Nb_3Ge$

(*e*) Nb-Ti

**6.** In the BSCCO formulas $Bi_2Sr_2Ca_2Cu_3O_{10+x}$ (Bi-2223) and $Bi_2Sr_2CaCu_2O_{8+x}$ (Bi-2212) the subscript $x$ refers to

(*a*) hole-doping by an excess of oxygen atoms

(*b*) impurity replacement of oxygen atoms

(*c*) uncertainty in the relative number of atoms

**7.** In many superconductors higher transition temperatures can be reached

(*a*) with the application of pressure

(*b*) in microgravity

(*c*) in magnetic fields

(*d*) in electric fields

**8.** The mechanisms of Type-I and Type-II superconductivity are the same

(*a*) true

(*b*) false

**9.** What superconductors have a transition temperature above the boiling point of liquid nitrogen (77 K)

(*a*) $YBa_2Cu_3O_7$ (YBCO)

(*b*) BSCCO

(*c*) Hg

(*d*) $Nb_3Ge$

(*e*) Answers (*a*) and (*b*) only

**10.** Phenomenological model of superconductivity

(*a*) Ginzburg-Landau theory

(*b*) Bardeen Cooper Schrieffer (BCS) theory

(*c*) London theory

**11.** Microscopic theory that describes Type-I superconductors

(*a*) Ginzburg-Landau theory

(*b*) Bardeen Cooper Schrieffer (BCS) theory

(*c*) London theory

**12.** In the BCS theory electrons interact with positive ions in the lattice to form
(*a*) lattice defects
(*b*) electron pairs known as Cooper pairs
(*c*) pinning centers for vortices
(*d*) domain boundaries

**13.** Application of superconductors based on the Meissner effect
(*a*) superconducting magnets (*b*) magnetic shields
(*c*) magnetic suspension (*d*) quantum tunneling

**14.** The magnetic screening of superconducting shields is much better than that of copper shielding at
(*a*) dc and very low frequencies (*b*) microwave frequencies
(*c*) radio frequencies (*d*) answers (*b*) and (*c*)

**15.** Metal with high conductivity such as copper, silver, and gold typically don't become superconductors at low temperatures
(*a*) true (*b*) false

**16.** Metals with lower conductivity at room temperature such as lead and tin do become superconductors at temperatures below 20 K.
(*a*) true (*b*) false

**17.** Electrons in Cooper pairs
(*a*) can travel through a superconductor with zero electrical resistivity
(*b*) have opposite spin
(*c*) condense into the same quantum state in a superconductor
(*d*) all the above

**18.** Magnetic field above which Type-II superconductors become normal
(*a*) upper critical field
(*b*) lower critical field
(*c*) intermediate field

**19.** Magnetic field below which Type-II superconductors are perfectly diamagnetic
(*a*) upper critical field
(*b*) lower critical field
(*c*) intermediate field

**20.** The upper and lower critical fields in Type-II superconductors depend on temperature

(*a*) true (*b*) false

**21.** Perfect diamagnetism is characterized by

(*a*) zero relative permeability

(*b*) complete expulsion of magnetic fields (except for a very thin surface layer)

(*c*) high relative permeability

(*d*) answers (*a*) and (*b*) only

**22.** The largest current density above which a superconductor becomes normal

(*a*) is known as the critical current density

(*b*) depends on temperature

(*c*) can reach thousands of A/mm$^2$

(*d*) depends on the external magnetic field

(*e*) all the above

**23.** Many Type-I superconductors

(*a*) have lower transition temperatures compared to Type-II superconductors

(*b*) are elements

(*c*) are typically cooled using liquid helium

(*d*) all the above

**24.** Many Type-II superconductors

(*a*) have higher transition temperatures compared to Type-I superconductors

(*b*) are metal alloys or ceramic compounds

(*c*) can exist in a mixed state where flux pinning is possible

(*d*) all the above

**25.** Above the lower critical field $B_{c1}$ and the below the upper critical field $B_{c2}$

(*a*) the superconductor is in a Meisner state

(*b*) magnetic flux can penetrate a Type-II superconductor

(*c*) the superconductor is normal

(*d*) the heat capacity is minimal

**26.** The coherence length $\xi$ in a superconductor

(*a*) is equal to the size of paramagnetic domains

(*b*) gives a measure of the maximum spatial variation of superconducting electrons

(*c*) is equal to the cube root of the London penetration depth

(*d*) all the above

**27.** The London penetration depth $\lambda_L$ in a superconductor

(*a*) is a measure of the distance that magnetic fields may penetrate a superconductor according to $B = B_0 e^{-\lambda_L x}$ where $B_0$ is the magnetic field at the surface $x = 0$

(*b*) is related the distance that supper currents $J_s$ can flow in a superconductor described by $J_s = J_0 e^{-\lambda_L x}$ where $J_0$ is the current density at $x = 0$

(*c*) is proportional to the square root of the mass of the charge carriers and inversely proportional to their charge.

(*d*) all the above

**28.** The ratio of penetration depth to the coherence length $\kappa = \lambda_L / \xi$

(*a*) $\kappa < 1/\sqrt{2}$ in type-I superconductors

(*b*) $\kappa > 1/\sqrt{2}$ in type-II superconductors

(*c*) $\kappa >> 1$ in high-temperature superconductors (HTS)

(*d*) all the above

**29.** According to the BSC theory, the superconducting energy gap at absolute zero $\Delta(0)$ is related to the transition temperature $T_c$ and the Boltzmann constant $k_B$

(*a*) $\Delta(0) = k_B T_c$

(*b*) $\Delta(0) = 1.764\, k_B T_c$

(*c*) $\Delta(0) = \dfrac{1}{k_B T_c}$

(*d*) the energy gap does not depend on the temperature

**30.** The suppression of the density of states in HTS compounds

(*a*) pseudo gap

(*b*) metastable gap

(*c*) nonlinear gap

(*d*) anomalous gap

**31.** Superconducting magnets made from Nb-Ti are typically cooled in

(*a*) liquid helium
(*b*) liquid nitrogen
(*c*) argon gas
(*d*) either (*b*) or (*c*)

**32.** High field superconducting electromagnets are used

(*a*) for MRI and NMR
(*b*) in particle accelerators such as the Large Hadron Collider (LHC)
(*c*) for plasma storage devices (tokamaks)
(*d*) all the above

**33.** An advantage of using high temperature superconductors (HTS) compared to low temperature superconductors (LTS)

(*a*) HTS compounds can usually be cooled in liquid nitrogen that is much cheaper than liquid helium needed to cool LTS materials
(*b*) HTS ceramics can be formed into wires while LTS materials are more brittle
(*c*) LTS materials are more susceptible to moisture that degrades the superconductor
(*d*) both (*b*) and (*c*) are correct

**34.** A disadvantage of using high temperature superconductors (HTS) compared to low temperature superconductors (LTS)

(*a*) HTS compounds such as YBCO and BSCCO are brittle and more difficult to form wires
(*b*) HTS compounds can degrade and become non-superconducting if exposed to moisture
(*c*) flux noise due to trapped vortices is higher in HTS compounds
(*d*) all the above

**35.** A resistive superconducting fault current limiter becomes normal above a critical current density thus limiting current during a power surge

(*a*) true
(*b*) false

**36.** The magnetic flux threading one flux vortex in a superconductor

(*a*) is $\Phi_0 = 2.07 \times 10^{-15}$ Wb
(*b*) is equal to one flux quantum
(*c*) depends on the external magnetic field
(*d*) answers (*a*) and (*b*) only

**37.** Flux pinning in type-II superconductors

(*a*) enables magnetic suspension where flux tubes are held in place

(*b*) enables higher magnetic fields in superconducting magnets

(*c*) occurs below the upper critical field

(*d*) all the above

**38.** The motion of flux vortices in type-II superconductors

(*a*) is known as flux creep

(*b*) reduces the critical current density

(*c*) is a noise source for SQUID magnetometers

(*d*) all the above

**39.** According to the London theory the supercurrent density $\mathbf{J}_s$

(*a*) is proportional to the vector potential **A**

(*b*) points in the opposite direction of **A**

(*c*) is inversely proportional to the London penetration depth

(*d*) all the above

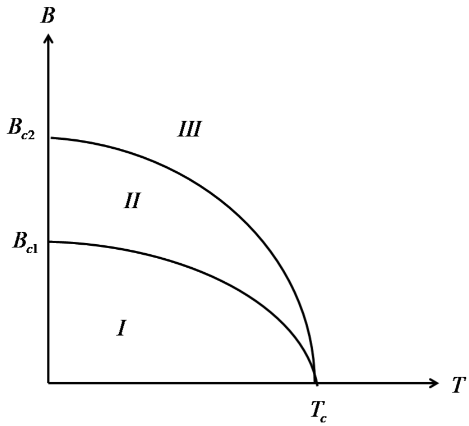


**Fig. Q. 40.**

**40.** Region I of the phase diagram of a Type-II superconductor above corresponds to a

(*a*) Meissner state with B=0 inside the superconductor

(*b*) mixed state consisting of both normal and superconducting regions inside the superconductor

(*c*) normal state corresponding to an absence of superconductivity

**41.** Region II of the phase diagram of a Type-II superconductor above corresponds to a

(*a*) Meissner state with B = 0 inside the superconductor

(*b*) mixed state consisting of both normal and superconducting regions inside the superconductor

(*c*) normal state corresponding to an absence of superconductivity

**42.** Region III of the phase diagram of a Type-II superconductor above corresponds to a

(*a*) Meissner state with B = 0 inside the superconductor

(*b*) mixed state consisting of both normal and superconducting regions inside the superconductor

(*c*) normal state corresponding to an absence of superconductivity

**43.** The superconductor in a magnetic field shown to the right

(*a*) Meissner state with B = 0 inside the superconductor

(*b*) mixed state consisting of both normal and superconducting regions inside the superconductor

(*c*) normal state corresponding to an absence of superconductivity

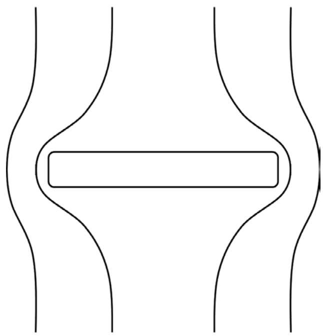

**Fig. Q. 43.**

**44.** The superconductor in a magnetic field shown to the right

(*a*) Meissner state with B=0 inside the superconductor

(*b*) mixed state consisting of both normal and superconducting regions inside the superconductor

(*c*) normal state corresponding to an absence of superconductivity

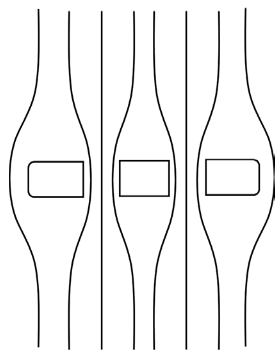

**Fig. Q. 44.**

**45.** The superconductor in a magnetic field shown to the right

(*a*) Meissner state with B = 0 inside the superconductor

(*b*) mixed state consisting of both normal and superconducting regions inside the superconductor

(*c*) normal state corresponding to an absence of superconductivity

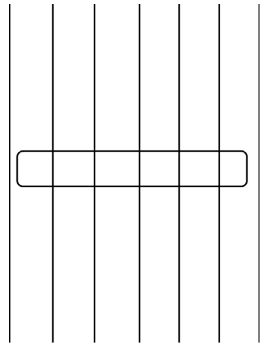

**Fig. Q. 45.**

**46.** Vortex motion and resistive losses in a superconductor can be avoided by

(*a*) cooling the superconductor in a high magnetic field

(*b*) pinning vortices to defects in the superconductor

(*c*) repeatedly warming up and cooling down the superconductor

**47.** The DC Josephson effect describes

(*a*) the creation of Cooper pairs by entanglement

(*b*) quantum tunneling of Cooper pairs across a superconducting-insulating-superconducting (SIS) junction

(*c*) the interaction of superconducting and normal electrons

**48.** The AC Josephson effect results in an AC current across a junction due to a DC voltage across junction with frequency

(*a*) $f = \dfrac{2eV}{h}$ in Hz

(*b*) $f = 483.6 \times 10^{12}V$ in Hz

(*c*) $f = \dfrac{h}{2e}V$ in MHz

(*d*) answers (*a*) and (*b*)

**49.** The inverse AC Josephson effect

(*a*) converts electric field to frequency

(*b*) converts frequency to voltage

(*c*) is the same as the DC Josephson effect

(*d*) only occurs in Josephson junction arrays

**50.** The super current $I(t)$ across a Josephson junction is related to the phase difference $\delta\phi = \phi_1(t) - \phi_2(t)$ in the quantum mechanical wavefunction across the junction and the critical current $I_c$

(*a*) $I(t) = I_c \tanh(\delta\phi)$

(*b*) $I(t) = I_c \exp(\delta\phi)$

(*c*) $I(t) = I_c \sin(\delta\phi)$

(*d*) $I(t) = I_c \sinh(\delta\phi)$

**51.** Sort the following materials in increasing conductivity

(*a*) Graphite, Titanium, Aluminum, Copper, Silver

(*b*) Silver, Copper, Aluminum, Titanium, Graphite

(*c*) Graphite, Silver, Copper, Aluminum, Titanium

(*d*) they all have the same conductivity

**52.** Vortices will move in a Type-II superconductor if

(*a*) if the superconductor is in a Meissner state

(*b*) the pinning force to defects is less than the Lorentz force

(*c*) Van der Waals attraction is nonzero

(*d*) if defects are separated by the London penetration depth

**53.** A DC SQUID consists of a superconducting loop with

(*a*) one Josephson junction

(*b*) two Josephson junctions

(*c*) three Josephson junctions

(*d*) without a Josephson junction

**54.** A RF SQUID consists of a superconducting loop with

(*a*) an array of Josephson junctions

(*b*) one Josephson junction coupled to a tank circuit

(*c*) two Josephson junctions

(*d*) without a Josephson junction

**55.** Linear flux to voltage transduction in a DC SQUID is obtained using a

(*a*) flux locked loop

(*b*) a Josephson junction array

(*c*) a tank circuit

(*d*) a resistive shunt

**56.** The current flowing in a superconducting ring will change

(*a*) periodically with time

(*b*) to oppose a change in magnetic flux through the ring

(*c*) is inversely proportional to the resistance according on Ohm's law

(*d*) current will not flow in a closed superconducting path

**57.** A phonon is

(*a*) photon given off by the annihilation of Cooper pairs

(*b*) a quantum of sound or vibration

(*c*) a voltage fluctuation resulting from the annihilation of flux vortices

(*d*) a quantum of magnetic field inside a superconducting ring

**58.** The two-fluid model of superconductivity describes the flow of

(*a*) Cooper pairs and unpaired normal electrons

(*b*) flux vortices and phonons

(*c*) normal electrons and phonons

(*d*) Cooper pairs and phonons

**59.** AC losses in a superconductor result from unpaired normal electrons that experience electrical resistance

(*a*) true (*b*) false

**60.** Unlike a bit that can be either "0" or "1" the basic unit of quantum information, or qubit,

(*a*) can be in any coherent superposition of 0 or 1

(*b*) is 0, 1, or 2

(*c*) is + 1/2 or – 1/2

(*d*) is + 1/2 , – 1/2 or 0

**61.** Measurement of the state of a qubit would destroy the quantum superposition such that it has a value of either 0 or 1

(*a*) true (*b*) false

**62.** The states $|00\rangle = \begin{pmatrix} 1 \\ 0 \\ 0 \\ 0 \end{pmatrix} |01\rangle = \begin{pmatrix} 0 \\ 1 \\ 0 \\ 0 \end{pmatrix} |10\rangle = \begin{pmatrix} 0 \\ 0 \\ 1 \\ 0 \end{pmatrix} |11\rangle = \begin{pmatrix} 1 \\ 0 \\ 0 \\ 1 \end{pmatrix}$ are basis states of

(*a*) one qubit (*b*) two qubits

(*c*) four qubits

**63.** The states $|0\rangle = \begin{pmatrix}1\\0\end{pmatrix} |1\rangle = \begin{pmatrix}0\\1\end{pmatrix}$ are basis states of
(*a*) one qubit
(*b*) two qubits
(*c*) four qubits

**64.** Given a qubit in a superposition state $|\psi\rangle = a|0\rangle + b|1\rangle$ on the adjacent Bloch sphere
(*a*) probability of measuring the qubits value to be 1 is $|b|^2$
(*b*) probability of measuring the qubits value to be 0 is $|a|^2$
(*c*) The sum of probabilities $|a|^2 + |b|^2 = 1$
(*d*) all the above

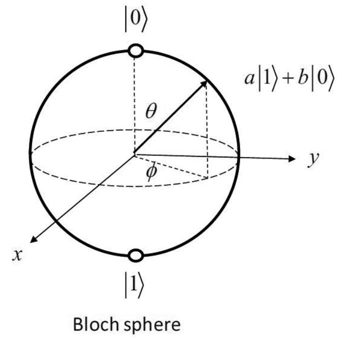


**Fig. Q. 64.**

**65.** The superposition state of a qubit can be represented on Bloch sphere as $|\psi\rangle = \cos\frac{\theta}{2}|0\rangle + e^{j\phi}\sin\frac{\theta}{2}|1\rangle$
(*a*) the value $\theta = 0$ (North pole) on the Block sphere corresponds to $|\psi\rangle = |0\rangle$
(*b*) the value $\theta = \pi$ (South pole) on the Block sphere corresponds to $|\psi\rangle = |1\rangle$
(*c*) Neither (*a*) nor (*b*)
(*d*) Both (*a*) and (*b*)

**66.** Given a qubit is in a superposition state $|\psi\rangle = \frac{j|0\rangle - |1\rangle}{\sqrt{2}}$ the probability of measuring the qubits value to be 1 is
(*a*) $\frac{1}{2}$
(*b*) $\frac{1}{\sqrt{2}}$
(*c*) the same as probability of measuring the qubit value equal to 0
(*d*) both (*a*) and (*c*)

**67.** A qubit may be physically implemented with superpositions states of
(*a*) two spin values of an electron
(*b*) clockwise or counter-clockwise current flow in a superconducting loop
(*c*) two polarization states of a photon
(*d*) all the above

**68.** How many complex numbers are required to specify the state of N qubits

(*a*) N (*b*) $N^2$

(*c*) $2^N$ (*d*) N!

**69.** Given two qubits are in the state $|\psi\rangle = a|00\rangle + 0.2|01\rangle - 0.3|10\rangle - 0.4j\,|11\rangle$ the possible values of $a$ are

(*a*) ±0.773

(*b*) ±0.879

(*c*) ±0.773$j$

(*d*) ±0.879, ±0.879$j$

**70.** Given two qubits are in the state $|\psi\rangle = A\left(2|00\rangle - \sqrt{3}j|01\rangle + \sqrt{3}j|10\rangle - 2|11\rangle\right)$ the value of the normalization constant $A$ is

(*a*) 0.267 (*b*) 1/14

(*c*) 14 (*d*) 0.733

**71.** Generic states such as $|\psi\rangle = \dfrac{1}{\sqrt{2}}\left(|10\rangle + |01\rangle\right)$ are

(*a*) separable

(*b*) not separable

(*c*) entangled

(*d*) not entangled

(*e*) answers (*b*) and (*c*)

**72.** $|\psi\rangle = |\psi_1\rangle|\psi_2\rangle$ is

(*a*) separable

(*b*) not separable

(*c*) entangled

(*d*) not entangled

(*e*) answers (*a*) and (*d*)

**73.** Given the not gate $N = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$ and $|0\rangle = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$ $|1\rangle = \begin{pmatrix} 0 \\ 1 \end{pmatrix}$

(*a*) $N|0\rangle = 1$

(*b*) $N|0\rangle = |1\rangle$

(*c*) $N|1\rangle = |0\rangle$

(*d*) answers (*b*) and (*c*)

**74.** Given the Hadamard gate $H = \frac{1}{\sqrt{2}}\begin{pmatrix} 1 & 1 \\ 1 & -1 \end{pmatrix}$ and $|0\rangle = \begin{pmatrix} 1 \\ 0 \end{pmatrix} |1\rangle = \begin{pmatrix} 0 \\ 1 \end{pmatrix}$

(*a*) $H|0\rangle = \frac{1}{\sqrt{2}}(|0\rangle + |1\rangle)$

(*b*) $H|1\rangle = \frac{1}{\sqrt{2}}(|0\rangle - |1\rangle)$

(*c*) $H|1\rangle = |0\rangle$

(*d*) answers (*a*) and (*b*)

**75.** Given the Pauli-X gate $X = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$ and $|0\rangle = \begin{pmatrix} 1 \\ 0 \end{pmatrix} |1\rangle = \begin{pmatrix} 0 \\ 1 \end{pmatrix}$

(*a*) $X|0\rangle = |1\rangle$

(*b*) $X|1\rangle = |0\rangle$

(*c*) $X|1\rangle = -|0\rangle$

(*d*) answers (*a*) and (*b*)

**76.** Given the Pauli-Y gate $Y = \begin{pmatrix} 0 & -j \\ j & 0 \end{pmatrix}$ and $|0\rangle = \begin{pmatrix} 1 \\ 0 \end{pmatrix} |1\rangle = \begin{pmatrix} 0 \\ 1 \end{pmatrix}$

(*a*) $Y|0\rangle = -j|1\rangle$

(*b*) $Y|1\rangle = j|0\rangle$

(*c*) $Y|1\rangle = -j|0\rangle$

(*d*) answers (*a*) and (*b*)

**77.** The no cloning theorem states that

(*a*) it is not possible to transfer information from a classical to a quantum computer

(*b*) it is not possible to make an exact copy of a quantum superposition state

(*c*) a given quantum computation is not always repeatable

(*d*) all the above

**78.** A classical search algorithm requires on average $N/2$ steps to locate one out of $N$ items. Grover's algorithm requires on the average of

(*a*) $\sqrt{N}$ steps

(*b*) $N^{1/4}$ steps

(*c*) $2^{N-1}$ steps

(*d*) $N/4$ steps

**79.** Given the matrix $A = \begin{pmatrix} 1+j & 1 \\ -1 & 1-j \end{pmatrix}$ the adjoint $A^\dagger$ is

(*a*) $\begin{pmatrix} 1+j & 1 \\ -1 & 1-j \end{pmatrix}$

(*b*) $\begin{pmatrix} 1-j & -1 \\ 1 & 1+j \end{pmatrix}$

(*c*) $\begin{pmatrix} 1-j & 1 \\ -1 & 1+j \end{pmatrix}$

(*d*) $\begin{pmatrix} 1+j & -1 \\ 1 & 1-j \end{pmatrix}$

**80.** The matrix $A$ is Hermitian if $A = A^\dagger$

(*a*) true

(*b*) false

**81.** The quantum entanglement between two particles

(*a*) depends on their separation distance

(*b*) depends on the inverse square of the separation distance

(*c*) does not depend on the separation distance

**82.** Identical particles such as photons become entangled if they are created together in the same process

(*a*) true

(*b*) false

**83.** Entangled particles exist in a superposition state

(*a*) true

(*b*) false

**84.** The existence of hidden variables that predetermine the measurement outcome of a quantum system is ruled out by

(*a*) Moore's law

(*b*) Bell's inequality

(*c*) the Ehrenfest theorem

(*d*) the correspondence principle

(*e*) the principle of complementarity

**85.** The most probable challenge to blockchain technology presented by quantum computers

(*a*) digital currency could be minted in superposition states enabling double spending

(*b*) smart contracts could be entangled impacting contract execution

(*c*) private keys might be hacked from their respective public keys with sufficient computing power

**86.** The resolution to the Einstein, Podolsky and Rosen (EPR) paradox is that

(*a*) measurement of the properties of a particle affects the properties of its entangled twin instantaneously and over an arbitrary large distance

(*b*) hidden variables are needed to rule out "spooky action at a distance"

(*c*) quantum mechanics is an incomplete description of nature

(*d*) special relativity and quantum mechanics are incompatible

**87.** A challenge to quantum computation where degradation and disentanglement of superposition states occurs though interactions with the environment such as by the scattering of photons

(*a*) quantum quenching

(*b*) quantum interference

(*c*) quantum decoherence

(*d*) Unruh-Davies effect

# 12

# *SELF-EXAMINATION*

**1.** To apply the Laplace transform method to solve for the charge $q(t)$ in an $LC$ series circuit driven by a time dependent voltage source according to the differential equation

$$L\frac{d^2q}{dt^2}+\frac{q}{C}=V_0\cos(\omega t)$$

the following initial conditions are needed

(*a*) $q(0)$ (*b*) $\dot{q}(0)$

(*c*) both $q(0)$ and $\dot{q}(0)$ (*d*) neither $q(0)$ nor $\dot{q}(0)$

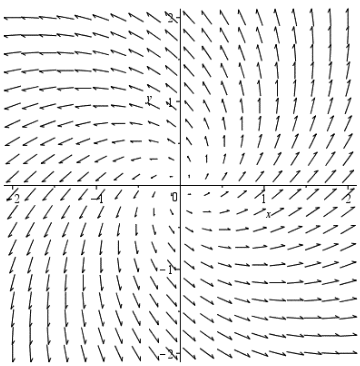

**Fig. Q. 2.**

**2.** The vector field above has

(*a*) curl only (*b*) divergence only

(*c*) both divergence and curl (*d*) neither divergence nor curl

**3.** A semiconductor diode has two separate crystals joined together to form a *p-n* junction.

(*a*) true (*b*) false

**4.** In the D. C. circuit shown below, the electric bulb

(*a*) will light

(*b*) will not light except while the capacitor initially charges

(*c*) will light at regular intervals

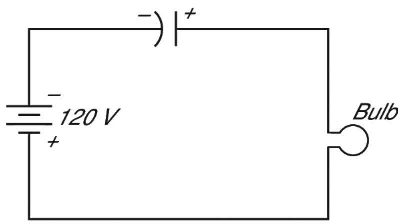


**Fig. Q. 4.**

**5.** Which of the following motors has high starting torque?

(*a*) A.C. series motor (*b*) D.C. series motor

(*c*) Induction motor (*d*) Synchronous motor

**6.** The deflection of hot wire instruments depends on

(*a*) instantaneous values of current

(*b*) average value of current

(*c*) R.M.S. value of current

(*d*) none of the above

**7.** The induction type signal phase energy meter is a

(*a*) ampere-hour meter (*b*) true watt-hour meter

(*c*) wattmeter (*d*) none of the above

**8.** Transformers operating in parallel will share the load depending upon their

(*a*) rating (*b*) leakage reactance

(*c*) efficiency (*d*) per unit impedance

**9.** A 50 micro-ampere meter movement has 500 ohms resistance, what shunt resistance is required to extend the range to 250 micro-ampere?

(*a*) 111.1 ohms (*b*) 125 ohms

(*c*) 250 ohms (*d*) 50 ohms

**10.** The rating of batteries is given by

(*a*) kW (*b*) kVA

(*c*) amp-hours (*d*) MVA

**11.** A television receiver uses 100 watts from a 100 volts power source. The receiver then draws the current from the source equal to

(*a*) 2 A (*b*) 2 mA

(*c*) 1 A (*d*) 10 mA

**12.** When voltage is measured by a multimeter, the multiplier for voltage is

(*a*) a high resistance with the series with the meter movement

(*b*) a high resistance in parallel with the meter movement

(*c*) less than 1 ohm in series with meter movement

(*d*) less than 1 ohm in parallel with the meter movement

**13.** What will be the voltage across the resistance in the circuit shown to the right at resonance?

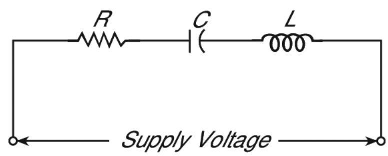


**Fig. Q. 13.**

(*a*) Zero

(*b*) Supply voltage

(*c*) Infinity

(*d*) Equal to the voltage across capacitor

**14.** If a parallel circuit is open in the main line, the current

(*a*) increases in each branch

(*b*) is zero in all branches

(*c*) is zero in the highest resistance branch

(*d*) increases in the branch of lowest resistance

**15.** The ionization current in liquids and gases results from

(*a*) protons (*b*) electrons

(*c*) neutrons (*d*) positive or negative ions

**16.** Sheath is used in cables to

(*a*) prevent moisture from entering the cable

(*b*) provide the strength of the cable

(*c*) avoid the chance of rust on the strands

(*d*) provide proper insulation

**17.** The surge impedance of a ground cable is

(*a*) 60 to 100 ohms (*b*) 40 to 60 ohms

(*c*) 40 to 500 ohms (*d*) 30 to 40 ohms

**18.** The use of a transformer does not influence of performance of the transmission line.

(*a*) true (*b*) false

**19.** The size of a feeder is determined primarily by

(*a*) the current it is required to carry

(*b*) the percentage variation of voltage in the feeder

(*c*) the voltage across the feeder

(*d*) the distance over which the transmission is made

**20.** The "metal clad" is related to

(*a*) amplidyne (*b*) switchgear system

(*c*) synchros (*d*) relays

**21.** When the grid of the triode is negative

(*a*) the plate current will increase

(*b*) the plate current will decrease

(*c*) the plate current will not be affected

(*d*) the grid will attract more electrons

**22.** The input impedance of an ideal operational amplifier is

(*a*) zero (*b*) small

(*c*) infinite (*d*) high

**23.** The energy needed to disrupt the bonds of pure germanium is

(*a*) 1.12 eV (*b*) 0.72 eV

(*c*) 0.6 eV (*d*) 7.5 eV

**24.** The bypass capacitor used in a self-biased amplifier must have

(*a*) very high capacitance

(*b*) very low capacitance

(*c*) low capacitance for low frequency signals

(*d*) high capacitance for high frequency signals

**25.** The collector current in a transistor will

(*a*) increase if the temperature increases

(*b*) decrease if the temperature decreases

(*c*) not change with temperature variation

(*d*) none of the above

**26.** Which of the following devices is half adder?

(*a*) OR gate (*b*) AND gate

(*c*) EXCLUSIVE OR gate (*d*) NAND gate

(*e*) INCLUSIVE OR gate

**27.** Which of the following is a minimum error code?

(*a*) Binary code (*b*) Gray code

(*c*) Excess-3 code (*d*) Octal code

**28.** In the circuit shown to the right some charge is applied across the capacitor at $t = t_0$. What will be the wave shape of current in the circuit?

(*a*) triangle wave

(*b*) Square waveform

(*c*) Oscillatory

(*d*) Exponentially rising

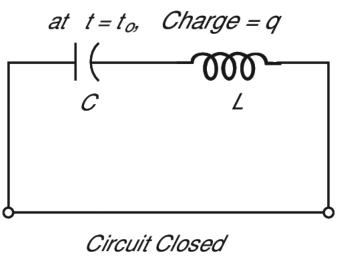


**Fig. Q. 28.**

**29.** A damped oscillation has the equation $I = Ae^{-5t}\sin(314t)$. What will be the frequency of oscillation?

(*a*) 50 Hz (*b*) 75 Hz

(*c*) 100 Hz (*d*) 500 Hz

**30.** For equal output the total current is more in

(*a*) wave winding (*b*) lap winding

(*c*) simplex lap winding (*d*) none of the above

**31.** The series $1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \cdots$ is

(*a*) $e^x$ (*b*) $\sin(x)$

(*c*) $\cos(x)$ (*d*) $\tan(x)$

**32.** $f(x) = \frac{1}{0!} f(a) + \frac{1}{1!} f'(a)(x-a) + \frac{1}{2!} f''(a)(x-a)^2 + \cdots$ is a

(*a*) Taylor series
(*b*) Maclaurin series when $a = 0$
(*c*) divergent series
(*d*) both (*a*) and (*b*)

**33.** In practice, inductance is not used to fabricate the lag network.

(*a*) true (*b*) false

**34.** The electrical inductor is analogous to a

(*a*) spring
(*b*) mass
(*c*) inertia
(*d*) viscous damper
(*e*) none of the above

**35.** The second order derivative of the input signal adjusts

(*a*) the gain of the system
(*b*) the damping of the system
(*c*) the time constant of the system
(*d*) the time constant suppresses the oscillations

**36.** The determinant of the matrix $\begin{pmatrix} \cos\theta & \sin\theta & 0 \\ -\sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{pmatrix}$ is

(*a*) $\cos^2\theta - \sin^2\theta$
(*b*) equal to 1
(*c*) equal to –1
(*d*) not defined

**37.** Type 0 systems have

(*a*) zero steady-state error
(*b*) small steady-state error
(*c*) high gain constant
(*d*) high steady-state error with high gain constant

**38.** The systems which commonly operate under a type 1 system with step-velocity input are

(*a*) servomechanisms

(*b*) regulators

(*c*) fire control servos and tacking radars

(*d*) none of the above

**39.** Compiling a program written in C++ converts the code to machine language

(*a*) true (*b*) false

**40.** If the word length is 12 bits, the number of locations that can be addressed without ambiguity will be

(*a*) 4096 (*b*) 8192

(*c*) $2^{11}$ (*d*) $2^{11} - 1$

(*e*) $2^{11}$

**41.** One byte is equal to

(*a*) 8 bits of information

(*b*) 4 bits of information

(*c*) 6 bits of information

(*d*) 10 bits of information

**42.** The noise factor of an amplifier which contributes no noise will be

(*a*) zero (*b*) one

(*c*) infinity (*d*) less than zero

**43.** Negative feedback is applied to many oscillator circuits to

(*a*) increase output impedance

(*b*) decrease output impedance

(*c*) stabilize frequency

(*d*) stabilize output amplitude

**44.** How many thyratron tubes will be used to have bidirectional rotation of a D.C. motor when the speed of the motor is being controlled?

(*a*) 1 (*b*) 2

(*c*) 3 (*d*) 4

**45.** When signals are summed at an amplifier input with operational feedback
(*a*) the signal potentials are added
(*b*) the signal currents are added
(*c*) either (*a*) or (*b*) are added
(*d*) both (*a*) and (*b*) are added

**46.** A diode circuit with resistance can be used as a limiter by connecting the load
(*a*) in series with diode only
(*b*) in shunt with diode only
(*c*) (*a*) or (*b*)
(*d*) none of the above

**47.** Trace the equivalent decimal number for binary number 111.
(*a*) 10
(*b*) 28
(*c*) 7
(*d*) 9

**48.** The excess 3-code of $(21)_{10}$ is
(*a*) 101100
(*b*) 110100
(*c*) 100011
(*d*) 010101

**49.** Hamming code is used in a digital computer to
(*a*) detect error
(*b*) detect the position
(*c*) detect the error and correct it
(*d*) either (*a*) or (*c*)

**50.** A Zener diode can operate when reverse biased
(*a*) true
(*b*) false

**51.** The breakdown voltage for most diodes is approximately
(*a*) –50 to –100 volts
(*b*) –1 to +1 volts
(*c*) 1 to 9 volts
(*d*) 0.7 V

**52.** What forward voltage is required across a silicon diode to make it conduct?
(*a*) 0.3 volts
(*b*) 0.5 volts
(*c*) 0.7 volts
(*d*) 0.3 volts to 0.7 volts

**53.** The material used for a fuse must have
(*a*) low melting point and low specific resistance
(*b*) low melting point and high specific resistance
(*c*) high melting point and low specific resistance
(*d*) low melting point with any specific resistance

**54.** If a fault occurs near the impedance relay, the *V/I* ratio will be
(*a*) lower than if the fault occurs away from the relay
(*b*) higher than if the fault occurs away from the relay
(*c*) constant for all distances
(*d*) none of the above

**55.** The earthing transformer is used
(*a*) to avoid harmonics in the transformer
(*b*) to provide artificial neutral earthing where the neutral point of a three-phase system is not possible
(*c*) to improve the current capacity of the neutral wire
(*d*) none of the above

**56.** If 5 amperes current is allowed to accumulate charge for 10 seconds the resultant charge equals
(*a*) 2 coulombs (*b*) 10 coulombs
(*c*) 50 coulombs (*d*) 50 amperes
(*e*) 10 amperes

**57.** Dielectric loss can be measured by a
(*a*) energy meter (*b*) Wheatstone bridge
(*c*) electrostatic wattmeter (*d*) none of the above

**58.** The alloying element which really makes steel corrosion resistant is
(*a*) chromium (*b*) magnesium
(*c*) nickel (*d*) molybdenum

**59.** Mu-metal is a ferromagnetic alloy composed of mostly nickel and iron with
(*a*) low permeability (*b*) low permittivity
(*c*) extremely high permeability (*d*) extremely high permittivity

**60.** The armature torque of a D.C. shunt motor is proportional to
(*a*) armature current only
(*b*) field flux only
(*c*) armature current and flux both
(*d*) none of the above

**61.** The retardation test is applicable to shunt motors and generators and is used to find

(*a*) stray losses (*b*) copper losses
(*c*) eddy current losses (*d*) friction losses

**62.** Which of the following statements is correct?

(*a*) An induction coil works off A.C.
(*b*) A transformer is used to step up the potential of D.C.
(*c*) The output current of an induction coil is nearly unidirectional
(*d*) In stepdown transformers the transformation ratio is always greater than one

**63.** If two resistances are connected in parallel and each dissipates 10 watts, the total power supplied by the voltage source equals

(*a*) 5 watts (*b*) 10 watts
(*c*) 20 watts (*d*) 100 watts

**64.** If a wire conductor is doubled in its length with the original area of cross-section the resistance of the wire is

(*a*) doubled
(*b*) half of the original resistance
(*c*) equal to the original resistance
(*d*) more than original resistance

**65.** The use of an integral-error control is superior to a derivative error control as far as steady state errors are concerned.

(*a*) true (*b*) false

**66.** Size of the transformer core will depend on

(*a*) frequency (*b*) flux density of the core
(*c*) area of the core (*d*) (*a*) and (*b*) both

**67.** The size of the transformer core will

(*a*) increase if frequency increases
(*b*) decrease if frequency increases
(*c*) not be affected by frequency variation
(*d*) increase if flux density increases

**68.** The waist products of polymer electrolyte fuels cells are
(*a*) CO and water
(*b*) water and heat
(*c*) $CO_2$ and water
(*d*) chlorofluorocarbons and HF

**69.** Thermocouple for extremely low temperatures used in cryogenic applications
(*a*) Type T Thermocouple (Copper/Constantan)
(*b*) Type B Thermocouple (Platinum Rhodium)
(*c*) (*a*) and (*b*) both

**70.** Thermocouple for very high temperature applications
(*a*) Type T Thermocouple (Copper/Constantan)
(*b*) Type B Thermocouple (Platinum Rhodium)
(*c*) (*a*) and (*b*) both

**71.** Eddy currents are used for
(*a*) induction heating
(*b*) detecting cracks in conducting materials
(*c*) electromagnetic braking
(*d*) all the above

**72.** Eddy currents are reduced in transformers by
(*a*) laminating magnetic cores
(*b*) using current cancellation by opposing magnetic fields
(*c*) cooling the transformer cores
(*d*) using three-phase current

**73.** Eddy currents are generated by
(*a*) time changing electric fields
(*b*) alternating voltages
(*c*) time changing magnetic fields
(*d*) movement of charge carriers due to temperature gradients

**74.** The AC current density in a conductor
(*a*) decreases linearly from its value at the surface
(*b*) decreases exponentially from its value at the surface
(*c*) maintains a constant magnitude in a conductor with varying phase
(*d*) maintains a constant magnitude in a conductor with constant phase

**75.** The fringe effect of a parallel plate capacitor

(*a*) results in a higher capacitance compared to the theoretical value

(*b*) results in a lower capacitance compared to the theoretical value

(*c*) has no influence on capacitance

**76.** A lock-in amplifier

(*a*) detects a signal with a known frequency in the presence of background noise

(*b*) multiplies the input signal by reference signal with a known frequency

(*c*) is used to fix the output frequency of an amplifier

(*d*) answers (*a*) and (*b*)

**77.** Electronic noise with a $1/f^{\alpha}$ power spectral density with $\alpha \approx 1$

(*a*) $1/f$ noise

(*b*) pink noise

(*c*) flicker noise

(*d*) all the above

**78.** The term "overreach" is related to

(*a*) transistors

(*b*) diodes

(*c*) relays

(*d*) flip-flops

(*e*) circuit breakers

**79.** The Lorentz force law states that the force acting on a charge $q$ moving with velocity $\mathbf{v}$ in electric $\mathbf{E}$ and magnetic $\mathbf{B}$ fields points

(*a*) in the direction of $\mathbf{E}$ only

(*b*) perpendicular to both $\mathbf{E}$ and $\mathbf{B}$

(*c*) parallel to $\mathbf{B}$ only

(*d*) in the direction $\mathbf{E} + \mathbf{v} \times \mathbf{B}$

**80.** The magnetic field inside a superconductor is

(*a*) zero

(*b*) low

(*c*) high

(*d*) negligible but not zero

**81.** The force on an electric dipole with moment $\mathbf{p}$ in a nonuniform electric field $\mathbf{E}$

(*a*) $\mathbf{p} \times \mathbf{E}$

(*b*) $-\mathbf{p} \cdot \mathbf{E}$

(*c*) $(\mathbf{p} \cdot \nabla)\mathbf{E}$

(*d*) zero

**82.** In which of the following machines will be preferred to charge the batteries?

(*a*) Series generator

(*b*) Series motor

(*c*) Shunt generator

(*d*) Compound generator

(*e*) Shunt motor

(*f*) None of the above

**83.** The large number of slots in an induction motor
(*a*) provides better overload capacity
(*b*) reduces overload capacity
(*c*) provides a bigger size motor
(*d*) reduces the size of the motor

**84.** Why are D.C. motors preferred for traction applications?
(*a*) The torque is proportional to the armature current
(*b*) The torque is proportional to the square root of the armature current
(*c*) The speed is inversely proportional to the torque and the torque is proportional to the square of armature current
(*d*) Torque and speed are inversely proportional to the armature current

**85.** The electric current in a motor generates
(*a*) heat only
(*b*) magnetic field
(*c*) (*a*) and (*b*)
(*d*) power only

**86.** The good power factor of an induction motor can be achieved if the average flux density in the air gap is
(*a*) large
(*b*) small
(*c*) infinity
(*d*) absent

**87.** If the speed of a D.C. shunt motor is increased, the back E.M.F. of the motor will
(*a*) decrease
(*b*) increase
(*c*) remain same
(*d*) increase then decrease

**88.** Which of the following generating machines will offer constant voltage on all loads?
(*a*) A separately excited generator
(*b*) A self-excited generator
(*c*) A level compound generator
(*d*) All the above machines

**89.** If the resistance of the field winding of a D.C. generator is increased, then the output voltage
(*a*) increases
(*b*) decreases
(*c*) remains constant
(*d*) decreases proportionally to the resistance of field winding

**90.** Separately excited motors have

(*a*) excitation which is independent of load current

(*b*) the advantage over self-excited motor that it can be utilized for zero volt to its maximum rated capacity

(*c*) (*a*) and (*b*) both

(*d*) none of them

**91.** The field current control of a D.C. shunt motor will provide

(*a*) constant current drive
(*b*) constant voltage drive
(*c*) constant HP drive
(*d*) constant torque drive

**92.** The armature voltage control of a D.C. motor provides

(*a*) constant current drive
(*b*) constant voltage drive
(*c*) constant HP drive
(*d*) constant torque drive

**93.** Which of the following generators will be preferred if they are required to be run in parallel?

(*a*) Series generators
(*b*) Shunt generators
(*c*) Shunt and series generators
(*d*) Compound generators

**94.** Which material is used to insulate the segments of a commutator?

(*a*) Fiber glass
(*b*) Plastic
(*c*) Mica
(*d*) PVC

**95.** Which of the following methods of speed control of a D.C. machine will offer minimum efficiency?

(*a*) Armature control method
(*b*) Field control method
(*c*) Voltage control method
(*d*) All of the above methods

**96.** The brushes of electrical machines are made of

(*a*) carbon
(*b*) copper
(*c*) cast iron
(*d*) steel

**97.** If a D.C. motor designed for 45°C ambient temperature is to be used for 55°C ambient temperature, then the motor

(*a*) is to be derated by a factor recommended by the manufacturer and the next higher HP motor selected

(*b*) can be used for 55°C ambient also

(*c*) of lower HP should be selected

(*d*) of high speed should be selected

**98.** Which method of braking will be selected if the highest braking torque is required?

(*a*) Plugging

(*b*) Dynamic braking

(*c*) Counter current braking

(*d*) Regenerative braking

(*e*) (*a*) or (*c*)

**99.** If we must control the speed of a 150 HP D.C. motor from zero to 1000 R.P.M. having rated speed of 1500 R.P.M., then it will be preferred to

(*a*) select a motor of 150 HP, 1500 R.P.M.

(*b*) select a motor of 1.5 × 150 HP, 1500 R.P.M.

(*c*) select a motor of 150 HP, 750 R.P.M.

(*d*) select a motor of 75 HP, 1500 R.P.M.

**100.** If the terminals of armature of a D.C. machine are interchanged, this action will offer the following kind of braking:

(*a*) Plugging
(*b*) Regenerative
(*c*) Dynamic braking
(*d*) Any of the above

**101.** In which of the following methods of speed control is commutation unsatisfactory?

(*a*) Field control method

(*b*) Voltage control method

(*c*) Armature current control method

(*d*) All of the above methods

**102.** Plugging gives the

(*a*) smallest torque braking
(*b*) highest torque braking
(*c*) zero torque braking
(*d*) none of them

**103.** Dynamic braking can be used for

(*a*) series motors
(*b*) shunt motors
(*c*) compound motors
(*d*) all the above motors

**104.** How many cycles of alternating current will be generated in one revolution of an 8-pole synchronous alternator?

(*a*) 10 cycles
(*b*) 4 cycles
(*c*) 8 cycles
(*d*) 16 cycles

**105.** Which of the following statements is correct?

(*a*) A single-phase induction motor has very high starting torque

(*b*) A single-phase induction motor has zero starting torque

(*c*) A single-phase motor starting torque is as good as that of a 3 phase induction motor

(*d*) A single-phase motor has very small torque but greater than zero

**106.** Which of the synchronous alternators will complete 1080 electrical degrees in one revolution?

(*a*) 8 pole synchronous alternator

(*b*) 6 pole synchronous alternator

(*c*) 4 pole synchronous alternator

(*d*) 10 pole synchronous alternator

**107.** How many poles will be required if an alternator runs at 1500 R.P.M. and gives frequency of 50 Hz?

(*a*) 8 poles (*b*) 6 poles

(*c*) 4 poles (*d*) 2 poles

**108.** For which of the following alternators, will the distribution factor be 0.96?

(*a*) Three phase alternator, 4 pole wound on 72 slots core

(*b*) Three phase alternator, 8 pole wound on 80 slots core

(*c*) Three phase alternator, 8 pole wound on 72 slots core

(*d*) Three phase alternator, 6 pole wound on 72 slots core

**109.** Generators are running in parallel. One generator may run as a motor for the following reasons:

(*a*) The speed of that generator is increased

(*b*) The direction of that generator is reversed

(*c*) That generator takes a large share of loads

(*d*) The field of that generator is weakened

**110.** Which of the following instruments will have same calibration on A.C. and D.C.?

(*a*) Moving coil instruments

(*b*) Moving iron instruments

(*c*) Induction type instruments

(*d*) Electrodynamometer instruments

**111.** The internal resistance of an instrument is normally based on the criterion that
(*a*) it draws large power
(*b*) the instrument can be connected in any circuit
(*c*) it does not change the parameters of the circuit to which it is connected
(*d*) it draws minimum power for its operation

**112.** The accuracy of measuring instruments of high frequency
(*a*) decreases (*b*) becomes zero
(*c*) increases (*d*) does not change

**113.** What will be the reading of megger if the measuring terminals are open circuited?
(*a*) Infinity (*b*) 500 ohms
(*c*) Zero (*d*) 10,000 ohms

**114.** Standard resistors are generally fabricated out of
(*a*) platinum (*b*) copper
(*c*) meganin (*d*) chromium

**115.** Generally, how many turns are used in the primary of CT?
(*a*) 2 (*b*) 1 to 5
(*c*) 5 to 10 (*d*) 10 to 40

**116.** The dynamic error of an instrument is defined as
(*a*) the difference in full scale reading and actual readings
(*b*) the difference in actual and indicated values
(*c*) the difference in two consecutive readings of the scale
(*d*) none of them

**117.** Which method will be used for precision measurement of resistance?
(*a*) Voltmeter method (*b*) Potentiometer method
(*c*) Multimeter method (*d*) Megger test
(*e*) Bridge method (*f*) CRO method

**118.** CT is used to
(*a*) step down the current
(*b*) step up the current
(*c*) step up the current but step down the voltage
(*d*) measure very high current

**119.** Radio frequency can be measured with a
(*a*) resonance frequency meter
(*b*) Weston frequency meter
(*c*) heterodyne frequency meter
(*d*) any of the above

**120.** A pulse transformer employs a
(*a*) air core
(*b*) iron core
(*c*) ferrite core
(*d*) none of these

**121.** Which of the following recorders are known as null recorders?
(*a*) strip chart recorders
(*b*) galvanometric recorders
(*c*) potentiometric recorders
(*d*) any of the above

**122.** The inductance of the current coil of a wattmeter is kept
(*a*) as high as possible
(*b*) as low as possible
(*c*) 10 H
(*d*) 1 to 10 H

**123.** Which of the following potentiometers is supposed to have infinite resolution?
(*a*) Resistance potentiometer
(*b*) Deposited film potentiometer
(*c*) Kelvins potentiometer
(*d*) None of these

**124.** The potentiometer coil of a wattmeter is designed for minimum inductance to
(*a*) achieve high phase difference between current and voltage
(*b*) keep current and voltage in the same phase
(*c*) minimize the reactance of the coil
(*d*) increase the reactance of the coil

**125.** The inductance of the following circuit across A and B will be
(*a*) $L_1 + L_2 - M$
(*b*) $L_1 + L_2 + 2M$
(*c*) $L_1 + L_2 + M^2 - L_1L_2$
(*d*) $\dfrac{(L_1L_2 - M^2)}{(L_1 + L_2 + 2M)}$

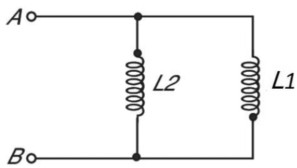

**Fig. Q. 125.**

**126.** Which of the following coils will have large resonant frequency?

(*a*) A coil with large distributed capacitance

(*b*) A coil with low distributed capacitance

(*c*) A coil with large resistance

(*d*) A coil with low resistance

**127.** What will be the magnetic field in the toroid having $N$ number of turns, diameter $d$ and current $I$?

(*a*) $\frac{1}{2}\pi\frac{NI}{d}$

(*b*) $\frac{1}{r}\frac{1}{\pi}\frac{NI}{d}$

(*c*) $\frac{\pi_0}{\pi}\frac{NI}{d}$

(*d*) $\frac{\mu_0 IN}{\pi d_2}$

**128.** A typical radar antenna will have a bandwidth of

(*a*) 4°

(*b*) 6°

(*c*) 1°

(*d*) 2°

**129.** Which material will one choose for a transformer core if the transformer must work at microwave frequency?

(*a*) Supermalloy

(*b*) Silicon

(*c*) Ferrites

(*d*) Iron

**130.** A coil is wound on an iron core which carries current $I$. The self-induced voltage in the coil is not affected by

(*a*) change of the number of turns of the coil

(*b*) the resistance of the magnetic path

(*c*) variation in voltage to the coil

(*d*) variation in coil current

**131.** Which of the following statements is correct?

(*a*) The inductance of a coil carrying a constant D.C. current will increase the current

(*b*) The inductance of a coil carrying a constant D.C. current will not affect the current

(*c*) The inductance of a coil carrying a constant D.C. current will decrease the current

(*d*) The inductance of a coil carrying a constant D.C. current will change the current into pulses

**132.** If a sinusoidal wave has a frequency of 50 Hz with 15 A R.M.S. current which of the following equations represents this wave?

(*a*) 15 sin 50 $t$ (*b*) 30 sin 25 $t$

(*c*) 42.42 sin 25 $t$ (*d*) 21.21 sin 314 $t$

**133.** Maxwell's equation in matter is $\nabla \times \mathbf{H} = \mathbf{J} + \dfrac{\partial \mathbf{D}}{\partial t}$ where

(*a*) $\mathbf{B} = \mu\mathbf{H}$

(*b*) $\mathbf{D} = \varepsilon\mathbf{E}$

(*c*) $\partial\mathbf{D}/\partial t$ is Maxwell's displacement current.

(*d*) all the above

**134.** A transformer is designed to achieve 240 V A.C. 50 Hz supply with input of 3.3 kV, 50 Hz and output of 415 V 50 Hz. The secondary of the transformer will have

(*a*) three phase 3 wire system

(*b*) three phase 2 wire system

(*c*) three phase 6 wire system

(*d*) three phase 4 wire system

**135.** For which of the following materials should the net magnetic moment be zero?

(*a*) Ferrimagnetic materials

(*b*) Diamagnetic materials

(*c*) Antiferrimagnetic materials

(*d*) Antiferromagnetic materials

**136.** Hysteresis losses do not depend on

(*a*) volume of material (*b*) magnetic field

(*c*) frequency (*d*) any of them

(*e*) none of these

**137.** Which of the following precautions will be taken first if a man suffers from electric shock?

(*a*) Switch off the power supply

(*b*) Call the doctor

(*c*) Make him lie on the ground

(*d*) Provide him with glucose

(*e*) Lie down on the ground and provide him artificial respiration

**138.** Which of the following statements is correct?

(*a*) The conductivity of ferromagnetic material is better than ferrites

(*b*) The conductivity of ferrites is better than ferromagnetic materials

(*c*) The conductivity of ferrites is same as that of ferromagnetic materials

(*d*) The conductivity of ferrites is very high

**139.** The effective power in a pure capacitive circuit shall be

(*a*) energy stored by capacitor

(*b*) positive

(*c*) half of the energy stored

(*d*) zero

**140.** In which materials are the spin moments associated with two sets of atoms aligned antiparallel to each other?

(*a*) Ferrimagnetic materials

(*b*) Antiferromagnetic materials

(*c*) Ferrites

(*d*) Ferromagnetic materials

**141.** Manganese dioxide acts as a dipole riser in a

(*a*) lead acid battery

(*b*) carbon zinc cell

(*c*) dry cell

(*d*) zinc electrolyte cell

**142.** The standing wave ratio of 4 will be applicable to a

(*a*) 80 ohms transmission line feeding to a load of 320 ohms

(*b*) 20 ohms transmission line feeding to a load of 100 ohms

(*c*) 100 ohms transmission line feeding to a load of 300 ohms

(*d*) 50 ohms transmission line feeding to a load of 500 ohms

**143.** Which of the following statements is correct?

(*a*) A polarizer converts the produced hydrogen in water in a carbon zinc battery

(*b*) A depolarizer converts the produced hydrogen in water in a carbon zinc battery

(*c*) Carbon power converts the produced hydrogen in water in a carbon zinc battery

(*d*) Zinc chloride converts the produced hydrogen in water in a carbon zinc battery

**144.** A network which does not have either voltage source or current source is called a

(*a*) active network

(*b*) passive network

(*c*) resistive network

(*d*) resistive and inductive network

**145.** Which of the following transmission lines has a reflection coefficient of minus one?

(*a*) Open circuit transmission line

(*b*) Short circuit transmission line

(*c*) Long transmission line

(*d*) Short transmission line

**146.** If the capacitance of a transmission line is increased, the transmitted power will

(*a*) remain

(*b*) increase

(*c*) decrease

(*d*) tend to zero at the receiving end

**147.** If the inductance of a transmission line is decreased, the power transmitted will

(*a*) increase

(*b*) decrease

(*c*) will not change

(*d*) tend to be very high at the receiving end

**148.** The difference between the sending end voltage and the receiving end voltage of a transmission line controls

(*a*) active power

(*b*) reactive power

(*c*) frequency

(*d*) none of these

**149.** Which of the following statements is correct?

(*a*) Arc in a circuit breaker is interrupted at maximum current

(*b*) Arc in a circuit breaker is interrupted at zero current

(*c*) Arc in a circuit breaker is interrupted at maximum voltage

(*d*) Arc in a circuit breaker is interrupted at minimum voltage

**150.** The sag of a transmission line with a 50 m span is 1 m. What will be the sag if the height of the transmission line is increased by 20%?

(*a*) 1.2 m (*b*) 2 m
(*c*) 1.25 m (*d*) 1 m

**151.** For which of the following increased values of horizontal tension will there be an increase of 20% in tension of the line for a certain span?

(*a*) 50% (*b*) 10%
(*c*) 5% (*d*) 20%

**152.** Strain type insulators are used when

(*a*) the transmission line is dead ended
(*b*) the direction of the transmission line changes
(*c*) the transmission line is short
(*d*) (*a*) or (*b*)

**153.** Power loss is a very important factor for designing the

(*a*) feeder (*b*) transmission line
(*c*) motor (*d*) generator

**154.** An electrical transducer gives an output when input applied to the transducer is zero. The output of the transducer in such a condition is known as

(*a*) zero balance (*b*) offset
(*c*) zero unbalance (*d*) (*a*) or (*b*)

**155.** A platinum resistance thermometer can be used to measure the temperature up to

(*a*) 0–500°C (*b*) 0–100°C
(*c*) 0–800°C (*d*) 0–150°C

**156.** Which of the following does not require an auxiliary circuitry if used as a transducer?

(*a*) Capacitance (*b*) Photocell
(*c*) Resistance (*d*) Inductance

**157.** If the output of an electrical pressure transducer is 4–20 mA corresponding to 0–50 kg/cm$^2$, then the span of the transducer in terms of current will be

(*a*) 20 mA (*b*) 24 mA
(*c*) 16 mA (*d*) 50 mA

**158.** How is the response of thermocouple output affected if a thermosheath is used for its protection?

(*a*) The response time of the thermocouple decreases

(*b*) The response time of the thermocouple increases

(*c*) The millivolt output to the thermocouple decreases

(*d*) The millivolt output to the thermocouple increases

**159.** Which of the following alloys are best suited for bimetallic thermometers?

(*a*) Steel and invar
(*b*) Steel and tin
(*c*) Invar and tin
(*d*) Inconel and tin

**160.** If the range of a voltmeter is –100 V to +100 V then the span of the voltmeter will be

(*a*) 100 V
(*b*) zero
(*c*) 200 V
(*d*) 50 V

**161.** An ammeter is required to read 200 A current whose range is 0–300 A. The actual reading of the ammeter falls between 197 and 203 A. What is the accuracy of the ammeter?

(*a*) 5% FSD
(*b*) 2% FSD
(*c*) 1% FSD
(*d*) 3% FSD

**162.** Which of the following statements will best define hysteresis?

(*a*) The dead-band

(*b*) Output variation of an instrument with different inputs

(*c*) The inaccuracy of scale reading of an instrument

(*d*) The variation of the instrument reading with same input being applied in ascending and descending mode

**163.** A load cell cannot be used to measure

(*a*) pressure
(*b*) weight
(*c*) level
(*d*) volume

**164.** Which of the following voltmeters will have negligible effect on the circuit is being tested for voltage?

(*a*) A voltmeter with low resistance

(*b*) A voltmeter with very high internal resistance

(*c*) A voltmeter with zero internal resistance

(*d*) None of the above

**165.** A moving iron ammeter is connected in a circuit shown to the right. What happens if the terminal connections of the ammeter are interchanged?

(*a*) It will not indicate the reading

(*b*) It will indicate the same reading

(*c*) The pointer will be deflected in the opposite direction

(*d*) It will indicate the full-scale reading

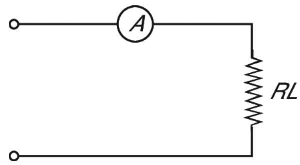


**Fig. Q. 165.**

**166.** Ultrasonic level sensors are used for measuring the level of material in a hopper only when the material is

(*a*) solid (*b*) liquid

(*c*) (*a*) or (*b*) (*d*) none of them

**167.** A continuous ultrasonic level controller functions on the principle of

(*a*) obstruction of ultrasonic sound by material

(*b*) transmission of ultrasonic sound and reflection of the same by materials to the sensor

(*c*) capacitance change in the hopper

(*d*) sound intensity

**168.** Which of the following level sensors is most economical?

(*a*) Capacitance type

(*b*) Electromechanical type

(*c*) Ultrasonic type

(*d*) Gamma rays type

**169.** If the capacitive method of level measurement of the solid material in a tank is used, which of the following parameters is variable?

(*a*) Distance between probe and wall of tank

(*b*) Area of the probe

(*c*) Dielectric formed by material between probe and wall of the tank

(*d*) Dielectric of air

**170.** Tuning fork type vibration limit switches are used to measure

(*a*) pressure (*b*) load

(*c*) vibration (*d*) level

**171.** If the electronic pressure transmitter is calibrated for a range –25 to +100 mm Wg, the transmitter has

(*a*) elevated zero range

(*b*) suppressed zero range

(*c*) suppressed span range

(*d*) elevated span range

**172.** A thermistor is used to sense the temperature. What happens if the temperature increases gradually?

(*a*) The resistance of the thermistor increases

(*b*) The resistance of the thermistor decreases

(*c*) The thermistor expands gradually

(*d*) The thermistor does not sense any decrease in temperature

**173.** Thermistors are ideally suited to measure

(*a*) temperature over short spans

(*b*) temperature over long spans

(*c*) temperature of bearings of motors

(*d*) temperature of motor windings

**174.** Why we do not require the compensation for extension wire resistance which is used with thermistor?

(*a*) The values of thermistor resistance vary up to the milliohm range

(*b*) The values of thermistor resistance vary up to the megaohm range

(*c*) The resistance of extension wire is very large in comparison to the resistance of thermistor

(*d*) Thermistors are normally self-compensated

**175.** Four leads in the RTD are used with

(*a*) single element RTD

(*b*) dual element RTD

(*c*) three element RTD

(*d*) four element RTD

**176.** Which of the following materials for thermocouple sheaths withstand the highest temperature?

(*a*) Alumina (*b*) Tantalum

(*c*) Zirconia (*d*) Molybdenum

**177.** If equipment is incapable of releasing sufficient electrical energy under normal or abnormal conditions to cause ignition of a specific hazardous atmospheric mixture, then the equipment

(*a*) is called extrinsically safe

(*b*) is called intrinsically safe

(*c*) will have explosion proof housing

(*d*) will have flame proof housing

**178.** Flow of liquid or gas in a pipeline is

(*a*) proportional to pressure in the pipeline

(*b*) proportional to differential pressure across the restriction introduced in the pipeline

(*c*) inversely proportional to the square root of differential pressure across the restriction in pipeline

(*d*) proportional to the square root of differential pressure across the restriction in the pipeline

**179.** Which flow element will be used to measure flow of fluid which is not enclosed in a pipe or duct?

(*a*) Venturimeter (*b*) Flow nozzle

(*c*) Intake done (*d*) Pitot tube

**180.** The downscale reading of a wattmeter can be changed to upscale by

(*a*) interchanging voltage coil terminals

(*b*) interchanging current coil terminals

(*c*) interchanging voltage and current coil terminals

(*d*) (*a*) or (*b*)

**181.** Which of the following parameters cannot be measured by a ring balance meter?

(*a*) Differential pressure (*b*) Pressure

(*c*) Mass-flow rate (*d*) Flow

**182.** Which of the following properties are important while selecting alloys for bimetallic thermometers?

(*a*) Coefficient of expansion

(*b*) Electrical conductivity

(*c*) Modulus of elasticity

(*d*) All above

**183.** Variation in ambient temperature will affect the accuracy of

(*a*) RTD (*b*) thermocouples
(*c*) thermistors (*d*) thermometers

**184.** A thermistor can be used to control the

(*a*) level of water in tank (*b*) altitude
(*c*) temperature (*d*) all above

**185.** Which of the following sources of error may exist when the temperature of a body is measured with a contact method?

(*a*) Testing body has high mass
(*b*) Testing body is affected chemically by a hot body
(*c*) There is a condensation of water on the testing body
(*d*) All of the above

**186.** The presence of $CO_2$ in the intervening space of radiation pyrometers will

(*a*) affect the reading of the pyrometer
(*b*) not affect the reading of the pyrometer
(*c*) make the pyrometer read more than the desired value of temperature
(*d*) increase the sensitivity of the pyrometer

**187.** The pressure measured above total vacuum is called

(*a*) absolute pressure (*b*) atmospheric pressure
(*c*) barometric pressure (*d*) gauge pressure

**188.** When a pressure transmitter is used to sense the pressure of fluid flowing in a pipe, it transmits

(*a*) the absolute pressure
(*b*) the gauge pressure
(*c*) the atmospheric pressure
(*d*) any of the above

**189.** The pressure of 1 kg/cm$^2$ is equivalent to

(*a*) 1 bar (*b*) 0.1 bar
(*c*) 10 bars (*d*) 100 bars

**190.** A nucleonic level gauge operates on the principle of

(*a*) gamma ray absorption (*b*) ultrasonic waves
(*c*) microwave waves (*d*) radiation method

**191.** What is the source of tracing the parameter on the paper in a light beam galvanometric recorder?

(*a*) Pen (*b*) Stylus

(*c*) Fiber tip stylus

(*d*) Reflected light from a mirror incorporated in the recorder

**192.** Galvanometric recorders have better speed response than potentiometric recorders.

(*a*) true (*b*) false

**193.** Pilot switches are operated

(*a*) manually

(*b*) in response to specified conditions of an actuating quantity

(*c*) automatically

(*d*) none of the above

**194.** Which of the following are classified as pilot switches?

(*a*) Pressure switch (*b*) Position switch

(*c*) Level switch (*d*) All of them

**195.** Active integrators can be used in

(*a*) compensating networks

(*b*) electronic controllers

(*c*) phase compensation

(*d*) all the above applications

**196.** The pressure taps for measuring flow of gases should preferably be

(*a*) raised above 0.5 meters vertically up from the flow element and a continuous slope of not less than 1 : 10 to the transducer should be given

(*b*) lowered 0.5 meters vertically down from the flow element and then a continuous slope of 1 : 10 to the transducer should be given

(*c*) raised by 1 meter vertically up from flow element

(*d*) none of the above

**197.** The distance of the transducer from the pressure tape should approximately be

(*a*) 10–15 meters (*b*) 20–30 meters

(*c*) 20 meters (*d*) 5 meters

**198.** Which of the following materials will be preferred for condensation pots if used at a pressure of 16 kg/cm$^{2?}$

(*a*) Cast iron
(*b*) Carbon steel
(*c*) Stainless steel
(*d*) Molybdenum

**199.** Which of the following devices will be used to protect pressure gauges or transmitters if the same are used in a medium of tarry liquids?

(*a*) Condensation pot
(*b*) Seal pot
(*c*) 3-way manifold value
(*d*) Isolation value

**200.** What is the binary material if referred to the analysis of a compound?

(*a*) If a compound is composed of many components and if only one of a them is affected by the method of analysis, then the compound is considered binary
(*b*) If the material exhibits two properties while analysing
(*c*) If two materials are used to get the material affected being analyzed
(*d*) If the material is analyzed by computer

**201.** The maximum current which can pass through 10 k-ohms and 0.25 watts resistor is

(*a*) 16 mA
(*b*) 20 mA
(*c*) 5 mA
(*d*) 50 mA

**202.** The magnetic saturation of iron means

(*a*) weakening of the magnetic field
(*b*) the losses during magnetization
(*c*) a little change in magnetic flux density $B$, if magnetic field strength $H$ is changed
(*d*) iron loses magnetic properties

**203.** Transformers operating in parallel will share the load based on

(*a*) their ratings
(*b*) leakage reactance
(*c*) efficiency
(*d*) per unit impedance

**204.** The total magnetic flux through any closed surface is zero

(*a*) true
(*b*) false

**205.** The adjacent operational amplifier circuit

(*a*) sums the input voltages

(*b*) averages the input voltages

(*c*) differentiates the input voltages

(*d*) integrates the input voltages

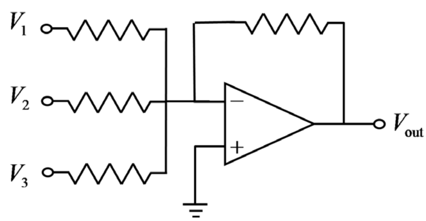


**Fig. Q. 205.**

**206.** The functioning of a synchronous motor is analogous to a

(*a*) turbine

(*b*) alternator

(*c*) distribution transformer

(*d*) gear train arrangement

(*e*) transmission of mechanical power by shaft

**207.** The logarithmic decrement of an oscillatory circuit with a coil inductance of 150 μ*H*, an effective resistance of 100 ohms and tuned at 1 mHz shall be

(*a*) 0.12 (*b*) 0.180

(*c*) 0.033 (*d*) 0.33

**208.** The natural frequency of an oscillator with capacitance of 0.055 μ*F*, inductance of 2 μ*H* and resistance of 1 ohm shall be

(*a*) 33 kHz (*b*) 190 kHz

(*c*) 478 kHz (*d*) 280 kHz

**209.** Give the output of the following Python script

```
z = 3 + 2j
 type(z)
```

(*a*) complex (*b*) 3+2j

(*c*) z (*d*) integer

**210.** Give the output of the following Python script

```
for n in range(5):
 print(n)
```

(*a*) 1 2 3 4 5 (*b*) 0 1 2 3 4

(*c*) 1 2 3 4 (*d*) 5

**211.** Freely distributed Python library for symbolic mathematics

(*a*) SymPy (*b*) Symphony

(*c*) ZenPy (*d*) Starfish Prime

**212.** MicroPython is an implementation of Python 3 written in C to run on
(*a*) supercomputers
(*b*) quantum computers
(*c*) desktop and laptop computers
(*d*) microcontrollers

**213.** The blockchain ledger solves the problem of
(*a*) anonymous transaction
(*b*) cryptocurrency double spending
(*c*) large block sizes
(*d*) orphaned blocks

**214.** Digital cryptocurrencies lack a
(*a*) hash algorithm
(*b*) central authority
(*c*) programming language of implementation
(*d*) blockchain network

**215.** Segments of the blockchain may become orphaned when
(*a*) a blockchain segment is accidently overwritten by a sidechain
(*b*) the network abandons the shorter chain following a fork
(*c*) a power surge temporarily disables the network
(*d*) indistinguishable blocks are simultaneously added to the blockchain

**216.** Hardware specifically used to mine cryptocurrency
(*a*) Application Specific Integrated Circuit (ASIC)
(*b*) Raspberry Pi
(*c*) Oracles
(*d*) Bitcoin ATM

**217.** Smart contracts are written in the programming language called
(*a*) Oracle (*b*) Merkle
(*c*) Block Explorer (*d*) Solidity

**218.** A unique alphanumeric password that enables users to spend or transfer cryptocurrencies
(*a*) proof of authority (*b*) user script
(*c*) wallet key (*d*) private key

**219.** Digital records stored at multiple locations
(*a*) Distributed ledgers
(*b*) Stealth addresses
(*c*) Side chains
(*d*) Smart contracts

**220.** A programming language is Turing complete if it can compute
(*a*) anything that a Turing machine can compute
(*b*) anything that any programmable computer can compute
(*c*) answers (*a*) and (*b*)
(*d*) neither (*a*) nor (*b*)

**221.** The bitcoin scripting language
(*a*) is Turing complete
(*b*) is Turing incomplete
(*c*) cannot perform loops
(*d*) answers (*b*) and (*c*)

**222.** The output hash created by the SHA-256 algorithm is
(*a*) 256-bits for any input data
(*b*) $2^8$-bits for any input data
(*c*) a random number of bits for any 256-bit input
(*d*) answers (*a*) and (*b*)

**223.** Cryptocurrency network that uses ring signatures
(*a*) Monero (XMR)
(*b*) Ripple
(*c*) Ethereum Classic
(*d*) Litecoin

**224.** Decrypting a hash by guessing of all possible inputs that produced an output to a cryptographic hash function
(*a*) brute force attack
(*b*) 51% attack
(*c*) hash hack
(*d*) whisper attack

**225.** All the superconductors below are Type-II except
(*a*) $YBa_2Cu_3O_7$ (YBCO)
(*b*) $Bi_2Sr_2Ca_2Cu_3O_{10+x}$ (BSCCO or Bi-2223)
(*c*) Hg
(*d*) $Nb_3Ge$
(*e*) Nb-Ti

**226.** In the BCS theory electrons interact with positive ions in the lattice to form

(*a*) lattice defects

(*b*) electron pairs known as Cooper pairs

(*c*) pinning centers for vortices

(*d*) domain boundaries

**227.** Application of superconductors based on the Meissner effect

(*a*) superconducting magnets

(*b*) magnetic shields

(*c*) magnetic suspension

(*d*) quantum tunnelling

**228.** Electrons in Cooper pairs

(*a*) can travel through a superconductor with zero electrical resistivity

(*b*) have opposite spin

(*c*) condense into the same quantum state in a superconductor

(*d*) all the above

**229.** Perfect diamagnetism is characterized by

(*a*) zero relative permeability

(*b*) complete expulsion of magnetic fields (except for a very thin surface layer)

(*c*) high relative permeability

(*d*) answers (*a*) and (*b*) only

**230.** Above the lower critical field $B_{c1}$ and the below the upper critical field $B_{c2}$

(*a*) the superconductor is in a Meisner state

(*b*) magnetic flux can penetrate a Type-II superconductor

(*c*) the superconductor is normal

(*d*) the heat capacity is minimal

**231.** High field superconducting electromagnets are used

(*a*) for MRI and NMR

(*b*) in particle accelerators such as the Large Hadron Collider (LHC)

(*c*) for plasma storage devices (tokamaks)

(*d*) all the above

**232.** Measurement of the state of a qubit would destroy the quantum superposition such that it has a value of either 0 or 1

(*a*) true (*b*) false

**233.** The states $|0\rangle = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$ $|1\rangle = \begin{pmatrix} 0 \\ 1 \end{pmatrix}$ are basis states of

(*a*) one qubit
(*b*) two qubits
(*c*) four qubits

**234.** Given the not gate $N = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$ and $|0\rangle = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$ $|1\rangle = \begin{pmatrix} 0 \\ 1 \end{pmatrix}$

(*a*) $N|0\rangle = 1$
(*b*) $N|0\rangle = |1\rangle$
(*c*) $N|1\rangle = |0\rangle$
(*d*) answers (*b*) and (*c*)

**235.** The no cloning theorem states that

(*a*) it is not possible to transfer information from a classical to a quantum computer
(*b*) it is not possible to make an exact copy of a quantum superposition state
(*c*) a given quantum computation is not always repeatable
(*d*) all the above

**236.** The quantum entanglement between two particles

(*a*) depends on their separation distance
(*b*) depends on the inverse square of the separation distance
(*c*) does not depend on the separation distance

**237.** Entangled particles exist in a superposition state

(*a*) true (*b*) false

**238.** A qubit may be physically implemented with superpositions states of

(*a*) two spin values of an electron
(*b*) clockwise or counter-clockwise current flow in a superconducting loop
(*c*) two polarization states of a photon
(*d*) all the above

**239.** Given a qubit is in a superposition state $|\psi\rangle = \dfrac{|0\rangle - j|1\rangle}{\sqrt{2}}$ the probability of measuring the qubits value to be 1 is

(*a*) $\dfrac{1}{2}$

(*b*) $\dfrac{1}{\sqrt{2}}$

(*c*) the same as probability of measuring the qubit value equal to 0

(*d*) both (*a*) and (*c*)

**240.** The North Pole of the Bloch sphere corresponds to the state

(*a*) $a|0\rangle + b|1\rangle$ (*b*) $|0\rangle$

(*c*) $b|1\rangle$ (*d*) $|1\rangle$

**241.** The South Pole of the Bloch sphere corresponds to the state

(*a*) $a|0\rangle + b|1\rangle$ (*b*) $|0\rangle$

(*c*) $b|1\rangle$ (*d*) $|1\rangle$

**242.** The probability of measuring the state of a qubit to be either $|0\rangle$ or $|1\rangle$

(*a*) is equal to 1 (*b*) is equal to 1/2

(*c*) is equal to 0 (*d*) none of the above

**243.** The probability of measuring the state of a qubit to be neither $|0\rangle$ nor $|1\rangle$

(*a*) is equal to 1 (*b*) is equal to 1/2

(*c*) is equal to 0 (*d*) none of the above

**244.** A challenge to quantum computation where degradation and disentanglement of superposition states occurs though interactions with the environment such as by the scattering of photons

(*a*) quantum quenching (*b*) quantum interference

(*c*) quantum decoherence (*d*) Unruh-Davies effect

**245.** Which of the following controllers has zero proportional band?

(*a*) PID controller (*b*) PI controller

(*c*) PD controller (*d*) ON-OFF controller

**246.** Electrical capacitance is analogous to

(*a*) spring (*b*) fluid resistance

(*c*) inertia (*d*) viscous damper

**247.** Which of the following motors will be used for a compressor?

(*a*) Universal motor
(*b*) Synchronous Motor
(*c*) D.C. series motor
(*d*) D.C. shunt motor

**248.** The torque of an induction type relay is

(*a*) proportional to the square of the current
(*b*) proportional to the current
(*c*) inversely proportional to the square of the current

**249.** The basic operational principle of Megger is based on

(*a*) moving iron meters
(*b*) moving coil meters
(*c*) potentiometer
(*d*) electrostatic meter

**250.** Which of the following equipment do we use for winding temperature measurement of the motor?

(*a*) Thermocouple
(*b*) Thermometer
(*c*) Resistance temperature detector
(*d*) None of the above

# APPENDIX: ANSWERS

## CHAPTER 1 ENGINEERING MATHEMATICS

(Numbers with blanks have answers enumerated in the text)

| | | |
|---|---|---|
| 1. $(b)$ | 2. $(c)$ | 3. $(a)$ |
| 4. $(b)$ | 5. $(a)$ | 6. $(a)$ |
| 7. $(a)$ | 8. $(a)$ | 9. $(d)$ |
| 10. $(d)$ | 11. $(a)$ | 12. $(d)$ |
| 13. $(a)$ | 14. $(b)$ | 15. $(c)$ |
| 16. $(c)$ | 17. $(b)$ | 18. $(b)$ |
| 19. $(c)$ | 20. $(a)$ | 21. $(c)$ |
| 22. $(d)$ | 23. $(a)$ | 24. $(d)$ |
| 25. $(c)$ | 26. $(b)$ | 27. $(b)$ |
| 28. $(d)$ | 29. $(d)$ | 30. $(b)$ |
| 31. $(b)$ | 32. $(b)$ | 33. $(d)$ |
| 34. $(a)$ | 35. $(c)$ | 36. $(a)$ |
| 37. $(d)$ | 38. $(b)$ | 39. $(a)$ |
| 40. $(a)$ | 41. $(b)$ | 42. $(c)$ |
| 43. $(d)$ | 44. $(b)$ | 45. $(b)$ |
| 46. $(b)$ | 47. $(c)$ | 48. $(c)$ |
| 49. $(b)$ | 50. $(b)$ | 51. $(c)$ |
| 52. $(b)$ | 53. $(b)$ | 54. $(d)$ |
| 55. $(a)$ | 56. $(a)$ | 57. $(a)$ |
| 58. $(d)$ | 59. $(c)$ | 60. $(a)$ |
| 61. $(d)$ | 62. $(a)$ | 63. $(a)$ |
| 64. $(b)$ | 65. $(a)$ | 66. $(a)$ |
| 67. $(c)$ | 68. $(d)$ | 69. $(a)$ |
| 70. $(b)$ | 71. $(a)$ | 72. $(c)$ |
| 73. $(b)$ | 74. $(d)$ | 75. $(b)$ |
| 76. $(c)$ | 77. $(a)$ | 78. $(b)$ |
| 79. $(c)$ | 80. $(d)$ | 81. $(b)$ |
| 82. $(a)$ | 83. $(d)$ | 84. $(c)$ |
| 85. $(b)$ | 86. $(a)$ | 87. $(a)$ |

| | | |
|---|---|---|
| 88. (*c*) | 89. (*e*) | 90. (*c*) |
| 91. (*c*) | 92. (*a*) | 93. (*b*) |
| 94. (*a*) | 95. (*a*) | 96. (*b*) |
| 97. (*a*) | 98. (*b*) | 99. (*c*) |
| 100. (*d*) | 101. (*c*) | 102. (*d*) |
| 103. (*b*) | 104. (*a*) | 105. (*a*) |
| 106. (*b*) | 107. (*a*) | 108. (*a*) |
| 109. (*a*) | 110. (*c*) | 111. (*b*) |
| 112. (*b*) | 113. (*b*) | 114. (*a*) |
| 115. (*d*) | 116. (*b*) | 117. (*c*) |
| 118. (*d*) | | |

## CHAPTER 2 ELECTRICAL MACHINES

| | | |
|---|---|---|
| 1. (*b*) | 2. (*d*) | 3. (*c*) |
| 4. (*b*) | 5. (*d*) | 6. (*b*) |
| 7. (*a*) | 8. (*b*) | 9. (*a*) |
| 10. (*b*) | 11. (*b*) | 12. (*c*) |
| 13. (*b*) | 14. (*c*) | 15. (*e*) |
| 16. (*a*) | 17. (*c*) | 18. (*b*) |
| 19. (*b*) | 20. (*a*) | 21. (*b*) |
| 22. (*b*) | 23. (*c*) | 24. (*a*) |
| 25. (*a*) | 26. (*c*) | 27. (*c*) |
| 28. (*c*) | 29. (*c*) | 30. (*b*) |
| 31. (*a*) | 32. (*b*) | 33. (*b*) |
| 34. (*a*) | 35. (*b*) | 36. (*c*) |
| 37. (*b*) | 38. (*c*) | 39. (*a*) |
| 40. (*b*) | 41. (*c*) | 42. (*c*) |
| 43. (*b*) | 44. (*a*) | 45. (*c*) |
| 46. (*c*) | 47. (*c*) | 48. (*a*) |
| 49. (*b*) | 50. (*c*) | 51. (*b*) |
| 52. (*d*) | 53. (*a*) | 54. (*a*) |
| 55. (*b*) | 56. (*b*) | 57. (*b*) |
| 58. (*c*) | 59. (*d*) | 60. (*d*) |
| 61. (*a*) | 62. (*a*) | 63. (*c*) |
| 64. (*b*) | 65. (*a*) | 66. (*b*) |
| 67. (*b*) | 68. (*b*) | 69. (*a*) |
| 70. (*a*) | 71. (*b*) | 72. (*a*) |

73. $(b)$
74. $(b)$
75. $(b)$
76. $(b)$
77. $(a)$
78. $(b)$
79. $(a)$
80. $(a)$
81. $(a)$
82. $(a)$
83. $(b)$
84. $(a)$
85. $(c)$
86. $(b)$
87. $(b)$
88. $(b)$
89. $(c)$
90. $(d)$
91. $(a)$
92. $(c)$
93. $(a)$
94. $(b)$
95. $(b)$
96. $(b)$
97. $(b)$
98. $(b)$
99. $(a)$
100. $(b)$
101. $(b)$
102. $(b)$
103. $(c)$
104. $(a)$
105. $(b)$
106. —
107. $(a)$
108. $(b)$
109. $(b)$
110. $(a)$
111. $(a)$
112. $(c)$
113. $(b)$
114. $(a)$
115. $(c)$
116. $(b)$
117. $(a)$
118. $(a)$
119. $(a)$
120. $(d)$
121. $(a)$
122. $(a)$
123. $(c)$
124. $(a)$
125. $(a)$
126. $(a)$
127. $(d)$
128. $(b)$
129. $(c)$
130. $(a)$
131. $(b)$
132. $(c)$
133. $(a)$
134. $(c)$
135. $(a)$
136. $(a)$
137. $(c)$
138. $(d)$
139. $(b)$
140. $(b)$
141. $(a)$
142. $(b)$
143. $(b)$
144. $(b)$
145. $(c)$
146. $(c)$
147. $(a)$
148. $(a)$
149. $(c)$
150. $(c)$
151. $(d)$
152. $(d)$
153. $(b)$
154. $(a)$
155. $(d)$
156. $(b)$
157. $(b)$
158. $(a)$
159. $(a)$
160. $(b)$
161. $(d)$
162. $(a)$
163. $(a)$
164. $(a)$
165. $(a)$
166. $(a)$
167. $(b)$
168. $(a)$
169. $(c)$
170. $(a)$
171. $(d)$
172. $(c)$
173. $(a)$
174. $(d)$
175. $(d)$
176. $(c)$
177. $(b)$
178. $(b)$
179. $(b)$
180. $(b)$
181. $(c)$
182. $(b)$
183. $(b)$
184. $(c)$
185. $(b)$
186. $(d)$
187. $(a)$
188. $(b)$
189. $(a)$

| | | |
|---|---|---|
| 190. (*c*) | 191. (*d*) | 192. (*a*) |
| 193. (*b*) | 194. — | 195. (*b*) |
| 196. (*a*) | 197. (*b*) | 198. (*c*) |
| 199. — | 200. (*a*) | 201. (*a*) |
| 202. (*c*) | 203. (*a*) | 204. (*a*) |
| 205. (*b*) | 206. (*d*) | 207. (*b*) |
| 208. (*b*) | 209. (*b*) | 210. (*a*) |
| 211. (*b*) | 212. (*d*) | 213. (*c*) |
| 214. (*d*) | 215. (*a*) | 216. (*a*) |
| 217. (*c*) | 218. (*a*) | 219. (*d*) |
| 220. (*a*) | 221. (*b*) | 222. (*a*) |
| 223. (*a*) | 224. (*b*) | 225. (*c*) |
| 226. (*a*) | 227. — | 228. (*c*) |
| 229. (*a*) | 230. (*d*) | 231. (*d*) |
| 232. (*a*) | 233. (*c*) | 234. — |
| 235. (*b*) | 236. (*a*) | 237. (*d*) |
| 238. (*d*) | 239. (*c*) | 240. (*c*) |
| 241. (*b*) | 242. (*a*) | 243. (*b*) |
| 244. (*b*) | 245. (*b*) | 246. (*a*) |
| 247. (*a*) | 248. (*c*) | 249. (*a*) |
| 250. (*a*) | 251. (*a*) | 252. (*c*) |
| 253. (*a*) | 254. (*e*) | 255. (*b*) |
| 256. (*b*) | 257. (*c*) | 258. (*d*) |
| 259. (*b*) | 260. (*b*) | 261. (*b*) |
| 262. (*b*) | 263. (*d*) | 264. (*b*) |
| 265. (*c*) | 266. (*c*) | 267. (*b*) |
| 268. (*d*) | 269. (*c*) | 270. (*b*) |
| 271. (*a*) | 272. (*b*) | 273. (*d*) |
| 274. (*b*) | 275. (*b*) | 276. (*b*) |
| 277. (*d*) | 278. (*a*) | 279. (*c*) |
| 280. (*a*) | 281. (*c*) | 282. (*c*) |
| 283. (*b*) | 284. (*b*) | 285. (*c*) |
| 286. (*d*) | 287. (*c*) | 288. (*b*) |
| 289. (*a*) | 290. (*e*) | 291. (*d*) |
| 292. (*c*) | 293. (*a*) | 294. (*d*) |
| 295. (*a*) | 296. (*e*) | 297. (*b*) |
| 298. (*b*) | 299. (*c*) | 300. (*a*) |
| 301. (*c*) | 302. (*b*) | 303. (*a*) |
| 304. (*b*) | 305. (*c*) | 306. (*c*) |

307. (*b*) 308. (*c*) 309. (*a*)
310. (*b*) 311. (*c*) 312. (*c*)
313. (*b*) 314. (*a*) 315. (*b*)
316. (*c*) 317. (*c*) 318. (*b*)
319. (*a*) 320. (*e*) 321. (*b*)
322. (*c*) 323. (*c*) 324. (*c*)
325. (*d*) 326. (*c*) 327. (*a*)
328. (*a*) 329. (*b*) 330. (*c*)
331. (*d*) 332. (*a*) 333. (*a*)
334. (*a*) 335. (*d*) 336. (*b*)
337. (*e*) 338. (*a*) 339. (*a*)
340. (*b*) 341. (*c*) 342. (*b*)
343. (*b*) 344. (*c*) 345. (*c*)
346. (*b*) 347. (*b*) 348. (*b*)
349. (*a*) 350. (*a*)

## CHAPTER 3 MEASUREMENTS

1. (*b*) 2. (*a*) 3. (*e*)
4. (*a*) 5. (*c*) 6. (*b*)
7. (*c*) 8. (*b*) 9. (*b*)
10. (*a*) 11. (*a*) 12. (*a*)
13. (*c*) 14. (*a*) 15. (*b*)
16. (*b*) 17. (*c*) 18. (*d*)
19. (*c*) 20. (*c*) 21. (*b*)
22. (*a*) 23. (*c*) 24. (*b*)
25. (*b*) 26. — 27. (*b*)
28. (*c*) 29. (*a*) 30. —
31. (*b*) 32. (*a*) 33. (*a*)
34. (*a*) 35. (*b*) 36. (*a*)
37. (*c*) 38. (*c*) 39. (*c*)
40. (*c*) 41. (*c*) 42. (*b*)
43. (*c*) 44. (*b*) 45. (*b*)
46. (*a*) 47. (*b*) 48. (*c*)
49. (*b*) 50. (*b*) 51. (*a*)
52. (*a*) 53. (*a*) 54. (*d*)
55. (*c*) 56. (*b*) 57. (*b*)
58. (*b*) 59. (*a*) 60. (*b*)

61. $(c)$
62. $(b)$
63. $(e)$
64. $(a)$
65. $(e)$
66. $(b)$
67. $(a)$
68. $(d)$
69. $(c)$
70. $(a)$
71. $(d)$
72. $(c)$
73. $(b)$
74. $(b)$
75. $(e)$
76. $(c)$
77. $(d)$
78. $(d)$
79. $(c)$
80. $(a)$
81. $(b)$
82. $(b)$
83. $(e)$
84. $(a)$
85. $(a)$
86. $(c)$
87. $(c)$
88. $(b)$
89. $(b)$
90. $(b)$
91. $(a)$
92. $(a)$
93. $(b)$
94. $(a)$
95. $(a)$
96. $(c)$
97. —
98. —
99. —
100. —
101. $(b)$
102. $(d)$
103. $(b)$
104. $(a)$
105. $(a)$
106. $(b)$
107. $(d)$
108. $(c)$
109. $(b)$
110. $(c)$
111. $(e)$
112. $(a)$
113. $(e)$
114. $(e)$
115. $(b)$
116. $(b)$
117. $(d)$
118. $(a)$
119. $(b)$
120. $(a)$
121. $(b)$
122. $(c)$
123. $(b)$
124. $(c)$
125. $(d)$
126. $(d)$
127. $(c)$
128. $(b)$
129. $(e)$
130. $(c)$
131. $(c)$
132. $(b)$
133. $(d)$
134. $(d)$
135. $(d)$
136. $(c)$
137. $(b)$
138. $(b)$
139. $(c)$
140. $(c)$
141. $(b)$
142. $(a)$
143. $(a)$
144. $(d)$
145. $(c)$
146. $(c)$
147. $(a)$
148. $(b)$
149. $(c)$
150. $(a)$
151. $(c)$
152. $(c)$
153. $(c)$
154. $(c)$
155. $(e)$
156. $(b)$
157. $(a)$
158. $(a)$
159. $(b)$
160. $(c)$
161. $(b)$
162. $(c)$
163. $(b)$
164. $(c)$
165. $(b)$
166. $(c)$
167. $(a)$
168. $(b)$
169. $(b)$
170. $(b)$
171. $(a)$
172. $(a)$
173. $(a)$
174. $(c)$
175. $(b)$
176. $(c)$
177. $(b)$

178. ($f$) 179. ($b$) 180. ($a$)
181. ($c$) 182. ($a$) 183. ($c$)
184. ($a$) 185. ($c$) 186. ($a$)
187. ($c$) 188. ($c$) 189. ($c$)
190. ($a$) 191. ($d$) 192. ($b$)
193. ($b$) 194. ($a$) 195. ($d$)
196. ($b$) 197. ($a$) 198. ($d$)
199. ($a$) 200. ($c$) 201. ($d$)
202. ($b$) 203. ($b$) 204. ($b$)
205. ($a$) 206. ($b$) 207. ($a$)
208. ($b$) 209. ($c$) 210. ($c$)
211. ($b$) 212. ($a$) 213. ($c$)
214. ($a$) 215. ($d$) 216. ($e$)
217. ($c$) 218. ($b$) 219. ($c$)
220. ($c$) 221. ($b$) 222. ($c$)
223. ($b$) 224. ($e$) 225. ($d$)
226. ($c$) 227. ($d$) 228. ($b$)
229. ($a$) 230. ($d$) 231. ($c$)
232. ($c$) 233. ($b$) 234. ($d$)
235. ($c$) 236. ($c$) 237. ($b$)
238. ($b$) 239. ($b$) 240. ($b$)
241. ($d$) 242. ($a$) 243. ($d$)
244. ($b$) 245. ($d$) 246. ($a$)
247. ($b$) 248. ($a$)

## CHAPTER 4 ELECTRIC CIRCUITS AND ELECTROMAGNETIC FIELDS

1. ($a$) 2. ($a$) 3. ($a$)
4. ($b$) 5. ($b$) 6. ($d$)
7. ($a$) 8. ($b$) 9. ($c$)
10. ($d$) 11. ($a$) 12. ($a$)
13. ($a$) 14. ($b$) 15. ($d$)
16. ($b$) 17. ($b$) 18. ($e$)
19. ($b$) 20. ($a$) 21. ($c$)
22. ($d$) 23. ($c$) 24. ($a$)
25. ($c$) 26. ($b$) 27. ($c$)
28. ($b$) 29. ($a$) 30. ($b$)

31. (*b*)
32. (*c*)
33. (*c*)
34. (*b*)
35. (*c*)
36. (*b*)
37. (*d*)
38. (*c*)
39. (*c*)
40. (*c*)
41. (*c*)
42. (*c*)
43. (*c*)
44. (*a*)
45. (*a*)
46. (*b*)
47. (*d*)
48. (*b*)
49. (*d*)
50. (*b*)
51. (*d*)
52. (*b*)
53. (*b*)
54. (*d*)
55. (*d*)
56. (*b*)
57. (*b*)
58. (*b*)
59. (*c*)
60. (*b*)
61. (*a*)
62. (*b*)
63. (*d*)
64. (*c*)
65. (*c*)
66. (*c*)
67. (*d*)
68. (*a*)
69. (*b*)
70. (*c*)
71. (*b*)
72. (*b*)
73. (*a*)
74. (*c*)
75. (*c*)
76. (*b*)
77. (*b*)
78. (*a*)
79. (*b*)
80. (*d*)
81. (*d*)
82. (*d*)
83. (*b*)
84. (*d*)
85. (*d*)
86. (*a*)
87. (*d*)
88. (*c*)
89. (*a*)
90. (*a*)
91. (*c*)
92. (*b*)
93. (*d*)
94. (*b*)
95. (*b*)
96. (*d*)
97. (*b*)
98. (*c*)
99. (*d*)
100. (*d*)
101. (*a*)
102. (*d*)
103. (*c*)
104. (*c*)
105. (*a*)
106. (*b*)
107. (*a*)
108. (*c*)
109. (*d*)
110. (*e*)
111. (*c*)
112. (*c*)
113. (*d*)
114. (*d*)
115. (*c*)
116. (*b*)
117. (*c*)
118. (*a*)
119. (*c*)
120. (*b*)
121. (*b*)
122. (*b*)
123. (*b*)
124. (*b*)
125. (*a*)
126. (*b*)
127. (*a*)
128. (*c*)
129. (*a*)
130. (*c*)
131. (*c*)
132. (*a*)
133. (*a*)
134. (*c*)
135. (*a*)
136. (*b*)
137. (*b*)
138. (*b*)
139. (*b*)
140. (*b*)
141. (*c*)
142. (*b*)
143. (*b*)
144. (*c*)
145. (*a*)
146. (*b*)
147. (*b*)
148. (*b*)
149. (*a*)
150. (*c*)

| | | |
|---|---|---|
| 151. (*c*) | 152. (*c*) | 153. (*a*) |
| 154. (*d*) | 155. (*b*) | 156. (*c*) |
| 157. (*b*) | 158. (*a*) | 159. (*a*) |
| 160. (*c*) | 161. (*b*) | 162. (*a*) |
| 163. (*a*) | 164. (*a*) | 165. (*a*) |
| 166. (*b*) | 167. (*d*) | 168. (*a*) |
| 169. (*a*) | 170. (*b*) | 171. (*b*) |
| 172. (*a*) | 173. (*a*) | 174. (*a*) |
| 175. (*d*) | 176. (*c*) | 177. (*a*) |
| 178. (*a*) | 179. (*e*) | 180. (*c*) |
| 181. (*b*) | 182. (*a*) | 183. (*a*) |
| 184. (*b*) | 185. (*d*) | 186. (*c*) |
| 187. (*c*) | 188. (*b*) | 189. (*a*) |
| 190. (*a*) | 191. (*a*) | 192. (*a*) |
| 193. (*b*) | 194. (*b*) | 195. (*e*) |
| 196. (*a*) | 197. (*c*) | 198. (*a*) |
| 199. (*b*) | 200. (*c*) | 201. (*d*) |
| 202. (*b*) | 203. (*c*) | 204. (*a*) |
| 205. (*a*) | 206. (*c*) | 207. (*c*) |
| 208. (*c*) | 209. (*a*) | 210. (*a*) |
| 211. (*a*) | 212. (*c*) | 213. (*c*) |
| 214. (*b*) | 215. (*a*) | 216. (*b*) |
| 217. (*c*) | 218. (*b*) | 219. (*d*) |
| 220. (*b*) | 221. (*c*) | 222. (*d*) |
| 223. (*b*) | 224. (*b*) | 225. (*d*) |
| 226. (*a*) | 227. (*d*) | 228. (*d*) |
| 229. (*a*) | 230. (*c*) | 231. (*c*) |
| 232. (*b*) | 233. (*c*) | 234. (*d*) |
| 235. (*a*) | 236. (*a*) | 237. (*b*) |
| 238. (*b*) | 239. (*d*) | 240. (*b*) |
| 241. (*b*) | 242. (*c*) | 243. (*c*) |
| 244. (*d*) | 245. (*d*) | 246. (*c*) |
| 247. (*d*) | 248. (*c*) | 249. (*e*) |
| 250. (*d*) | 251. (*b*) | 252. (*a*) |
| 253. (*d*) | 254. (*c*) | 255. (*d*) |
| 256. (*c*) | 257. (*b*) | 258. (*b*) |
| 259. (*a*) | 260. (*b*) | 261. (*c*) |
| 262. (*b*) | 263. (*b*) | 264. (*e*) |
| 265. (*a*) | 266. (*c*) | 267. (*c*) |
| 268. (*d*) | 269. (*d*) | 270. (*d*) |

271. (*b*) 272. (*c*) 273. (*e*)
274. (*c*) 275. (*c*) 276. (*c*)
277. (*b*) 278. (*c*) 279. (*d*)
280. (*b*) 281. (*e*) 282. (*e*)
283. (*d*) 284. (*e*) 285. (*d*)
286. (*d*) 287. (*b*) 288. (*b*)
289. (*b*) 290. (*d*) 291. (*d*)
292. (*b*) 293. (*b*) 294. (*b*)
295. (*c*) 296. (*c*) 297. (*b*)
298. (*a*) 299. (*b*) 300. (*a*)
301. (*d*) 302. (*a*) 303. (*d*)
304. (*a*) 305. (*e*) 306. (*e*)
307. (*a*) 308. (*d*) 309. (*a*)
310. (*a*) 311. (*b*) 312. (*c*)
313. (*d*) 314. (*e*) 315. (*c*)
316. (*a*) 317. (*b*) 318. (*c*)
319. (*d*) 320. (*a*) 321. (*b*)
322. (*c*) 323. (*d*) 324. (*a*)
325. (*a*) 326. (*b*) 327. (*d*)
328. (*a*) 329. (*b*) 330. (*a*)
331. (*d*) 332. (*b*) 333. (*c*)
334. (*a*) 335. (*d*) 336. (*b*)
337. (*c*) 338. (*c*) 339. (*b*)
340. (*a*) 341. (*b*)

## CHAPTER 5 POWER SYSTEMS

1. (*a*) 2. (*a*) 3. (*a*)
4. (*a*) 5. (*a*) 6. (*a*)
7. (*a*) 8. (*c*) 9. (*a*)
10. (*b*) 11. (*b*) 12. (*a*)
13. (*a*) 14. (*b*) 15. (*a*)
16. (*c*) 17. (*a*) 18. (*d*)
19. (*b*) 20. (*b*) 21. (*a*)
22. (*c*) 23. (*b*) 24. (*b*)
25. (*a*) 26. (*b*) 27. (*d*)
28. (*a*) 29. (*a*) 30. (*b*)
31. (*a*) 32. (*a*) 33. (*b*)
34. (*a*) 35. (*c*) 36. (*d*)

| | | |
|---|---|---|
| 37. (*a*) | 38. (*b*) | 39. (*b*) |
| 40. (*b*) | 41. (*b*) | 42. (*b*) |
| 43. (*a*) | 44. (*a*) | 45. (*b*) |
| 46. (*c*) | 47. (*b*) | 48. (*c*) |
| 49. (*c*) | 50. (*c*) | 51. (*b*) |
| 52. (*b*) | 53. (*b*) | 54. (*b*) |
| 55. (*a*) | 56. (*a*) | 57. (*b*) |
| 58. (*b*) | 59. (*b*) | 60. (*b*) |
| 61. (*b*) | 62. (*a*) | 63. (*a*) |
| 64. (*c*) | 65. (*a*) | 66. (*b*) |
| 67. (*a*) | 68. (*c*) | 69. (*b*) |
| 70. (*b*) | 71. (*d*) | 72. (*c*) |
| 73. (*a*) | 74. (*b*) | 75. (*b*) |
| 76. (*d*) | 77. (*a*) | 78. (*a*) |
| 79. (*b*) | 80. (*b*) | 81. (*c*) |
| 82. (*a*) | 83. (*a*) | 84. (*a*) |
| 85. (*a*) | 86. (*a*) | 87. (*b*) |
| 88. (*b*) | 89. (*b*) | 90. (*d*) |
| 91. (*c*) | 92. (*a*) | 93. (*d*) |
| 94. (*d*) | 95. (*b*) | 96. (*a*) |
| 97. (*a*) | 98. (*a*) | 99. (*c*) |
| 100. (*c*) | 101. (*b*) | 102. (*b*) |
| 103. (*a*) | 104. (*c*) | 105. (*c*) |
| 106. (*a*) | 107. (*b*) | 108. (*b*) |
| 109. (*a*) | 110. (*c*) | 111. (*a*) |
| 112. (*b*) | 113. (*a*) | 114. (*d*) |
| 115. (*c*) | 116. (*b*) | 117. (*b*) |
| 118. (*a*) | 119. (*a*) | 120. (*a*) |
| 121. (*a*) | 122. (*b*) | 123. (*d*) |
| 124. (*b*) | 125. (*b*) | 126. (*c*) |
| 127. (*c*) | 128. (*d*) | 129. (*a*) |
| 130. (*d*) | 131. (*b*) | 132. (*c*) |
| 133. (*a*) | 134. (*d*) | 135. (*a*) |
| 136. (*a*) | 137. (*a*) | 138. (*c*) |
| 139. (*b*) | 140. (*a*) | 141. (*b*) |
| 142. (*c*) | 143. (*b*) | 144. (*b*) |
| 145. (*a*) | 146. (*a*) | 147. (*a*) |
| 148. (*b*) | 149. (*a*) | 150. (*b*) |
| 151. (*b*) | 152. (*b*) | 153. (*d*) |
| 154. (*b*) | 155. (*b*) | 156. (*e*) |

| | | |
|---|---|---|
| 157. (*b*) | 158. (*e*) | 159. (*b*) |
| 160. (*a*) | 161. (*c*) | 162. (*a*) |
| 163. — | 164. (*d*) | 165. (*c*) |
| 166. (*a*) | 167. (*a*) | 168. (*a*) |
| 169. (*b*) | 170. (*e*) | 171. (*a*) |
| 172. (*a*) | 173. (*a*) | 174. (*d*) |
| 175. (*a*) | 176. (*a*) | 177. (*a*) |
| 178. (*c*) | 179. (*b*) | 180. (*c*) |
| 181. (*a*) | 182. (*d*) | 183. (*b*) |
| 184. (*d*) | 185. (*a*) | 186. (*d*) |
| 187. (*a*) | 188. (*b*) | 189. (*c*) |
| 190. (*e*) | 191. (*a*) | 192. (*d*) |
| 193. (*a*) | 194. (*b*) | 195. (*a*) |
| 196. (*b*) | 197. (*c*) | 198. (*d*) |
| 199. (*c*) | 200. (*d*) | 201. (*a*) |
| 202. (*b*) | 203. (*b*) | 204. (*a*) |
| 205. — | 206. (*b*) | 207. (*b*) |
| 208. (*b*) | 209. (*d*) | 210. (*a*) |
| 211. (*a*) | 212. (*a*) | 213. (*b*) |
| 214. (*d*) | 215. (*e*) | 216. (*b*) |
| 217. (*a*) | 218. (*e*) | 219. (*b*) |
| 220. (*c*) | 221. (*b*) | 222. (*b*) |
| 223. (*d*) | 224. (*d*) | 225. (*d*) |
| 226. (*c*) | 227. (*d*) | 228. (*d*) |
| 229. (*b*) | 230. (*d*) | 231. (*e*) |
| 232. (*e*) | 233. (*e*) | 234. (*a*) |
| 235. (*c*) | | |

## CHAPTER 6 CONTROLL SYSTEM ENGINEERING

| | | |
|---|---|---|
| 1. (*b*) | 2. (*d*) | 3. (*b*) |
| 4. (*a*) | 5. (*c*) | 6. (*a*) |
| 7. (*b*) | 8. (*a*) | 9. (*c*) |
| 10. (*a*) | 11. (*a*) | 12. (*b*) |
| 13. (*b*) | 14. (*c*) | 15. (*b*) |
| 16. (*c*) | 17. (*b*) | 18. (*d*) |
| 19. (*c*) | 20. (*b*) | 21. (*a*) |
| 22. (*b*) | 23. (*e*) | 24. (*a*) |

25. ($a$)
26. ($c$)
27. ($b$)
28. ($a$)
29. ($c$)
30. ($a$)
31. ($b$)
32. ($a$)
33. ($b$)
34. ($a$)
35. ($b$)
36. ($a$)
37. ($a$)
38. ($c$)
39. ($a$)
40. ($a$)
41. ($a$)
42. ($a$)
43. ($d$)
44. ($b$)
45. ($b$)
46. ($c$)
47. ($a$)
48. ($c$)
49. ($a$)
50. ($a$)
51. ($c$)
52. ($b$)
53. ($c$)
54. ($b$)
55. ($a$)
56. ($b$)
57. ($a$)
58. ($b$)
59. ($b$)
60. ($b$)
61. ($a$)
62. ($a$)
63. ($b$)
64. ($b$)
65. ($b$)
66. ($c$)
67. ($a$)
68. ($b$)
69. ($b$)
70. ($b$)
71. ($b$)
72. ($a$)
73. ($b$)
74. ($b$)
75. ($b$)
76. ($b$)
77. ($d$)
78. ($b$)
79. ($a$)
80. ($a$)
81. ($a$)
82. ($d$)
83. ($a$)
84. ($a$)
85. ($a$)
86. ($b$)
87. ($a$)
88. ($b$)
89. ($d$)
90. ($c$)
91. ($a$)
92. ($b$)
93. ($c$)
94. ($b$)
95. ($a$)
96. ($b$)
97. ($b$)
98. ($a$)
99. ($c$)
100. ($b$)
101. ($a$)
102. ($c$)
103. ($a$)
104. ($b$)
105. ($a$)
106. ($a$)
107. ($c$)
108. ($a$)
109. ($b$)
110. ($b$)
111. ($b$)
112. ($a$)
113. ($b$)
114. ($c$)
115. ($a$)
116. ($d$)
117. ($c$)
118. ($a$)
119. ($c$)
120. ($b$)
121. ($c$)
122. ($d$)
123. ($d$)
124. ($b$)
125. ($a$)
126. ($c$)
127. ($c$)
128. ($b$)
129. ($b$)
130. ($c$)
131. ($b$)
132. ($a$)
133. ($c$)
134. ($a$)
135. ($c$)
136. ($a$)
137. ($b$)
138. ($b$)
139. ($b$)
140. ($a$)
141. ($a$)

| | | |
|---|---|---|
| 142. (*b*) | 143. (*c*) | 144. (*a*) |
| 145. (*e*) | 146. (*a*) | 147. (*a*) |
| 148. (*c*) | 149. (*a*) | 150. (*b*) |
| 151. (*b*) | 152. (*a*) | 153. (*d*) |
| 154. (*c*) | 155. (*b*) | 156. (*c*) |
| 157. — | 158. (*d*) | 159. (*c*) |
| 160. (*c*) | 161. (*a*) | 162. (*a*) |
| 163. (*a*) | 164. (*d*) | 165. (*a*) |
| 166. (*a*) | 167. (*c*) | 168. (*d*) |
| 169. (*d*) | 170. (*c*) | 171. (*d*) |
| 172. (*a*) | 173. (*b*) | 174. (*c*) |
| 175. (*c*) | 176. (*a*) | 177. (*e*) |
| 178. (*b*) | 179. (*c*) | 180. (*d*) |
| 181. (*a*) | 182. (*c*) | 183. (*a*) |
| 184. (*b*) | 185. (*c*) | 186. (*a*) |
| 187. (*b*) | 188. (*a*) | 189. (*b*) |
| 190. (*a*) | 191. (*a*) | 192. (*a*) |
| 193. (*c*) | 194. (*c*) | 195. (*b*) |
| 196. (*a*) | 197. (*a*) | 198. (*b*) |
| 199. (*b*) | 200. (*c*) | 201. (*a*) |
| 202. (*b*) | 203. (*c*) | 204. (*a*) |
| 205. (*c*) | 206. (*c*) | 207. (*c*) |
| 208. (*b*) | 209. (*d*) | 210. (*c*) |
| 211. (*a*) | 212. (*d*) | 213. (*b*) |
| 214. (*b*) | 215. (*b*) | 216. (*b*) |
| 217. (*d*) | 218. (*c*) | 219. (*c*) |
| 220. (*a*) | 221. (*a*) | 222. (*a*) |
| 223. (*a*) | 224. (*a*) | 225. (*b*) |
| 226. (*e*) | 227. (*c*) | 228. (*b*) |
| 229. (*c*) | 230. (*d*) | |

## CHAPTER 7 ELECTRONICS

| | | |
|---|---|---|
| 1. (*a*) | 2. (*b*) | 3. (*b*) |
| 4. (*b*) | 5. (*b*) | 6. (*b*) |
| 7. (*b*) | 8. (*c*) | 9. (*d*) |
| 10. (*b*) | 11. (*c*) | 12. (*c*) |
| 13. (*b*) | 14. (*d*) | 15. (*b*) |
| 16. (*d*) | 17. (*b*) | 18. (*a*) |

| | | |
|---|---|---|
| 19. $(b)$ | 20. $(b)$ | 21. $(b)$ |
| 22. $(a)$ | 23. $(c)$ | 24. $(c)$ |
| 25. $(a)$ | 26. $(b)$ | 27. $(c)$ |
| 28. $(c)$ | 29. $(c)$ | 30. $(c)$ |
| 31. $(b)$ | 32. $(b)$ | 33. $(a)$ |
| 34. $(b)$ | 35. $(a)$ | 36. $(c)$ |
| 37. $(a)$ | 38. $(a)$ | 39. $(a)$ |
| 40. $(a)$ | 41. $(a)$ | 42. $(c)$ |
| 43. $(a)$ | 44. $(a)$ | 45. $(c)$ |
| 46. $(d)$ | 47. $(d)$ | 48. $(c)$ |
| 49. $(c)$ | 50. $(a)$ | 51. $(a)$ |
| 52. $(b)$ | 53. $(b)$ | 54. $(b)$ |
| 55. $(b)$ | 56. $(a)$ | 57. $(a)$ |
| 58. $(c)$ | 59. $(b)$ | 60. $(b)$ |
| 61. $(c)$ | 62. $(d)$ | 63. $(a)$ |
| 64. $(b)$ | 65. $(c)$ | 66. $(c)$ |
| 67. $(a)$ | 68. $(b)$ | 69. $(b)$ |
| 70. $(a)$ | 71. $(d)$ | 72. $(b)$ |
| 73. $(b)$ | 74. $(b)$ | 75. $(c)$ |
| 76. $(d)$ | 77. $(a)$ | 78. — |
| 79. $(c)$ | 80. $(c)$ | 81. $(b)$ |
| 82. $(c)$ | 83. $(a)$ | 84. $(c)$ |
| 85. $(c)$ | 86. $(c)$ | 87. $(a)$ |
| 88. $(b)$ | 89. $(a)$ | 90. $(b)$ |
| 91. $(b)$ | 92. $(b)$ | 93. $(b)$ |
| 94. $(b)$ | 95. $(b)$ | 96. $(b)$ |
| 97. $(b)$ | 98. — | 99. $(b)$ |
| 100. $(a)$ | 101. $(a)$ | 102. $(a)$ |
| 103. $(d)$ | 104. $(a)$ | 105. $(c)$ |
| 106. $(b)$ | 107. — | 108. $(c)$ |
| 109. $(b)$ | 110. $(b)$ | 111. $(d)$ |
| 112. $(d)$ | 113. $(c)$ | 114. $(c)$ |
| 115. $(c)$ | 116. $(c)$ | 117. $(b)$ |
| 118. $(d)$ | 119. $(a)$ | 120. $(d)$ |
| 121. $(d)$ | 122. $(d)$ | 123. $(a)$ |
| 124. $(b)$ | 125. $(d)$ | 126. $(d)$ |
| 127. $(b)$ | 128. $(c)$ | 129. $(d)$ |
| 130. $(c)$ | 131. $(c)$ | 132. $(a)$ |
| 133. $(b)$ | 134. $(b)$ | 135. $(c)$ |
| 136. $(b)$ | 137. $(a)$ | 138. $(b)$ |

139. ($c$) 140. ($b$) 141. ($c$)
142. ($d$) 143. ($c$) 144. ($c$)
145. ($a$) 146. ($d$) 147. ($a$)
148. ($a$) 149. ($b$) 150. ($a$)
151. ($a$) 152. ($c$) 153. ($d$)
154. ($a$) 155. ($b$) 156. ($a$)
157. ($a$) 158. ($a$) 159. ($b$)
160. ($a$) 161. ($b$) 162. ($b$)
163. ($a$) 164. ($a$) 165. ($a$)
166. ($a$) 167. ($a$) 168. ($b$)
169. ($b$) 170. ($a$) 171. ($c$)
172. ($d$) 173. ($e$) 174. ($b$)
175. ($b$) 176. ($a$) 177. ($d$)
178. ($b$) 179. ($c$) 180. ($b$)
181. ($a$) 182. ($c$) 183. ($d$)
184. ($d$) 185. ($b$) 186. ($c$)
187. ($c$) 188. ($a$) 189. ($b$)
190. ($c$) 191. ($a$) 192. ($b$)
193. ($b$) 194. ($a$) 195. ($a$)
196. ($c$) 197. ($a$) 198. ($b$)
199. ($d$) 200. ($b$) 201. ($c$)
202. ($c$) 203. ($c$) 204. ($c$)
205. ($a$) 206. ($b$) 207. ($b$)
208. ($a$) 209. ($b$) 210. ($a$)
211. ($c$) 212. ($b$) 213. ($a$)
214. ($b$) 215. ($c$) 216. ($c$)
217. ($c$) 218. ($a$) 219. ($d$)
220. ($c$) 221. ($d$) 222. ($d$)
223. ($a$) 224. ($a$) 225. ($a$)
226. ($d$) 227. ($d$) 228. ($b$)
229. ($b$) 230. ($b$) 231. ($a$)
232. ($b$) 233. ($a$) 234. ($a$)
235. ($f$) 236. ($e$) 237. ($d$)
238. ($d$) 239. ($c$) 240. ($b$)
241. ($a$) 242. ($a$) 243. ($c$)
244. ($d$) 245. ($b$) 246. ($c$)
247. ($e$) 248. ($c$) 249. ($a$)
250. ($a$) 251. ($b$) 252. ($d$)
253. ($b$) 254. ($b$) 255. ($f$)
256. ($c$) 257. ($a$) 258. ($b$)

259. $(c)$
260. $(b)$
261. $(a)$
262. $(e)$
263. $(a)$
264. $(e)$
265. $(d)$
266. $(b)$
267. $(b)$
268. $(a)$
269. $(a)$
270. $(d)$
271. $(c)$
272. $(b)$
273. $(b)$
274. $(a)$
275. $(c)$
276. $(c)$
277. $(a)$
278. $(a)$
279. $(a)$
280. $(c)$
281. $(c)$
282. $(b)$
283. $(a)$
284. $(b)$
285. $(a)$
286. $(b)$
287. $(c)$
288. $(e)$
289. $(a)$
290. $(b)$
291. $(a)$
292. $(c)$
293. $(a)$
294. $(a)$
295. $(c)$
296. $(c)$
297. $(a)$
298. $(a)$
299. $(a)$
300. $(b)$
301. $(b)$
302. $(a)$
303. $(b)$
304. $(d)$
305. $(a)$
306. $(b)$
307. $(a)$
308. $(b)$
309. $(b)$
310. $(b)$
311. $(b)$
312. $(b)$
313. $(d)$
314. $(d)$
315. $(a)$
316. $(d)$
317. $(b)$
318. $(a)$
319. $(c)$
320. $(b)$
321. $(b)$
322. $(a)$
323. $(d)$
324. $(c)$
325. $(c)$
326. $(b)$
327. $(b)$
328. $(a)$
329. $(a)$
330. $(d)$
331. $(a)$
332. $(b)$
333. $(c)$
334. $(c)$
335. $(a)$
336. $(a)$
337. $(c)$
338. $(d)$
339. $(b)$
340. $(c)$
341. $(c)$
342. $(a)$
343. $(a)$
344. $(c)$
345. $(b)$
346. $(d)$
347. $(e)$
348. $(b)$
349. $(b)$
350. $(a)$
351. $(b)$
352. $(b)$
353. $(b)$
354. $(a)$
355. $(d)$
356. $(b)$
357. $(a)$
358. $(c)$
359. $(a)$
360. $(a)$
361. $(b)$
362. $(b)$
363. $(a)$
364. $(b)$
365. $(c)$
366. $(a)$
367. $(b)$
368. $(b)$
369. $(c)$
370. $(b)$
371. $(b)$
372. $(a)$
373. $(c)$
374. $(b)$
375. $(c)$
376. $(d)$
377. $(c)$
378. $(b)$

| | | |
|---|---|---|
| 379. (*a*) | 380. (*c*) | 381. (*c*) |
| 382. (*c*) | 383. (*a*) | 384. (*c*) |
| 385. (*a*) | 386. (*a*) | 387. (*a*) |
| 388. (*a*) | 389. (*b*) | 390. (*a*) |
| 391. (*a*) | 392. (*b*) | 393. (*b*) |
| 394. (*a*) | 395. (*b*) | 396. (*d*) |
| 397. (*a*) | 398. (*a*) | 399. (*b*) |
| 400. (*a*) | 401. (*b*) | 402. (*a*) |
| 403. (*a*) | 404. (*a*) | 405. (*a*) |
| 406. (*c*) | 407. (*a*) | 408. (*b*) |
| 409. (*a*) | 410. (*a*) | 411. (*b*) |
| 412. (*b*) | 413. (*a*) | 414. (*b*) |
| 415. (*a*) | 416. (*c*) | 417. (*c*) |
| 418. (*a*) | 419. (*a*) | 420. (*b*) |
| 421. (*a*) | 422. (*a*) | 423. (*c*) |
| 424. (*d*) | 425. (*b*) | 426. (*a*) |
| 427. (*a*) | 428. (*b*) | 429. (*a*) |
| 430. (*a*) | 431. (*c*) | 432. (*b*) |
| 433. (*d*) | | |

## CHAPTER 8 COMPUTER SCIENCE

| | | |
|---|---|---|
| 1. (*d*) | 2. (*c*) | 3. (*c*) |
| 4. (*c*) | 5. (*b*) | 6. (*c*) |
| 7. (*a*) | 8. (*c*) | 9. (*b*) |
| 10. (*d*) | 11. (*b*) | 12. (*a*) |
| 13. (*a*) | 14. (*a*) | 15. (*c*) |
| 16. (*c*) | 17. (*b*) | 18. (*e*) |
| 19. (*c*) | 20. (*c*) | 21. (*b*) |
| 22. (*a*) | 23. (*d*) | 24. (*b*) |
| 25. (*c*) | 26. (*c*) | 27. (*c*) |
| 28. (*c*) | 29. (*d*) | 30. (*b*) |
| 31. (*b*) | 32. (*b*) | 33. (*c*) |
| 34. (*d*) | 35. (*b*) | 36. (*b*) |
| 37. (*b*) | 38. (*b*) | 39. (*a*) |
| 40. (*a*) | 41. (*a*) | 42. (*b*) |
| 43. (*d*) | 44. (*b*) | 45. (*d*) |
| 46. (*a*) | 47. (*c*) | 48. (*a*) |
| 49. (*c*) | 50. (*b*) | 51. (*c*) |

| | | |
|---|---|---|
| 52. (*d*) | 53. (*b*) | 54. (*b*) |
| 55. (*b*) | 56. (*c*) | 57. (*c*) |
| 58. (*d*) | 59. (*c*) | 60. (*b*) |
| 61. (*d*) | 62. (*a*) | 63. (*b*) |
| 64. (*d*) | 65. (*b*) | 66. (*c*) |
| 67. (*c*) | 68. (*a*) | 69. (*c*) |
| 70. (*b*) | 71. (*a*) | 72. (*c*) |
| 73. (*c*) | 74. (*a*) | 75. (*a*) |
| 76. (*c*) | 77. (*c*) | 78. (*a*) |
| 79. (*a*) | 80. (*b*) | 81. (*a*) |
| 82. (*a*) | 83. (*d*) | 84. (*a*) |
| 85. (*a*) | 86. (*a*) | 87. (*d*) |
| 88. (*a*) | 89. (*c*) | 90. (*d*) |
| 91. (*c*) | 92. (*a*) | 93. (*a*) |
| 94. (*d*) | 95. (*a*) | 96. (*a*) |
| 97. (*c*) | 98. (*a*) | 99. (*a*) |
| 100. (*b*) | 101. (*d*) | 102. (*a*) |
| 103. (*a*) | 104. (*b*) | 105. (*a*) |
| 106. (*c*) | 107. (*c*) | 108. (*c*) |
| 109. (*d*) | 110. (*b*) | 111. (*d*) |
| 112. (*a*) | 113. (*c*) | 114. (*a*) |
| 115. (*c*) | 116. (*d*) | 117. (*c*) |
| 118. (*d*) | 119. (*b*) | 120. (*c*) |
| 121. (*c*) | 122. (*b*) | 123. (*a*) |
| 124. (*e*) | 125. (*e*) | 126. (*b*) |
| 127. (*a*) | 128. (*d*) | 129. (*a*) |
| 130. (*b*) | 131. (*a*) | 132. (*a*) |
| 133. (*b*) | 134. (*a*) | 135. (*e*) |
| 136. (*b*) | 137. (*a*) | 138. (*b*) |
| 139. (*c*) | 140. (*a*) | 141. (*a*) |
| 142. (*c*) | 143. (*e*) | 144. (*d*) |
| 145. (*c*) | 146. (*d*) | 147. (*b*) |
| 148. (*a*) | 149. (*b*) | 150. (*a*) |
| 151. (*b*) | 152. (*c*) | 153. (*b*) |
| 154. (*a*) | 155. (*c*) | 156. (*c*) |
| 157. (*a*) | 158. (*b*) | 159. (*a*) |
| 160. (*b*) | 161. (*b*) | 162. (*b*) |
| 163. (*e*) | 164. (*a*) | 165. (*b*) |
| 166. (*d*) | 167. (*c*) | 168. (*e*) |
| 169. (*d*) | 170. (*b*) | 171. (*a*) |

| | | |
|---|---|---|
| 172. (*b*) | 173. (*b*) | 174. (*b*) |
| 175. (*a*) | 176. (*d*) | 177. (*a*) |
| 178. (*c*) | 179. (*e*) | 180. (*a*) |
| 181. (*c*) | 182. (*c*) | 183. (*b*) |
| 184. (*b*) | 185. (*f*) | 186. (*a*) |
| 187. (*d*) | 188. (*b*) | 189. (*d*) |
| 190. (*b*) | 191. (*b*) | 192. (*c*) |
| 193. (*b*) | 194. (*a*) | 195. (*a*) |
| 196. (*c*) | 197. (*b*) | |

## CHAPTER 9 PROCESS INSTRUMENTATION

| | | |
|---|---|---|
| 1. (*b*) | 2. (*d*) | 3. (*b*) |
| 4. (*a*) | 5. (*a*) | 6. (*b*) |
| 7. (*b*) | 8. (*c*) | 9. (*c*) |
| 10. (*a*) | 11. (*c*) | 12. (*c*) |
| 13. (*c*) | 14. (*a*) | 15. (*c*) |
| 16. (*b*) | 17. (*b*) | 18. (*d*) |
| 19. (*d*) | 20. (*d*) | 21. (*b*) |
| 22. (*b*) | 23. (*b*) | 24. (*c*) |
| 25. (*c*) | 26. (*b*) | 27. (*a*) |
| 28. (*b*) | 29. (*c*) | 30. (*d*) |
| 31. (*c*) | 32. (*b*) | 33. (*c*) |
| 34. (*a*) | 35. (*c*) | 36. (*b*) |
| 37. (*a*) | 38. (*b*) | 39. (*d*) |
| 40. (*d*) | 41. (*b*) | 42. (*c*) |
| 43. (*b*) | 44. (*d*) | 45. (*b*) |
| 46. (*c*) | 47. (*d*) | 48. (*b*) |
| 49. (*d*) | 50. (*a*) | 51. (*d*) |
| 52. (*a*) | 53. (*c*) | 54. (*d*) |
| 55. (*b*) | 56. (*b*) | 57. (*b*) |
| 58. (*d*) | 59. (*d*) | 60. (*a*) |
| 61. (*a*) | 62. (*b*) | 63. (*a*) |
| 64. (*d*) | 65. (*b*) | 66. (*a*) |
| 67. (*c*) | 68. (*a*) | 69. (*b*) |
| 70. (*b*) | 71. (*a*) | 72. (*e*) |
| 73. (*c*) | 74. (*d*) | 75. (*d*) |
| 76. (*d*) | 77. (*c*) | 78. (*a*) |

| | | |
|---|---|---|
| 79. (*c*) | 80. (*b*) | 81. (*b*) |
| 82. (*b*) | 83. (*b*) | 84. (*d*) |
| 85. (*a*) | 86. (*b*) | 87. (*c*) |
| 88. (*b*) | 89. (*a*) | 90. (*d*) |
| 91. (*d*) | 92. (*d*) | 93. (*a*) |
| 94. (*a*) | 95. (*d*) | 96. (*a*) |
| 97. (*a*) | 98. (*a*) | 99. (*a*) |
| 100. (*c*) | 101. (*b*) | 102. (*a*) |

## CHAPTER 10 INFORMATION AND BLOCKCHAIN TECHNOLOGY

| | | |
|---|---|---|
| 1. (*a*) | 2. (*b*) | 3. (*d*) |
| 4. (*b*) | 5. (*a*) | 6. (*a*) |
| 7. (*b*) | 8. (*c*) | 9. (*a*) |
| 10. (*b*) | 11. (*a*) | 12. (*b*) |
| 13. (*c*) | 14. (*b*) | 15. (*a*) |
| 16. (*b*) | 17. (*b*) | 18. (*c*) |
| 19. (*e*) | 20. (*b*) | 21. (*a*) |
| 22. (*b*) | 23. (*c*) | 24. (*b*) |
| 25. (*d*) | 26. (*a*) | 27. (*a*) |
| 28. (*b*) | 29. (*c*) | 30. (*a*) |
| 31. (*a*) | 32. (*c*) | 33. (*b*) |
| 34. (*a*) | 35. (*b*) | 36. (*c*) |
| 37. (*c*) | 38. (*d*) | 39. (*b*) |
| 40. (*d*) | 41. (*a*) | 42. (*b*) |
| 43. (*b*) | 44. (*a*) | 45. (*d*) |
| 46. (*a*) | 47. (*e*) | 48. (*d*) |
| 49. (*c*) | 50. (*d*) | 51. (*a*) |
| 52. (*c*) | 53. (*a*) | 54. (*d*) |
| 55. (*d*) | 56. (*d*) | 57. (*a*) |
| 58. (*a*) | 59. (*d*) | 60. (*b*) |
| 61. (*a*) | 62. (*d*) | 63. (*b*) |
| 64. (*c*) | 65. (*d*) | 66. (*d*) |
| 67. (*a*) | 68. (*a*) | 69. (*c*) |
| 70. (*a*) | 71. (*b*) | 72. (*a*) |
| 73. (*c*) | 74. (*b*) | 75. (*c*) |
| 76. (*d*) | 77. (*a*) | |

## CHAPTER 11 SUPERCONDUCTIVITY AND QUANTUM COMPUTING

| | | |
|---|---|---|
| 1. (*b*) | 2. (*b*) | 3. (*b*) |
| 4. (*c*) | 5. (*e*) | 6. (*a*) |
| 7. (*a*) | 8. (*b*) | 9. (*e*) |
| 10. (*a*) | 11. (*b*) | 12. (*b*) |
| 13. (*b*) | 14. (*a*) | 15. (*a*) |
| 16. (*a*) | 17. (*d*) | 18. (*a*) |
| 19. (*b*) | 20. (*a*) | 21. (*d*) |
| 22. (*e*) | 23. (*d*) | 24. (*d*) |
| 25. (*b*) | 26. (*b*) | 27. (*d*) |
| 28. (*d*) | 29. (*b*) | 30. (*a*) |
| 31. (*a*) | 32. (*d*) | 33. (*a*) |
| 34. (*d*) | 35. (*a*) | 36. (*d*) |
| 37. (*d*) | 38. (*d*) | 39. (*d*) |
| 40. (*a*) | 41. (*b*) | 42. (*c*) |
| 43. (*a*) | 44. (*b*) | 45. (*c*) |
| 46. (*b*) | 47. (*b*) | 48. (*d*) |
| 49. (*b*) | 50. (*c*) | 51. (*a*) |
| 52. (*b*) | 53. (*b*) | 54. (*b*) |
| 55. (*a*) | 56. (*b*) | 57. (*b*) |
| 58. (*a*) | 59. (*a*) | 60. (*a*) |
| 61. (*a*) | 62. (*b*) | 63. (*a*) |
| 64. (*d*) | 65. (*d*) | 66. (*d*) |
| 67. (*d*) | 68. (*c*) | 69. (*d*) |
| 70. (*a*) | 71. (*e*) | 72. (*e*) |
| 73. (*d*) | 74. (*d*) | 75. (*d*) |
| 76. (*c*) | 77. (*b*) | 78. (*a*) |
| 79. (*b*) | 80. (*a*) | 81. (*c*) |
| 82. (*a*) | 83. (*a*) | 84. (*b*) |
| 85. (*c*) | 86. (*a*) | 87. (*c*) |

## CHAPTER 12 SELF-EXAMINATION

| | | |
|---|---|---|
| 1. (*c*) | 2. (*c*) | 3. (*a*) |
| 4. (*b*) | 5. (*b*) | 6. (*c*) |
| 7. (*b*) | 8. (*d*) | 9. (*b*) |
| 10. (*a*) | 11. (*c*) | 12. (*b*) |

13. (*b*) 14. (*b*) 15. (*d*)
16. (*a*) 17. (*b*) 18. (*b*)
19. (*a*) 20. (*b*) 21. (*b*)
22. (*c*) 23. (*b*) 24. (*a*)
25. (*a*) 26. (*c*) 27. (*b*)
28. (*c*) 29. (*a*) 30. (*b*)
31. (*c*) 32. (*d*) 33. (*a*)
34. (*a*) 35. (*d*) 36. (*b*)
37. (*b*) 38. (*c*) 39. (*a*)
40. (*a*) 41. (*a*) 42. (*b*)
43. (*d*) 44. (*b*) 45. (*b*)
46. (*c*) 47. (*c*) 48. (*a*)
49. (*b*) 50. (*a*) 51. (*a*)
52. (*c*) 53. (*b*) 54. (*a*)
55. (*b*) 56. (*c*) 57. (*c*)
58. (*c*) 59. (*c*) 60. (*a*)
61. (*a*) 62. (*c*) 63. (*c*)
64. (*a*) 65. (*a*) 66. (*c*)
67. (*c*) 68. (*b*) 69. (*a*)
70. (*b*) 71. (*d*) 72. (*a*)
73. (*c*) 74. (*b*) 75. (*a*)
76. (*d*) 77. (*d*) 78. (*c*)
79. (*d*) 80. (*a*) 81. (*c*)
82. (*c*) 83. (*a*) 84. (*c*)
85. (*c*) 86. (*b*) 87. (*b*)
88. (*c*) 89. (*a*) 90. (*c*)
91. (*a*) 92. (*d*) 93. (*b*)
94. (*c*) 95. (*a*) 96. (*a*)
97. (*a*) 98. (*e*) 99. (*b*)
100. (*a*) 101. (*a*) 102. (*b*)
103. (*d*) 104. (*b*) 105. (*b*)
106. (*b*) 107. (*c*) 108. (*c*)
109. (*c*) 110. (*d*) 111. (*d*)
112. (*a*) 113. (*a*) 114. (*c*)
115. (*b*) 116. (*b*) 117. (*e*)
118. (*a*) 119. (*c*) 120. (*c*)
121. (*c*) 122. (*b*) 123. (*b*)
124. (*b*) 125. (*b*) 126. (*a*)
127. (*c*) 128. (*d*) 129. (*c*)
130. (*c*) 131. (*b*) 132. (*d*)

133. (*d*)
134. (*d*)
135. (*d*)
136. (*e*)
137. (*e*)
138. (*b*)
139. (*d*)
140. (*b*)
141. (*c*)
142. (*a*)
143. (*b*)
144. (*b*)
145. (*b*)
146. (*b*)
147. (*a*)
148. (*b*)
149. (*b*)
150. (*d*)
151. (*d*)
152. (*d*)
153. (*b*)
154. (*d*)
155. (*a*)
156. (*b*)
157. (*c*)
158. (*a*)
159. (*c*)
160. (*c*)
161. (*c*)
162. (*d*)
163. (*d*)
164. (*b*)
165. (*b*)
166. (*d*)
167. (*b*)
168. (*a*)
169. (*c*)
170. (*d*)
171. (*a*)
172. (*b*)
173. (*a*)
174. (*b*)
175. (*b*)
176. (*b*)
177. (*b*)
178. (*d*)
179. (*d*)
180. (*d*)
181. (*c*)
182. (*d*)
183. (*b*)
184. (*d*)
185. (*d*)
186. (*a*)
187. (*a*)
188. (*b*)
189. (*a*)
190. (*a*)
191. (*d*)
192. (*a*)
193. (*b*)
194. (*d*)
195. (*d*)
196. (*a*)
197. (*a*)
198. (*a*)
199. (*b*)
200. (*a*)
201. (*c*)
202. (*c*)
203. (*d*)
204. (*a*)
205. (*a*)
206. (*e*)
207. (*d*)
208. (*c*)
209. (*a*)
210. (*b*)
211. (*a*)
212. (*d*)
213. (*b*)
214. (*b*)
215. (*b*)
216. (*a*)
217. (*d*)
218. (*d*)
219. (*a*)
220. (*c*)
221. (*d*)
222. (*d*)
223. (*a*)
224. (*a*)
225. (*c*)
226. (*b*)
227. (*b*)
228. (*d*)
229. (*d*)
230. (*b*)
231. (*d*)
232. (*a*)
233. (*a*)
234. (*d*)
235. (*b*)
236. (*c*)
237. (*a*)
238. (*d*)
239. (*d*)
240. (*b*)
241. (*d*)
242. (*a*)
243. (*c*)
244. (*c*)
245. (*d*)
246. (*c*)
247. (*b*)
248. (*c*)
249. (*b*)
250. (*c*)