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Question Booklet Series

Question Booklet **B**

ELECTRICAL ENGINEERING/TECHNOLOGY

(Objective)

Time Allowed : 2 Hours

Maximum Marks : 50

Read the following instructions carefully before you begin to answer the questions.

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1. This Question Booklet contains **100** questions in all.
2. **All** questions carry equal marks.
3. Attempt **all** questions.
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SEAL

1. What is the centre of gravity of a plate whose density $\rho(x, y)$ is constant and is bounded by the curves $y = x^2$ and $y = x + 2$?

(A) $\left(\frac{1}{2}, \frac{7}{5}\right)$

(B) $\left(\frac{1}{2}, \frac{8}{5}\right)$

(C) $\left(\frac{1}{5}, \frac{8}{3}\right)$

(D) $\left(\frac{1}{5}, \frac{7}{2}\right)$

2. The cylinder $x^2 + z^2 = 1$ is cut by the planes $y = 0$, $z = 0$ and $x = y$. What is the volume of the region in the first octant?

(A) $\frac{2}{3}$ cubic units

(B) $\frac{4}{3}$ cubic units

(C) $\frac{5}{3}$ cubic units

(D) $\frac{1}{3}$ cubic units

3. What is the volume of the solid in the first octant bounded by the paraboloid

$$z = 36 - 4x^2 - 9y^2 \ ?$$

(A) 27π cubic units

(B) 27 cubic units

(C) 17π cubic units

(D) 17 cubic units

4. What is the solution of the initial-value problem $y'' + 6y' + 9y = 0$, $y(0) = 2$, $y'(0) = 3$?

(A) $(2 + 7x)e^{-3x}$

(B) $(2 + 9x)e^{-x}$

(C) $(1 + 9x)e^{-3x}$

(D) None of the above

5. What is the solution of the differential equation

$$2x^2y'' + 3xy' - y = x,\ y(1) = 1,\ y(4) = \frac{41}{16} \ ?$$

(A) $y = \frac{1}{4}\left(\sqrt{x} + \frac{\sqrt{x}}{2}\right) + \frac{x}{2}$

(B) $y = \frac{1}{2}\left(\sqrt{x} + \frac{\sqrt{x}}{2}\right) + \frac{x}{2}$

(C) $y = \frac{1}{4}\left(\sqrt{x} + \frac{\sqrt{x}}{4}\right) + \frac{x}{2}$

(D) None of the above

6. What is the particular integral of the differential equation

$$16y'' + 8y' + y = 48xe^{-\frac{x}{4}} \ ?$$

(A) $\frac{1}{3}x^2e^{-\frac{x}{4}}$

(B) $\frac{1}{2}x^3e^{-\frac{x}{4}}$

(C) $\frac{1}{2}x^3e^{\frac{x}{4}}$

(D) $\frac{1}{3}x^3e^{-\frac{x}{4}}$

7. What is the solution of the partial differential equation

$(3-2yz)p + x(2z-1)q = 2x(y-3)$

which passes through the curve $z = 0,\ x^2 + y^2 = 4$?

(A) $x^2 + y^2 + z = 4$

(B) $x^2 + y^2 + z^2 = 4$

(C) $x + y^2 + z^2 = 4$

(D) $x^2 + y + z^2 = 4$

8. What is the integrating factor of the differential equation

$$\frac{dy}{dx} - y = y^2(\sin x + \cos x)\ ?$$

(A) xe^x

(B) $\frac{e^x}{x}$

(C) $\log x$

(D) None of the above

9. If z_1 and z_2 are the simple poles of the function

$$f(z) = \frac{\sin mz}{z^2 + 2z + 2},\ z \neq 0$$

in the finite z-plane, then $z_1 + z_2$ equals

(A) 2

(B) -2

(C) 0

(D) None of the above

10. $\int_0^{2\pi} \frac{\cos 3\theta}{5 - 4\cos\theta} d\theta$ equals

(A) $\frac{\pi}{2}$

(B) 0

(C) $\frac{\pi}{3}$

(D) $\frac{\pi}{12}$

11. Which of the following is not true?

(A) $f(z) = z|z|$ is analytic anywhere

(B) There is no analytic function whose imaginary part is $x^2 - 2y$

(C) $f(z) = \frac{1}{z-2}$ is analytic in any region not including $z = 2$

(D) None of the above

12. If the sum of the first three terms in the Laurent series of $f(z) = \frac{\cos z}{z - \pi}$ at $z = \pi$ is $\frac{a}{z-\pi} + b(z-\pi) + c(z-\pi)^3$, then $a - b - c$ equals

(A) $-\frac{73}{24}$

(B) $-\frac{71}{24}$

(C) $\frac{73}{24}$

(D) 0

13. If a_1 and a_2 $(a_1 > a_2)$ are the residues of the function $f(z) = \frac{2z+3}{z^2-4}$, then $5a_1 - 3a_2$ equals

(A) -4

(B) 4

(C) 8

(D) -8

14. Which of the following is not true?

(A) $\int_0^\infty \frac{\sin x}{x}\,dx = \frac{\pi}{2}$

(B) $\int_0^\infty \frac{\sin^2 x}{x^2}\,dx = \frac{\pi}{2}$

(C) $\int_0^\infty \frac{\sin^3 x}{x}\,dx = \frac{\pi}{2}$

(D) None of the above

15. The probability that at least one of the events A and B occurs is 0·8 and the probability that both the events occur simultaneously is 0·25. What is the value of $P(\bar{A}) + P(\bar{B})$?

(A) 0·85

(B) 0·95

(C) 0·97

(D) 0·93

16. A die is thrown twice and the sum of the numbers is noted to be 8. What is the conditional probability that the number 5 has appeared at least once?

(A) $\frac{1}{5}$

(B) $\frac{3}{5}$

(C) $\frac{2}{5}$

(D) None of the above

17. The joint pdf of the random variables X and Y is given by $f(x, y) = K(xy + y^2)$, $0 \le x \le 1$, $0 \le y \le 2$. What is the value of $P\left(X > \frac{1}{2}, Y < 1\right)$?

(A) $\frac{111}{132}$

(B) $\frac{17}{176}$

(C) $\frac{3}{88}$

(D) None of the above

18. In a book of 800 pages, 300 typographical errors are noticed. Assuming Poisson law for the number of errors per page, what is the probability that a randomly chosen 4 pages will contain no errors?

(A) $e^{-1.7}$

(B) $e^{-1.3}$

(C) $e^{-1.5}$

(D) None of the above

19. The mean and variance of a binomial distribution are 4·5 and 1·125 respectively. Then $P(X \ge 1)$ equals

(A) $B\left(n, \frac{5}{7}\right)$

(B) $B\left(n, \frac{5}{11}\right)$

(C) $B\left(n, \frac{7}{12}\right)$

(D) None of the above

20. In a distribution which is exactly normal, 12% of the items is under 30 and 85% is under 60. What are the mean and standard deviation of the distribution?

(A) $\sigma = 13{\cdot}5655,\ \mu = 45{\cdot}9395$

(B) $\sigma = 11{\cdot}5655,\ \mu = 41{\cdot}9395$

(C) $\sigma = 13{\cdot}5655,\ \mu = 41{\cdot}9395$

(D) $\sigma = 11{\cdot}5655,\ \mu = 45{\cdot}9395$

21. After performing three iterations of the bisection method, what is the smallest positive root of the equation $x^3 - 5x + 1 = 0$, the root lying in $(0, 1)$?

(A) 0·1870

(B) 0·1875

(C) 0·1885

(D) None of the above

22. What is the approximate value of $y(1{\cdot}4)$ for the initial-value problem $y' = x^2 + y^2$, $y(1) = 2$, with $h = 0{\cdot}2$ by using Euler-Cauchy method?

(A) 8·545

(B) 9·545

(C) 7·454

(D) None of the above

23. Using Simpson's $\frac{1}{3}$rd rule with $h = \frac{1}{2}$, $\int_1^2 \sqrt{1+4x^2}\,\sin x\,dx$ equals

(A) 5·0414

(B) 3·0414

(C) 3·1414

(D) 5·1414

24. Using the classical Runge-Kutta fourth-order method with the step size $h = 0{\cdot}2$, what is the solution of the initial-value problem $y' = x(y - x)$, $y(2) = 3$?

(A) 5·1608

(B) 4·5608

(C) 4·1608

(D) None of the above

25. What is the least squares polynomial of degree one for $f(x) = \sqrt{x}$ on $[0, 1]$?

(A) $P(x) = \frac{4}{15}(1+3x)$

(B) $P(x) = \frac{4}{5}(1+3x)$

(C) $P(x) = \frac{14}{15}(1+3x)$

(D) None of the above

26. If $\delta(t)$ is the Dirac delta function and $G(t)$ is a continuous function, then $\int_0^\infty \delta(t-a)G(t)\,dt$ equals

(A) $G(0)$

(B) $G(\infty)$

(C) $G(a)$

(D) None of the above

27. What is the Laplace transform of the function $F(t) = t^{-\frac{1}{2}}$?

(A) $\sqrt{\frac{\pi}{s}},\ s > 0$ (B) $\frac{\sqrt{\pi}}{s},\ s > 0$

(C) $\frac{\pi}{\sqrt{s}},\ s > 0$ (D) $\frac{\pi}{s},\ s > 0$

28. If $L^{-1}\left(\frac{1}{s^2(s^2+1)}\right) = at^2 + b\cos t + c$ then $a+b-c$ equals

(A) $\frac{1}{2}$ (B) $-\frac{1}{2}$

(C) $\frac{3}{2}$ (D) $\frac{5}{2}$

29. What is the Fourier transform of

$$F(x) = \begin{cases} 1-x^2, & |x|<1 \\ 0, & |x|>1 \end{cases} ?$$

(A) $4\left(\frac{\lambda\cos\lambda - \sin\lambda}{\lambda^2}\right)$

(B) $4\left(\frac{\lambda\cos\lambda - \sin\lambda}{\lambda}\right)$

(C) $4\left(\frac{\lambda\cos\lambda - \sin\lambda}{\lambda^3}\right)$

(D) None of the above

30. If the Fourier sine transform of $F(x) = e^{-x}$, $x \geq 0$ is $\frac{a\lambda}{b+c\lambda^2}$, then $a-b+c$ equals

(A) 2 (B) 1

(C) -1 (D) 0

31. If the inverse Z-transform of

$$F(z) = \frac{z}{(z+2)(z+3)}$$

is $Z^{-1}[F(z)] = (a)^n - (b)^n$, then what is the value of $a-b$?

(A) 1

(B) 0

(C) 2

(D) None of the above

32. If $N = \begin{bmatrix} 0 & 2 & 0 \\ 0 & 0 & 2 \\ 0 & 0 & 2 \end{bmatrix}$ then which of the following is true?

(A) $N^2 = 0$

(B) $N^3 = 0$

(C) $N^3 = N$

(D) None of the above

33. Let A be an invertible matrix of order $n \times n$. Which of the following is not true?

(A) A is row equivalent to the $n \times n$ identity matrix I

(B) For every n-vector b, the system $Ax = b$ has many solutions

(C) $Ax = 0$ has only the trivial solution

(D) None of the above

34. Let A be a square matrix of order two. Which of the following is not true?

(A) A has two distinct real eigenvalues, each corresponding to a single eigenvector

(B) A has a single real eigenvalue corresponding to a single eigenvector

(C) A has two complex conjugate eigenvalues corresponding to complex conjugate eigenvectors

(D) None of the above

35. Let λ_1, λ_2 and λ_3 be the eigenvalues of the matrix

$$\begin{bmatrix} 7 & 0 & 0 \\ 0 & -5 & 0 \\ 0 & 0 & 3 \end{bmatrix}$$

Then $\lambda_1 + \lambda_2 + \lambda_3$ equals

(A) 5

(B) 15

(C) 10

(D) None of the above

36. Let A and B be diagonalizable matrices. Let λ_1, λ_2 and λ_3 be eigenvalues of A; and λ_1, $-\lambda_2$ and $-\lambda_3$ be eigenvalues of B. If α is the sum of the eigenvalues of A^2 and β is the sum of the eigenvalues of B^2, then $\alpha + \beta$ equals

(A) $2\lambda_1$

(B) $2(\lambda_1 + \lambda_2 + \lambda_3)$

(C) $2(\lambda_1^2 + \lambda_2^2 + \lambda_3^2)$

(D) $2(\lambda_1^2 - \lambda_2^2 - \lambda_3^2)$

37. If $k \neq 4$ in the system of equations $3x + 2y = 11$, $6x + ky = 21$, then the system has

(A) a unique solution

(B) no solution

(C) infinitely many solutions

(D) exactly two solutions

38. What is the volume of the solid generated by revolving the region bounded by the curves $y = 1 + \sqrt{x}$ and $y = 1 + x$ about the y-axis?

(A) $\frac{2\pi}{15}$ cubic units

(B) $\frac{\pi}{15}$ cubic units

(C) $\frac{2\pi}{5}$ cubic units

(D) $\frac{\pi}{5}$ cubic units

39. Which of the following is true?

(A) $\Gamma\left(\frac{1}{2}\right) = \pi$

(B) $\Gamma\left(-\frac{1}{2}\right) = -\sqrt{\pi}$

(C) $\Gamma\left(-\frac{1}{2}\right) = -2\sqrt{\pi}$

(D) $\Gamma(1) = -1$

40. If

$$f(x, y) = \begin{cases} \frac{x^3 + 2y^3}{x^2 + y^2}, & (x, y) \neq (0, 0) \\ 0, & (x, y) = (0, 0) \end{cases}$$

then which of the following is not true?

(A) $f(x, y)$ is continuous at $(0, 0)$

(B) $f(x, y)$ possesses partial derivatives $f_x(0, 0)$ and $f_y(0, 0)$

(C) $f(x, y)$ is differentiable at $(0, 0)$

(D) None of the above

41. A 3-phase synchronous generator is operating at zero p.f. lagging with respect to the excitation voltage. The armature reaction m.m.f. produced by the armature current is

(A) magnetizing in nature

(B) demagnetizing in nature

(C) cross-magnetizing in nature

(D) Either (B) or (C)

42. Two transformers of the same type, using the same grade of iron and conductor materials, are designed to work at the same flux and current densities; but the linear dimensions of one are two times those of the other in all respects. The ratio of kVA of the two transformers closely equals

(A) 16 (B) 8

(C) 4 (D) 2

43. A 3-phase, 50-Hz, 4-pole squirrel-cage induction motor has its stator rewound for 6 poles without any alternations in the rotor. The motor would now run at a speed of

(A) <1000 r.p.m.

(B) <1500 r.p.m.

(C) <3000 r.p.m.

(D) zero r.p.m.

44. If a transformer primary is energized from a square-wave voltage source, then its out voltage will be

(A) zero

(B) a sine wave

(C) a triangular wave

(D) a pulsed wave

45. A 200 V d.c. shunt motor delivers an output at 17 kW with an input of 20 kW. The field winding resistance is 50 C and armature resistance is 0·04 Ω. The maximum efficiency will be obtained when the total armature copper losses are equal to

(A) 2632 W (B) 3000 W

(C) 3680 W (D) 5232 W

46. A shunt motor having unsaturated magnetic circuit runs at 1000 r.p.m. with rated voltage. If the applied voltage is half of the rated voltage, the motor will run at

(A) 2000 r.p.m.

(B) 1000 r.p.m.

(C) 750 r.p.m.

(D) 500 r.p.m.

47. A d.c. shunt motor has external resistance of R_a and R_f in the armature and field circuits respectively. The armature current at starting can be reduced by keeping

(A) R_f maximum and R_a minimum

(B) R_a maximum and R_f maximum

(C) R_a minimum and R_f minimum

(D) R_a maximum and R_f minimum

48. Two transformers of different kVA ratings working in parallel, share the load in proportion to their ratings when their

(A) per unit leakage impedance on the same kVA base are the same

(B) per unit leakage impedance on their respective ratings are equal

(C) ohmic values of the leakage impedance are inversely proportional to their ratings

(D) ohmic values of the magnetizing reactances are the same

49. The hysteresis and eddy current losses of a single-phase transformer working on 200 V, 0 Hz supply are P_h and P_e respectively. The percentage decreases in these, when operated on a 160 V, 40 Hz supply are

(A) 32, 36

(B) 20, 36

(C) 25, 20

(D) 40, 80

50. A single-phase transformer has a maximum efficiency of 90% at full load and unity power factor. The efficiency at half load at the same power factor is

(A) 86·7%

(B) 88·26%

(C) 88·9%

(D) 87·8%

51. An induction motor having full-load torque of 0 N-m when delta-connected develops a starting torque of 120 N-m. For the same supply voltage, if the motor is changed to star connection, the starting torque developed will be

(A) 40 N-m

(B) 60 N-m

(C) 90 N-m

(D) 120 N-m

52. The direction of rotation of a 3-phase induction motor is clockwise when it is supplied with a 3-phase sinusoidal voltage having phase sequence *A-B-C*. For counter-clockwise rotation of the motor, the phase sequence of the power supply should be

(A) *B-C-A*

(B) *C-A-B*

(C) *A-C-B*

(D) *B-C-A* or *C-A-B*

53. A 100 km long transmission line is loaded at 110 kV. If the loss of the line is 5 MW and the load is 150 MVA, the resistance of the line is

(A) 0·806 Ω/phase

(B) 8·06 Ω/phase

(C) 0·0806 Ω/phase

(D) 80·6 Ω/phase

54. It is found that the receiving-end voltage of long transmission line is greater than sending-end voltage on no-load. This might happen due to which of the following transmission line parameters?

(A) Capacitance

(B) Inductance

(C) Resistance

(D) Conductance

55. The insulation resistance of a cable of length 10 km is 1 MΩ. For a length of 100 km of the same cable, the insulation resistance will be

(A) 0·1 MΩ

(B) 10 MΩ

(C) 1 MΩ

(D) 0·01 MΩ

56. If in a short transmission line, resistance and inductance are found to be equal and regulation appears to be zero, then load will

(A) have unity power factor

(B) have zero power factor

(C) be 0·707 lagging

(D) be 0·707 leading

57. Series capacitive compensation on EHV transmission line is used to

(A) reduce the line loading

(B) improve the protection of the line

(C) reduce the voltage profile

(D) improve the stability of the system

58. For stability and economic reasons, we operate the transmission line with power angle in the range

(A) 10° to 25°

(B) 30° to 45°

(C) 60° to 75°

(D) 65° to 80°

59. If X is the system reactance and R is the resistance, the power transferred is maximum when

(A) $X = R$ (B) $X = \sqrt{2R}$

(C) $X = \sqrt{3R}$ (D) $X = 2R$

60. A 3-phase breaker is rated at 2000 MVA, 33 kV. Its making current will be

(A) 35 kA (B) 49 kA

(C) 70 kA (D) 89 kA

61. Resistance switching is normally resorted in case of

(A) bulk oil circuit breakers

(B) minimum oil circuit breakers

(C) air-blast circuit breakers

(D) all types of breakers

62. An MHO relay is

(A) a voltage restrained directional relay

(B) a voltage controlled over-current relay

(C) the capacitance of the system only

(D) the inductance and capacitance of the system

63. The per unit impedance of a circuit element is 0·15. If the base kV and base MVA are halved, then the new value of the per unit impedance of the circuit element will be

(A) 0·075 (B) 0·30

(C) 0·15 (D) 0·600

64. When bundled conductors are used in place of single conductors, the effective inductance and capacitance will respectively

(A) decrease and increase

(B) increase and decrease

(C) decrease and remain unaffected

(D) remain unaffected and increase

65. The concept of an electricity short, medium and long is primarily based on the

(A) nominal voltage of the line

(B) physical length of the line

(C) wavelength of the line

(D) power transmitted over the line

66. The total instantaneous power supplied by a 3-phase a.c. supply to a balanced RL load is

(A) zero

(B) constant

(C) pulsating with zero voltage

(D) pulsating with non-zero average

67. An over-current relay of current rating 5 A and setting 150% is connected to the secondary of CT of ratio 300/5. Then the current in the lines for which the relay pick-up is

(A) 450 A (B) 150 A

(C) 300 A (D) 200 A

68. The blocks having transfer functions

$$G_{1(S)} = \frac{1}{s+2}, G_{2(S)} = \frac{1}{s+3}, G_{3(S)} = \frac{s+2}{s+5}$$

are cascaded. The equivalent transfer function is

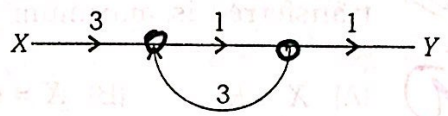
(A) $\frac{-(s^3+9s^2+31s+37)}{(s+2)(s+3)(s+5)}$

(B) $\frac{1}{(s+3)(s+5)}$

(C) $\frac{s^3+9s^2+31s+37}{(s+2)(s+3)(s+5)}$

(D) $\frac{3s^2+20s+31}{(s+2)(s+3)(s+5)}$

69. For the signal-flow graph shown below



Y/X equals

(A) $\frac{3}{4}$ (B) $-\frac{3}{4}$

(C) $\frac{3}{2}$ (D) $-\frac{3}{2}$

70. The steady-state errors due to step and ramp inputs are

(A) zero and 1

(B) zero and $1/K$

(C) zero and K

(D) infinite and $1/K$

71. The transfer function of a certain system is given as

$$(S) = \frac{1}{(s+2)(s+200)}$$

The 2% settling time for unit step is

(A) 4S (B) 2S

(C) 8S (D) 1S

If poles of the transfer function are negative distinct real roots, then system is

(A) over-damped

(B) critically damped

(C) under-damped

(D) unstable system

73. The transfer function of a system is

$$(S) = \frac{2}{(s+1)(s+2)}$$

The damping ratio will be

(A) $\frac{3}{4}$ (B) $\frac{3}{2}$

(C) $\frac{3}{2\sqrt{2}}$ (D) $\frac{3}{\sqrt{2}}$

74. The open-loop transfer functions with unity feedback are given below for different systems :

I. $G(S) = \frac{2}{s+2}$

II. $G(S) = \frac{2}{s(s+2)}$

III. $G(S) = \frac{12}{s^2(s+2)}$

IV. $G(S) = \frac{2(s+1)}{s(s+2)}$

Among these systems, the unstable system is

(A) only I (B) only II

(C) only III (D) only IV

75. The number of roots of the equation

$$2S^4 + S^3 + 3S^2 + 5S + 7 = 0$$

that lie in the right half of S-plane is

(A) 0 (B) 1

(C) 2 (D) 3

If a system has multiple poles on the Y-axis, the system is

(A) stable

(B) unstable

(C) marginally stable

(D) conditionally stable

77. The introduction of feedback affects the stability

(A) by increasing it

(B) by decreasing it

(C) May increase or decrease depending on the type of feedback

(D) No effect on stability

A single-phase energy meter is operating on 230 V, 50 Hz supply with a load of 20 A for two hours at u.p.f. The meter makes 1380 revolutions in that period. The meter constant is

(A) 695 rev/kWh

(B) 150 rev/kWh

(C) 0·15 rev/kWh

(D) 1/150 rev/kWh

79. In case of power measurement by two-wattmeter method in a balanced 3-phase system with a pure inductive load

(A) both the wattmeters will indicate the same value but of opposite sign

(B) both the wattmeters will indicate zero

(C) both the wattmeters will indicate the same value but of same sign

(D) one wattmeter will indicate zero and the other will indicate some non-zero value

80. In the measurement of power on balanced load by two-wattmeter method in a 3-phase circuit, the readings of the wattmeter are 3 kW and 1 kW respectively, the latter being obtained after reversing the connections of the current coil. The power factor of the load is

(A) 0·277 (B) 0·554

(C) 0·625 (D) 0·866

81. When the thyristor gets turn on, the gate drive

(A) should not be removed as it will turn off the SCR

(B) may or may not be removed

(C) should be removed

(D) should be removed in order to avoid increased losses and higher junction temperature

82. In a single-phase semi-converter, for continuous conduction, each SCR conducts for

(A) α (B) π

(C) $\alpha + \pi$ (D) $\alpha - \pi$

83. In a single-phase full converter, if output voltage has peak and average values of 325 V and 133 V respectively, then the firing angle is

(A) 40° (B) 140°

(C) 50° (D) 130°

84. A d.c. chopper is fed from 100 V d.c. Its load voltage consists of rectangular pulses of duration 1 msec in an overall cycle time of 3 msec. The average output voltage for this chopper is

(A) 25 V (B) 50 V

(C) 33·33 V (D) 60 V

85. The objective of connecting a resistance and capacitance across gate circuit is to protect the SCR gate against

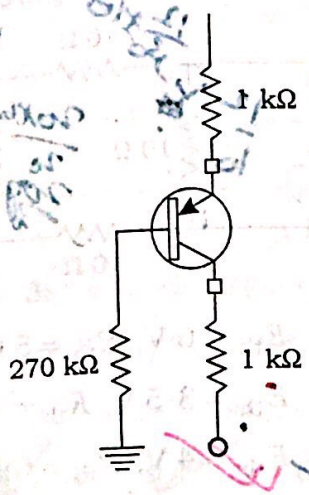
(A) overvoltages

(B) dv/dt

(C) noise signals

(D) overcurrents

86. The common-emitter forward current gain of the transistor shown below is $\beta_F = 100$.



The transistor is operating in

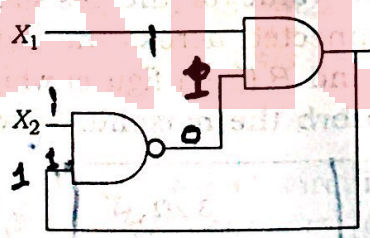
(A) saturation region

(B) cut-off region

(C) reverse active region

(D) forward active region

87. In the figure below, as long as $X_1 = 1$ and $X_2 = 1$, the output Q remains



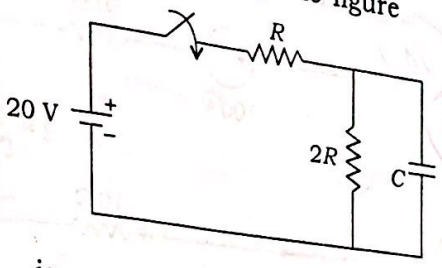
(A) at one

(B) at zero

(C) at its initial value

(D) unstable

88. The time constant of the network shown in the figure



is

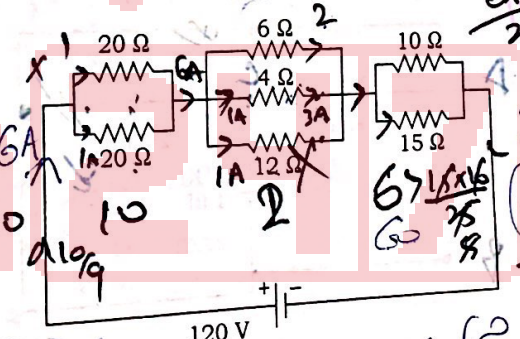
(A) $2RC$

(B) $3RC$

(C) $\frac{RC}{2}$

(D) $\frac{2RC}{3}$

89. In the figure below, the current of 1 A flows through the resistance of



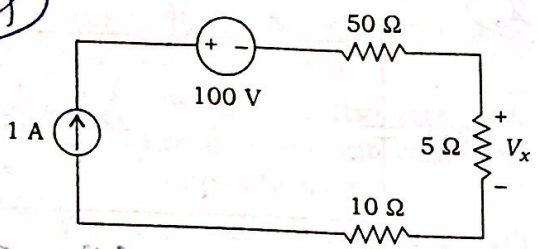
(A) 4 Ω

(B) 20 Ω

(C) 30 Ω

(D) 12 Ω

90. Find the value of V_x in the given figure.



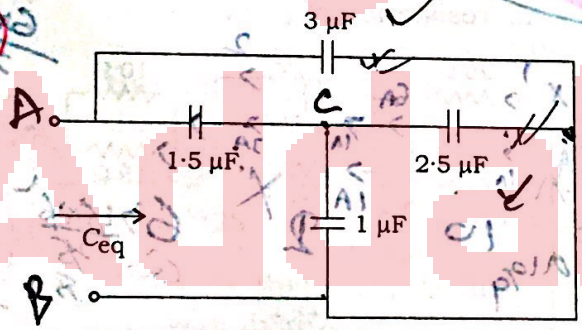
(A) 37·5 V

(B) 5 V

(C) 32·5 V

(D) 100 V

91. Find the value of C_{eq} in the given figure.



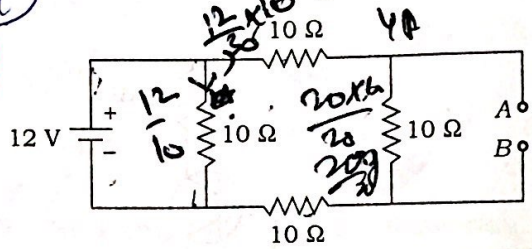
(A) 3·5 μF

(B) 1·2 μF

(C) 2·4 μF

(D) 4·05 μF

92. Find the Thevenin's equivalent circuit to the left of terminals *A* and *B* in the figure below.



(A) $E_{th} = 6$ V, $R_{th} = 5\ \Omega$

(B) $E_{th} = 3{\cdot}5$ V, $R_{th} = 4{\cdot}5\ \Omega$

(C) $E_{th} = 4$ V, $R_{th} = 6{\cdot}67\ \Omega$

(D) $E_{th} = 8$ V, $R_{th} = 4\ \Omega$

93. In which of the following, it is not desired to attain the condition of maximum power transfer?

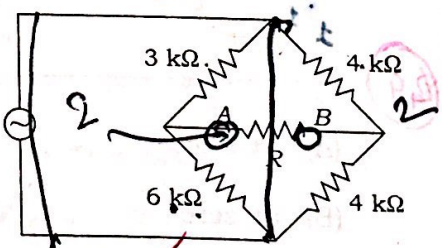
(A) Electronic circuits

(B) Communicational circuits

(C) Computer circuits

(D) Electtic circuits

94. The value of the resistance *R*, connected across the terminals *A* and *B* (from figure) which will absorb the maximum power is



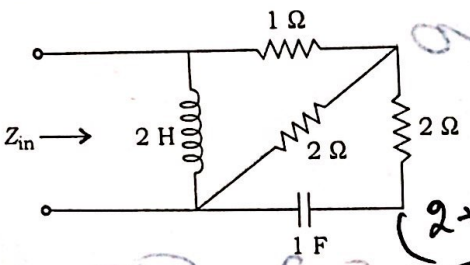
(A) 4 kΩ

(B) 4·11 kΩ

(C) 8 kΩ

(D) 9 kΩ

95. Find the value of $Z(s)$ in the figure given below.



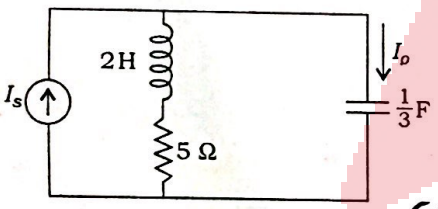
(A) $3s^2+8s+7 / s(5s+6)$

(B) $s(5s+6) / 3s^2+8s+7$

(C) $3s^2+7s+6 / s(5s+6)$

(D) $2s(8s+3) / 8s^2+10s+3$

96. The current ratio transfer function I_o / I_s of the given circuit



is

(A) $s(s+4) / s^2+3s+4$

(B) $s(2s+5) / (s+1)(2s+3)$

(C) $s^2+3s+4 / s(s+4)$

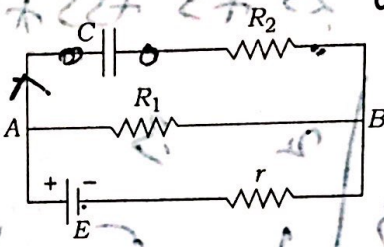
(D) $(s+1)(s+3) / s(s+4)$

97. A series R-L-C circuit has a resonance frequency of 1 kHz and a quality factor $Q = 100$. If each of R, L and C is doubled from its original value, the new Q of the circuit is

(A) 25 (B) 50

(C) 100 (D) 200

98. The value of charge on each plate of capacitor shown in the figure



(A) CER_2 / R_2+r

(B) CE

(C) CER_1 / R_1+r

(D) CER_1 / R_2+r

99. A field excitation of 20 A in a certain alternator results in an armature current of 400 A in short circuit and a terminal voltage of 2000 V on open circuit. The magnitude of internal voltage drop within the machine at a load current of 200 A is

(A) 1 V (B) 10 V

(C) 100 V (D) 1000 V

100. The maximum possible speeds in r.p.m. at which an alternator can be driven to generate voltages at 60 Hz and 50 Hz are respectively

(A) 2000, 2400

(B) 3000, 3600

(C) 2400, 2000

(D) 3600, 3000