16/L/34–2015

Serial No. ErForum

Question Booklet Series

Question Booklet **D**

ELECTRICAL ENGINEERING/TECHNOLOGY

(Objective)

Time Allowed : 2 Hours | **Maximum Marks : 50**

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

IMPORTANT INSTRUCTIONS

1. This Question Booklet contains **100** questions in all.
2. **All** questions carry equal marks.
3. Attempt **all** questions.
4. **Immediately after commencement of the examination, you should check up your Question Booklet and ensure that the Question Booklet Series is printed on the top right-hand corner of the Booklet and the Booklet contains 20 printed pages and no page or question is missing or unprinted or torn or repeated. If you find any defect in this Booklet, get it replaced immediately by a complete Booklet of the same series.**
5. You must write your Roll Number in the space provided on the top of this page. Do not write anything else on the Question Booklet.
6. An OMR Answer Sheet will be supplied to you separately by the Invigilator to mark the answers. **You must write your Name, Roll No. and other particulars on the first page of the OMR Answer Sheet provided, failing which your OMR Answer Sheet will not be evaluated.**
7. You will encode your **Roll Number** and the **Question Booklet Series A, B, C or D** as it is printed on the top right-hand corner of this Question Booklet with Black/Blue ballpoint pen in the space provided on **Page–2** of your OMR Answer Sheet. **If you do not encode or fail to encode the correct series of your Question Booklet, your OMR Answer Sheet will not be evaluated correctly.**
8. Questions and their responses are printed in English only in this Booklet. Each question comprises **four** responses—(A), (B), (C) and (D). You are to select ONLY ONE correct response and mark in your OMR Answer Sheet. In case you feel that there are more than one correct response, mark the response which you consider the best. In any case, choose ONLY ONE response for each question. Your total marks will depend on the number of correct responses marked by you in the OMR Answer Sheet.
9. In the OMR Answer Sheet, there are **four** circles—Ⓐ, Ⓑ, Ⓒ and Ⓓ against each question. To answer the questions you are to **mark with Black/Blue ballpoint pen** ONLY ONE circle of your choice for each question. Select one response for each question in the Question Booklet and mark in the OMR Answer Sheet. If you mark more than one answer for one question, the answer will be treated as wrong. **Any erasure or change is not allowed.**
10. You should not remove or tear off any sheet from the Question Booklet. You are not allowed to take this Question Booklet and the OMR Answer Sheet out of the Examination Hall during the examination. **After the examination has concluded, you must hand over your OMR Answer Sheet to the Invigilator.** Thereafter, you are permitted to take away the Question Booklet with you.
11. Failure to comply with any of the above instructions will render you liable to such action o penalty as the Commission may decide at their discretion.

1. Let the notation F_x denote the partial derivative of F with respect to x, etc. If $\mathbf{i}$, $\mathbf{j}$ and $\mathbf{k}$ denote the unit vectors perpendicular to each other, then the unit normal to the surface $z = F(x, y)$ at the point (x, y) is given by

(A) $F_x\mathbf{i} + F_y\mathbf{j} + F_{xy}\mathbf{k}$

(B) $-(F_x\mathbf{i} + F_y\mathbf{j} - \mathbf{k}) / (1 + (F_x)^2 + (F_y)^2)^{1/2}$

(C) $-(F_x\mathbf{i} + F_y\mathbf{j} + F_z\mathbf{k}) / (1 + (F_x)^2 + (F_y)^2)^{1/2}$

(D) $-(F_x\mathbf{i} + F_y\mathbf{j} + \mathbf{k}) / (1 + (F_x)^2 + (F_y)^2)^{1/2}$

2. Let a river flow in the y direction. Let the z-axis be along the width of the river with total width d. Then a possible function describing the velocity of the river is $\mathbf{v} = az(d - z)^2\,\mathbf{j}$, where a is a constant. A leaf floating in such a river at a distance $d/4$ from a bank of the river will

(A) float forward without turning

(B) float and turn clockwise

(C) float and turn clockwise or anticlockwise

(D) float and turn anticlockwise

3. The curl of the velocity of particle moving in a circle with constant speed is

(A) zero

(B) proportional to the angular velocity and in the plane of the circle

(C) proportional to the angular velocity and perpendicular to the plane of the circle

(D) continuously changing direction as the particle moves along the circle

4. If $\mathbf{B}$ denotes the magnetic field, then the equation $\text{div}\,\mathbf{B} = 0$ means that

(A) there is no net magnetic charge

(B) there is no magnetic charge at all

(C) curl of $\mathbf{B}$ is always constant

(D) $\mathbf{B}$ is constant

5. For a conservative vector field $\mathbf{F}$

(A) the line integral of $\mathbf{F}$ along a closed curve is 0

(B) the line integral of $\mathbf{F}$ along a closed curve is constant but may not be 0

(C) the line integral of $\mathbf{F}$ along a closed curve is 0, if the curve is continuously differentiable

(D) the line integral of $\mathbf{F}$ along a closed curve is never 0 for a second-order differentiable curve

6. If **B** and **E** are the magnetic and electric fields, then the Faraday's law of magnetic induction is represented mathematically by the equation

(A) $c^2(\nabla \times \mathbf{B}) = \mathbf{j}/\varepsilon_0 + \partial \mathbf{E}/\partial t$

where c is the speed of light and $\mathbf{j}$ is the current density

(B) $\nabla \cdot \mathbf{B} = \partial \mathbf{E}/\partial t$

(C) $\nabla \times \mathbf{E} = -\partial \mathbf{B}/\partial t$

(D) $\nabla \times \mathbf{E} = \partial \mathbf{B}/\partial t$

7. If $\mathbf{r}$ is the radius vector and $\mathbf{n}$ is the normal to the closed surface ΔS enclosing a volume ΔV, then the vector operator ∇ is given by

(A) $\lim_{\Delta V \to 0} \frac{1}{\Delta V} \oiint_{\Delta S} da\, \mathbf{n}$

(B) $\lim_{\Delta V \to 0} \frac{1}{\Delta V} \oiint_{\Delta S} da\, \mathbf{n} \cdot \mathbf{r}$

(C) $\lim_{\Delta V \to 0} \frac{1}{\Delta V} \oiint_{\Delta S} da\, \mathbf{n} \times \mathbf{r}$

(D) $\lim_{\Delta S \to 0} \frac{1}{\Delta S} \oiint_{\Delta S} da\, \mathbf{n}$

8. The number of linearly independent rows of the matrix

$$\begin{pmatrix} 2 & 1 & -1 & 3 \\ 0 & 1 & 1 & 0 \\ 0 & 0 & 3 & 3 \\ 0 & 0 & 0 & 0 \end{pmatrix}$$

is

(A) 1 (B) 2

(C) 3 (D) 4

9. A linear transformation preserves all lengths, if

(A) its matrix has 0 determinant

(B) its matrix is singular

(C) its matrix is non-orthogonal

(D) its matrix is orthogonal

10. The matrix

$$\begin{pmatrix} -1 & 1 \\ 4 & 2 \end{pmatrix}$$

(A) has no eigenvalue

(B) has two distinct eigenvalues

(C) has only one eigenvalue

(D) is degenerate

11. A Hermitian square matrix

(A) has orthogonal eigenvalues

(B) may not have any eigenvalue

(C) may not have orthogonal eigenvalues

(D) has only one unique eigenvalue

12. Let A and B be $n \times n$ matrices with $AB = 0$. Then

(A) if A has rank $< n$, B is 0

(B) if A has rank $> n$, B is 0

(C) if A has rank n, $B = 0$

(D) $B = 0$

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13. The solution to the differential equation $9yy' + 4x = 0$ represents

(A) a family of straight lines

(B) a family of ellipses

(C) a family of circles

(D) a family of cubic intersecting curves

14. A separable first-order differential equation

(A) does not always have a solution

(B) has bounded solutions

(C) need not be exact

(D) is always exact

15. The auxiliary equation for the Cauchy equation

$$x^2y'' + axy' + by = 0$$

has a double root, if and only if

(A) $b = \frac{1}{4}(1+a)^2$

(B) $b = \frac{1}{4}(1-a)$

(C) $b = \frac{1}{4}(1+a)$

(D) $b = \frac{1}{4}(1-a)^2$

16. The technique of separation variable applied to the dimensional heat equation

$$\frac{\partial u}{\partial t} = c^2(\partial^2 u)/(\partial x^2)$$

involves the substitution

$$u(x, t) = F(x)G(t)$$

This yields the system differential equations given in

(A) $F'' + p^2F = 0;$

$$\frac{dG}{dt} + c^2p^2G = 0$$

(B) $F'' + p^2F' + F = 0;$

$$\frac{dG}{dt} + c^2p^2G = 0$$

(C) $F'' + p^2F = 0;$

$$\frac{dG}{dt} - c^2p^2G = 0$$

(D) $F'' - p^2F = 0;$

$$\frac{dG}{dt} - c^2p^2G = 0$$

17. The Neumann boundary condition for the Laplace's equation $\nabla^2 u = 0$ on the boundary B of a region R specifies the

(A) function u on B

(B) total derivatives of u on B

(C) Green's function for u

(D) normal derivative of u on B

18. If u is a function of x, y and z, and satisfies the partial differential equation

$$(y-z)\frac{\partial u}{\partial x}+(z-x)\frac{\partial u}{\partial y}+(x-y)\frac{\partial u}{\partial z}=0$$

then u is of the form given in

(A) $u=f(x+y,\ y^2+z^2)$

(B) $u=f(x+y+z,\ x^2+y^2+z^2)$

(C) $u=f(x+y-z,\ y^2+z^2-x^2)$

(D) $u=f(x-y-z,\ x^2+y^2+z^2)$

19. In case of R-L-C electrical circuits, the case of under-damping occurs, when

(A) $R^2=\frac{4L}{C}$

(B) $R^2>\frac{4L}{C}$

(C) $R^2<\frac{4L}{C}$

(D) $R^2=4LC$

20. The function $f(z)=\ln z$ has

(A) infinitely many branches with branch point 0

(B) finitely many branches with branch point 0

(C) finitely many branches with branch point i

(D) no branch point

21. For the point $z=a$ inside a simple closed curve C, the integral around the curve C

$$\oint\frac{dz}{(z-a)^n}\ \text{for}\ n\geq 2$$

is

(A) n

(B) $2\pi in$

(C) ndependent of n

(D) $-n$

22. For an analytic function $f(z)$ on a circle C with centre at a, the mean of $f(z)$ on C is

(A) $2f(a)$

(B) $\frac{1}{2}f(a)$

(C) 0

(D) $f(a)$

23. The second term in the Laurent series expansion of

$$(z-3)\sin\frac{1}{z+2}$$

about the point $z=-2$ is

(A) $-\frac{5}{(z+2)^2}$

(B) $-\frac{5}{z+2}$

(C) $-\frac{5}{(z+2)^3}$

(D) $\frac{5}{(z+2)^2}$

24. The integral

$$\int_0^{\infty} \frac{\sin x}{x} dx$$

is

(A) π

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

(C) πi

(D) None of the above

25. An integral of the form

$$\int_0^{2\pi} F(\sin\theta, \cos\theta) d\theta$$

is usually evaluated by using the substitution

(A) $z = e^{ir}$

(B) $z = e^{\theta}$

(C) $z = x + iy$

(D) $z = e^{i\theta}$

26. If five coins are tossed simultaneously, the probability of at least one head turning up is

(A) $\frac{31}{32}$

(B) $\frac{1}{32}$

(C) $\frac{15}{32}$

(D) $\frac{5}{32}$

27. The distribution with densi

$$f(x) = \frac{1}{b-a}$$

for $a < x < b$ and $f(x) = 0$, if outside the interval (a, b), the variance

(A) $\frac{(b-a)^3}{12}$ (B) $\frac{b-a}{12}$

(C) $\frac{b+a}{12}$ (D) $\frac{(b-a)^2}{12}$

28. Let X be a normal rando variable with mean μ a variance σ^2, then the variab $aX + b$ with $a \neq 0$ is

(A) normal with variance $b\sigma^2$

(B) normal with variance $a^2\sigma$

(C) non-normal with varianc $b^2\sigma^2$

(D) normal with variance $b^2\sigma^2$

29. Let X be the binomia distribution with parameters n and p, then the Poisson distribution with $\lambda = np$ can be used as an approximation for binomial distribution, if

(A) both n and p are large

(B) n is large and p is small

(C) both n and p are small

(D) n is small and p is large

30. If $a_0, a_1, \cdots, a_m$ and $b_0, b_1, \cdots, b_m$ are given numbers, then the iteration for the linear m-step method is given by

(A) $a_0 y_i - a_1 y_{i-1} + \ldots \pm a_m y_{i-m}$

$= h[b_0 f_i - b_1 f_{i-1} + \ldots \pm b_m f_{i-m}]$

$i = m, m+1, \ldots$

(B) $a_0 b_0 y_i - a_1 b_1 y_{i-1} + \ldots \pm a_m b_m y_{i-m}$

$= h[a_0 b_0 f_i - a_1 b_1 f_{i-1} + \ldots \pm a_m b_m f_{i-m}]$,

$i = m, m+1, \ldots$

(C) $a_0 y_i + a_1 y_{i-1} + \ldots + a_m y_{i-m}$

$= h[b_0 f_i + b_1 f_{i-1} + \ldots + b_m f_{i-m}]$,

$i = m, m+1, \ldots$

(D) $a_0 b_0 y_i + a_1 b_1 y_{i-1} + \ldots + a_m b_m y_{i-m}$

$= h[a_0 b_0 f_i + a_1 b_1 f_{i-1} + \ldots + a_m b_m f_{i-m}]$,

$i = m, m+1, \ldots$

31. The maximum consistency order of the m-stage

(A) implicit linear multistep method is $2m$, while for the explicit linear multistep method, it is $2m-1$

(B) implicit linear multistep method is $2m-1$, while for the explicit linear multistep method, it is $2m$

(C) implicit and explicit linear multistep methods is $2m$

(D) implicit and explicit linear multistep methods is $2m-1$

32. The discrete time equivalent of the Laplace transform

(A) does not exist

(B) is the z-transform

(C) is the Fourier transform

(D) is the Hankel transform

33. The region of convergence of the z-transform must contain the unit circle for

(A) stability

(B) causality

(C) stability and causality

(D) None of the above

34. The continuous analog of the power series in which the discrete parameter is replaced by a continuous parameter is given by the

(A) z-transform

(B) Fourier half-wave functions

(C) Laplace transform

(D) Fourier full-wave functions

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35. Let $f : (a, b) \to \mathbf{R}$ be a real-valued function defined on an open interval $I = (a, b)$. Let f be differentiable at a point c of the interval I. Let T be the tangent to the curve $y = f(x)$ at the point c with derivative $f'(c)$. The difference in the y-coordinate of the tangent T at the point $x = c$ and a point $x = d > c$ is

(A) $f'(c)$ (B) $f'(c)(d - c)$

(C) $f''(c)(d - c)$ (D) $f'(c)(x - c)^2$

36. A particle moves from A to B with an ever-increasing speed. Its motion describes a curve C on a distance-time graph. Then at some point on the curve C

(A) the tangent is parallel to the distance or time axis

(B) the tangent is parallel to the chord AB

(C) the tangent does not exist

(D) the tangent is perpendicular to the chord AB

37. The equation satisfied by an ideal gas with pressure P, volume V at the temperature T is $PV = RT$, where R is a constant. The total differential dP is

(A) $\frac{R}{V}dT - \frac{RT}{V^2}dV$

(B) $RVdT - \frac{RT}{V^2}dV$

(C) $RV^2dT - \frac{RT}{V^2}dV$

(D) $\frac{R}{V}dT + \frac{RT}{V^2}dV$

38. The critical point of the functi

$$f(x, y) = \frac{1}{2}x^2 - xy,$$

is

(A) maxima at (0, 0)

(B) minima at (0, 0)

(C) non-existent

(D) saddle point at (0, 0)

39. The Parseval's formula for th Fourier coefficients of a functio f gives

(A) the Fourier coefficients i terms of f

(B) the square of the Fourie coefficients

(C) the product of the Fourier coefficients

(D) the sum of the squares of the Fourier coefficients

40. The integral

$$\int_{\pi}^{\infty} \frac{\sin x}{x} dx$$

is

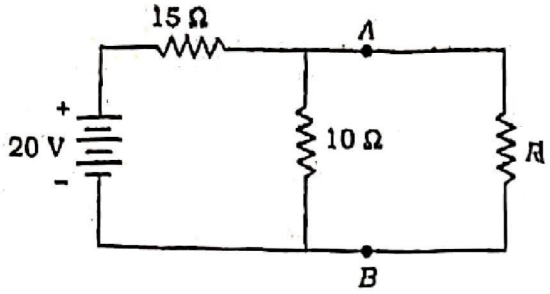
(A) absolutely convergent

(B) conditionally convergent

(C) divergent

(D) oscillatory

41. Consider the following circuit :

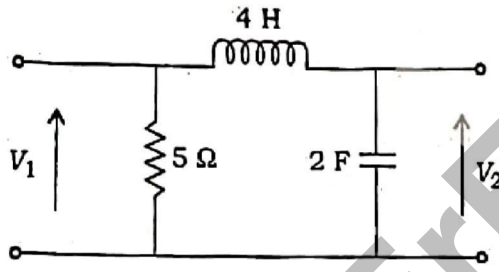


What should be the value of resistance R in the above circuit, if it has to absorb the maximum power from the source?

(A) 25 Ω (B) 18 Ω

(C) 9 Ω (D) 6 Ω

42. For the two-port network shown in the figure below, what is the voltage transfer function?



(A) $\frac{s}{8s^2+1}$ (B) $\frac{1}{8s^2+1}$

(C) $\frac{s}{8s+1}$ (D) $\frac{1}{8s+1}$

43. The electric flux and field intensity inside a conducting sphere is

(A) infinite (B) zero

(C) uniform (D) minimum

44. The open-circuit and short-circuit impedances of a line are 100 Ω each. What is the characteristic impedance of the line?

(A) 100 Ω

(B) $100\sqrt{2}$ Ω

(C) 50 Ω

(D) $50\sqrt{2}$ Ω

45. A 50 Ω distortionless transmission line has an inductance of 0·25 μH/m. What is the capacitance per metre?

(A) 10^{-2} F

(B) 10^{-5} F

(C) 10^{-10} F

(D) Zero

46. z and Laplace transforms are related by

(A) $s=\frac{\ln z}{T}$

(B) $s=\frac{T}{\ln z}$

(C) $s=\ln z$

(D) $s=z$

47. The Fourier series representation of a periodic current is

$$[6+7\sqrt{2}\cos\omega t+\sqrt{12}\sin 2\omega t]$$

The effective value of the current is

(A) $(7+\sqrt{12})$ A

(B) $(6+7\sqrt{2})$ A

(C) 121 A

(D) 11 A

48. A signal $x(t) = 6\cos 10\pi t$ is sampled at the rate of 12 Hz. To recover the original signal, the cut-off frequencies of the ideal low-pass filter should be

(A) $5 \text{ Hz} < f_c < 9 \text{ Hz}$

(B) $5 \text{ Hz} < f_c < 8 \text{ Hz}$

(C) $5 \text{ Hz} < f_c < 7 \text{ Hz}$

(D) $7 \text{ Hz} < f_c < 9 \text{ Hz}$

49. The full-load copper loss and iron loss of a transformer are 3200 W and 2000 W respectively. Both of the losses at half-load will be respectively

(A) 1600 W and 1000 W

(B) 1600 W and 2000 W

(C) 3200 W and 1000 W

(D) 800 W and 2000 W

50. The open-circuit test result gives 200 V, 90 A, 5 kW on low-voltage side of a transformer whose rating is 100 kVA, 1100/220 V, 50 Hz and 1-phase with 2000 turns on high-voltage side. The core loss component of current is approximately

(A) 22·7 A

(B) 45·4 A

(C) 9·1 A

(D) 5·4 A

51. 25 A current is drawn by 120 V d.c. motor with back e.m.f. of 110 V What will be the value of armature resistance of this motor?

(A) 40 Ω (B) 0·4 Ω

(C) 0·04 Ω (D) 1·4 Ω

52. Which motor should not be used for centrifugal pumps?

(A) Cumulatively compound

(B) Shunt

(C) Series

(D) Differentially compound

53. The no-load power factor of an induction motor is low due to its

(A) small slip

(B) high starting current

(C) low starting torque

(D) large magnetizing current

54. A 3-phase, 400 V, 50 Hz synchronous motor is working at 50% load. In case an increase in the field current of the motor causes a reduction in the armature current, it can be concluded that

(A) the motor is delivering reactive power to the mains

(B) the motor is absorbing reactive power from the mains

(C) the motor is neither absorbing nor delivering reactive power

(D) None of the above

55. The torque angle, δ is defined as the angle between

(A) stator field axis and resultant field axis

(B) rotor field axis and resultant field axis

(C) stator field axis and rotor field axis

(D) stator field axis and mutual field axis

56. In a salient-pole synchronous generator connected to an infinite bus bar, the maximum power is delivered as power angle

(A) $\delta = 90°$

(B) $\delta = 0°$

(C) $45° < \delta < 90°$

(D) $\delta = 45°$

59. For a short transmission line with R/X ratio equal to 1, the voltage regulation will be zero when the load power factor is

(A) unity

(B) 0·707 leading

(C) 0·707 lagging

(D) 0° leading

60. In a string of suspension insulators, the maximum voltage appears

(A) across the unit nearest to the conductor

(B) in the middle unit

(C) across the unit nearest to the cross arm

(D) None of the above

61. An impedance relay is

(A) current-restrained over-voltage relay

(B) current-restrained direc-tional relay

(C) voltage-restrained direc-tional relay

(D) voltage-restrained over-current relay

63. For the protection of medium transmission lines, normally the preferred relay is

(A) reactance relay

(B) ohm relay

(C) mho relay

(D) impedance relay

64. The steady-state stability limit of a transmission line

(A) increases with the increase in length of the line

(B) decreases with the increase in length of the line

(C) decreases with the increase in load angle

(D) increases with the increase in load angle

65. In order to have lower cost of electrical energy generation

(A) the load factor should be low and the diversity factor should be high

(B) the load factor and diversity factor should be low

(C) the load factor and diversity factor should be high

(D) the load factor should be high and the diversity factor should be low

66. The leakage resistance of 50 km long cable is 1 MΩ. For 100 km long cable, it will be

(A) 0·25 MΩ (B) 0·5 MΩ

(C) 1·0 MΩ (D) 2·0 MΩ

67. The maximum demand of consumer is 2·0 kW and his daily energy consumption 20 units. His load factor is

(A) 10·6% (B) 20·6%

(C) 31·6% (D) 41·6%

68. The earthing switch is used to

(A) discharge the voltage dead lines to earth

(B) provide earthing substation equipments

70. Consider a unity feedback system whose open-loop transfer function is

$$G(s) = \frac{1}{s(s+0{\cdot}2)}$$

From a step input, it is required that response of this system settles to within 2% of its final value. The settling time will be

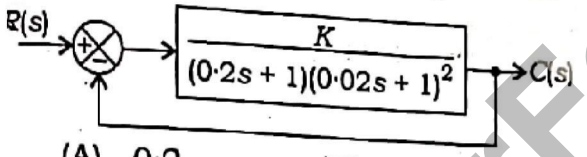
(A) 40 s

(B) 30 s

(C) 25 s

(D) 4 s

71. The system shown in the figure below has a unit step input. In order that the steady-state error is 0·1, the value of K required is



(A) 0·2 (B) 0·9

(C) 2·0 (D) 9·0

72. The characteristic equation of a closed-loop control system is given as $s^2 + 4s + 16 = 0$. The undamped frequency and the damping factor of this system are respectively

(A) 4 rad/s and 0·5

(B) $2\sqrt{3}$ rad/s and 0·5

(C) $2\sqrt{3}$ rad/s and 0·25

(D) $4\sqrt{3}$ rad/s and 0·5

73. The correct sequence of steps needed to improve the system stability is

(A) reduce gain, use negative feedback and insert derivative action

(B) use negative feedback, reduce gain and insert derivative action

(C) reduce gain, insert derivative action and use negative feedback

(D) insert derivative action, use negative feedback and reduce gain

74. The maximum phase shift that can be obtained by using a lead compensator with transfer function

$$G_c(s) = \frac{4(1+0{\cdot}15s)}{1+0{\cdot}05s}$$

is

(A) 60° (B) 45°

(C) 30° (D) 15°

75. The Nyquist plot of a phase transfer function $G(j\omega)H(j\omega)$ of a system encloses the point $(-1, j0)$. The gain margin of the system is

(A) infinity

(B) greater than zero

(C) less than zero

(D) zero

76. The open-loop transfer function of a unity feedback control system is given by

$$G(s) = \frac{K(s+4)}{s(s^2+4s+5)}$$

The centroid and angles of asymptotes are respectively

(A) $-\frac{2}{3}$ and $+90°$ and $-90°$

(B) $-\frac{3}{2}$ and $+60°$ and $-60°$

(C) zero and $+120°$ and $-120°$

(D) zero and $+90°$ and $-90°$

77. A system is described by the state equation

$$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix} = \begin{bmatrix}2 & 0\\ 0 & 2\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix} + \begin{bmatrix}1\\ 1\end{bmatrix}u$$

The state transition matrix of the system is

(A) $\begin{bmatrix}e^{2t} & 0\\ 0 & e^{2t}\end{bmatrix}$

(B) $\begin{bmatrix}0 & e^{2t}\\ e^{2t} & 0\end{bmatrix}$

(C) $\begin{bmatrix}e^{-2t} & 0\\ 0 & e^{-2t}\end{bmatrix}$

(D) $\begin{bmatrix}e^{2t} & 1\\ 1 & e^{2t}\end{bmatrix}$

78. A moving-iron ammeter coil has thick wire and few turns because of having

(A) low resistance and large current-carrying capacity

(B) high resistance and large current-carrying capacity

(C) low resistance and small current-carrying capacity

(D) high resistance and small current-carrying capacity

79. In a two-wattmeter method of power measurement in a 3-phase circuit, if both the wattmeters' readings are equal and positive, the power factor of the circuit will be

(A) zero

(B) unity

(C) 0·5 lagging

(D) 0·5 leading

80. A 5 mA ammeter having coil resistance of 9·99 Ω can be used to measure current up to 5 A by using a shunt of

(A) 0·1 Ω

(B) 0·001 Ω

(C) 0·01 Ω

(D) 0·0099 Ω

81. The range of measurement of resistance using Wheatstone bridge method is ideally lying between

(A) 100 kΩ to 10 MΩ

(B) 100 Ω to 10 kΩ

(C) 0·1 Ω to 100 Ω

(D) 0·001 Ω to 1 Ω

82. Generally creeping in an energy meter is due to

(A) stray magnetic field

(B) mechanical vibration

(C) excessive voltage across the potential coil

(D) over-compensation for friction

83. Input signal is integrated for duration of 500 clock cycles in a digital voltmeter. To eliminate the effect of 50 Hz noise present in the signal, what is the maximum clock frequency?

(A) 25 kHz

(B) 50 kHz

(C) 100 kHz

(D) 250 kHz

84. To measure 5 volts if one selects a 0–100 volt range voltmeter which is accurate within ±1%, then the error in this measurement may be up to

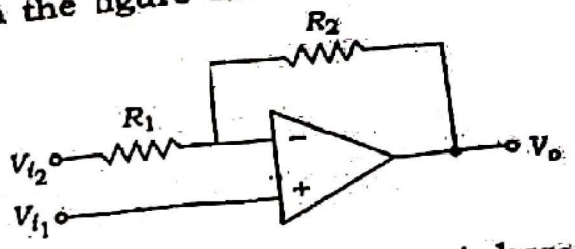
(A) ± 2·5%

(B) ± 5%

(C) ±7·5%

(D) ±20%

85. A circuit with op-amp is shown in the figure below :



The output voltage V_o (where $R_2 = 2R_1$) is

(A) $2V_{i_1} - 3V_{i_2}$

(B) $2V_{i_1} - 2V_{i_2}$

(C) $3V_{i_1} - 2V_{i_2}$

(D) $3V_{i_1} - 3V_{i_2}$

86. The decrease in effective base width with increasing reverse collector voltage in BJT is known as

(A) thermal runaway

(B) early effect

(C) avalanche breakdown

(D) Zener breakdown

87. An amplifier without feedbac has a gain of 1000. What is tl gain with negative feedback 0·004?

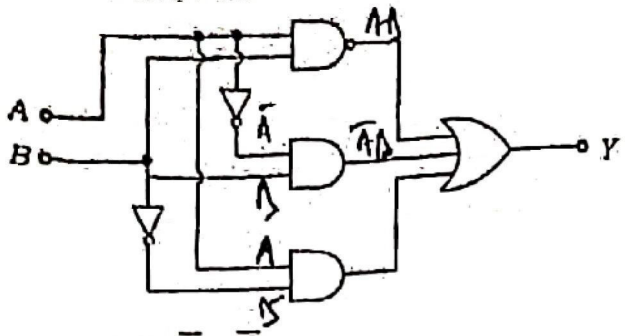
(A) 4000

(B) 2500

(C) 2000

(D) 200

88. In the circuit shown in the figure below, the output Y equals which one of the following?



(A) $\overline{A}+\overline{B}$

(B) $A+B$

(C) $\overline{A}B+A\overline{B}$

(D) AB

89. The firing angle of thyristor in a thyristor-controlled rectifier is to be controlled in the range of

(A) 90° to 270°

(B) 90° to 180°

(C) 0° to 180°

(D) 0° to 90°

90. To reduce $\frac{di}{dt}$ by the use of R-C snubber, it is used

(A) in parallel with the thyristor

(B) in series with the thyristor

(C) either in parallel or in series with the thyristor

(D) neither in series nor in parallel with the thyristor

91. To control the speed of the 3-phase cage motor at 25 Hz, the most suitable solid state converter will be

(A) load-commutated inverter

(B) cycloconverter

(C) voltage source inverter

(D) current source inverter

92. The ratio of output ripple frequency to the supply voltage frequency in a 3-phase full-wave a.c. to d.c. converter is

(A) 1

(B) 3

(C) 6

(D) 24

93. The anode current through a conducting SCR is 12 A. If its gate current is made one-third, then what will be the anode current?

(A) Zero

(B) 4 A

(C) 9 A

(D) 12 A

94. The total capacitance of two condensers, when connected in parallel, is 18 F, and 4 F when connected in series. The capacity of the two condensers will be

(A) 3 F and 6 F

(B) 6 F and 12 F

(C) 4 F and 8 F

(D) 8 F and 16 F

95. A series *R-L-C* circuit with $R = 3\Omega$, $L = 200$ mH and $C = 100\ \mu F$ is connected to a voltage source of $200\sin 100t$ volts. The power factor of the circuit will be

(A) unity

(B) zero

(C) leading

(D) lagging

96. An *R-C* circuit has an impedance of $(10 - j6)\ \Omega$ for the fundamental. For the third harmonic, the impedance will be

(A) $(10 + j2)\ \Omega$

(B) $(10 + j6)\ \Omega$

(C) $(10 - j2)\ \Omega$

(D) $(10 - j18)\ \Omega$

A network has 6 elements and 3 nodes. The number of tree and co-tree branches will be

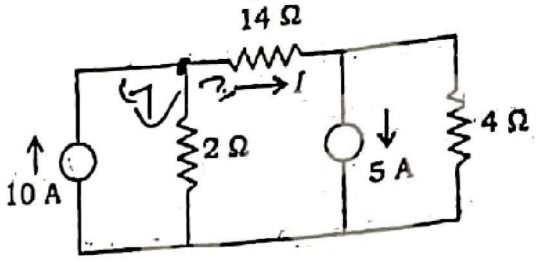
(A) 2 and 4 respectively

(B) 4 and 2 respectively

(C) 3 and 6 respectively

(D) 6 and 3 respectively

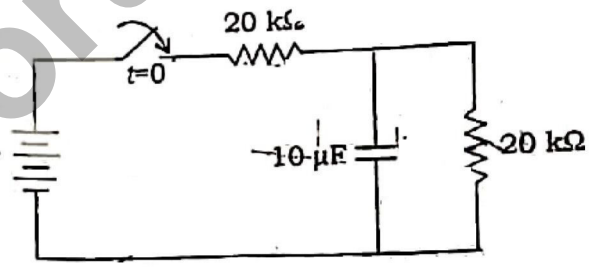
98. In the circuit shown in the figure below, the current I will be



(A) 4 A (B) 2 A

(C) 1 A (D) zero

99. The switch of the circuit shown in the figure below was open for long time and at $t = 0$, it is closed. What is the final steady-state voltage across the capacitor and the time constant of the circuit?



(A) 20 V and 0·1 s

(B) 20 V and 0·2 s

(C) 10 V and 0·1 s

(D) 10 V and 0·2 s

100. For a parallel *R-L-C* resonant circuit, the damped frequency is $\sqrt{12}$ r/s and bandwidth is 4 r/s. What is its resonant frequency?

(A) 1 r/s (B) 2 r/s

(C) 3 r/s (D) 4 r/s