080/2023

Maximum : 100 marks

Time : 1 hour and 30 minutes

1. Assertion (A) : Kirchhoff's Voltage Law states that the algebraic sum of all voltages around a closed path in a network is Zero.

   Reason (R) : Law of conservation of charge is the basis of Kirchhoff's Voltage law.
   - (A) Both (A) and (R) are true and (R) is the correct explanation of (A)
   - (B) Both (A) and (R) are true but (R) is not the correct explanation of (A)
   - (C) (A) is true but (R) is false
   - (D) (A) is false but (R) is true

2. Twelve 6 H inductors are used as edges to form a cube, determine the equivalent inductance seen between the two diagonally opposite corners of the cube :
   - (A) 7.2 H
   - (B) 5 H
   - (C) 3.6 H
   - (D) 10 H

3. Find the current through the $3\,\Omega$ resistor using Superposition theorem :
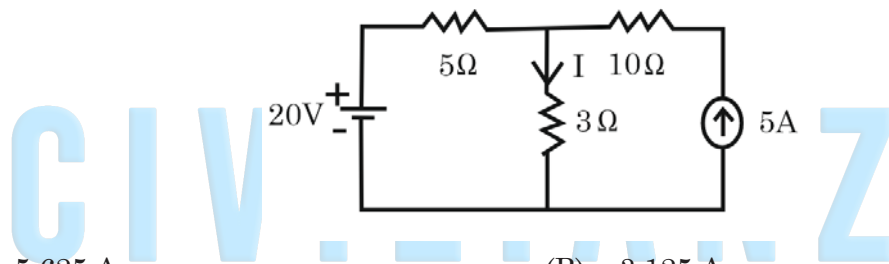
   - (A) 5.625 A
   - (B) 3.125 A
   - (C) 2.5 A
   - (D) 4.25 A

4. Find the maximum power that can be transferred to R_L :
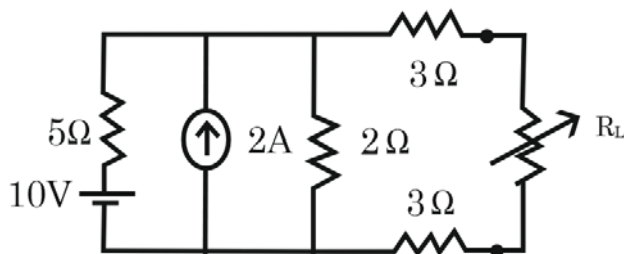

   - (A) 1.2 W
   - (B) 1.99 W
   - (C) 1.099 W
   - (D) 2 W

A

3

[P.T.O.]

5. In an ac series RLC circuit, the voltage across R and L is 20 V, voltage across L and C is 9 V and voltage across RLC is 15 V. What is the voltage across C?

    (A) 7 V   (B) 12 V

    (C) 16 V   (D) 21 V

6. In a parallel resonance circuit, why does the current lag behind the source voltage at frequencies below resonance?

    (A) Because circuit is predominantly resistive

    (B) Because circuit is predominantly inductive

    (C) Because circuit is predominantly capacitive

    (D) None of the above

7. If the impedance parameters are given as $\begin{bmatrix} R & R \\ R & R \end{bmatrix}$ then the corresponding circuit or two port network will be :

(A)

(B)

(C)

(D)
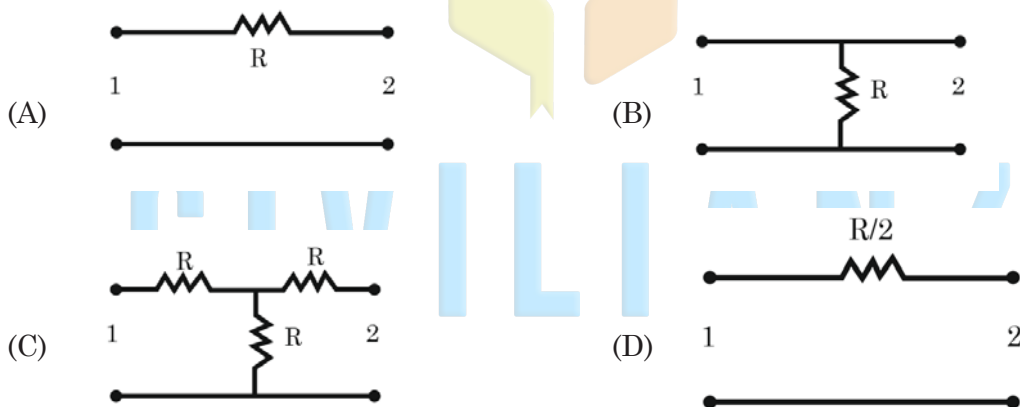
8. Obtain the equivalent capacitance of the network given :
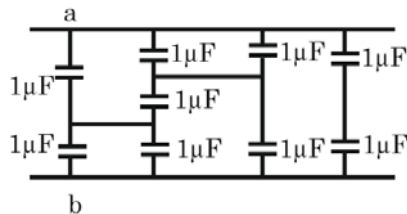
    (A) 1 μF   (B) 1.9 μF

    (C) 2.6 μF   (D) 0.8 μF

9. In order to produce a flux of 100 μWb in an airgap of length 0.2 mm and area of cross-section is 1 cm², the MMF required is :

(A) $500/\pi$ (B) $500\,\pi$

(C) $250\,\pi$ (D) $250/\pi$

10. A ring-shaped coil with fixed number of turns of it carries a current of certain magnitude. If an iron core is threaded into the coil without any change in coil dimensions, the magnetic induction density will :

(A) Remain unaffected   (B) Reduce

(C) Unpredictable   (D) Increase

11. What is the main difference between first order LPF and second order LPF?

(A) Second order LPF has High cut off frequency

(B) Second order LPF has Low cut off frequency

(C) Lower voltage gain

(D) Higher voltage gain

12. If the voltage and current in an AC circuit are given by $v = 200\sin(\omega t + 30)$ and $i = 10\sin(\omega t - 60)$ then power factor of the circuit is :

(A) 0.707   (B) 0

(C) 0.5   (D) 0.866

13. The electric field inside a perfectly conducting media is :

(A) Infinite   (B) Zero

(C) Dependent upon the value of charge   (D) None of the above

14. Two point charges $Q_1 = 1$ nC and $Q_2 = 2$ nC are at a distance apart. Which of the following is incorrect?

(A) The force on Q_1 is repulsive

(B) The force on Q_2 is along the line joining them

(C) The force on Q_2 is the same in magnitude as that on Q_1

(D) As the distance between them decreases, the force on Q_1 increases linearly

15. Two identical co-axial circular coils carry same current I but in opposite direction. The magnitude of magnetic field $\overline{B}$ at a point on the axis midway between the coils is :

(A) Zero   (B) Same as that produced by one coil

(C) Twice that produced by one coil   (D) Half that produced by one coil

16. Unit of Poynting vector is :
    - (A) Watt
    - (B) Watt/s
    - (C) Watt/m
    - (D) Watt/m²

17. The Stoke's theorem can be used to find which of the following?
    - (A) Area enclosed by a function in the given region
    - (B) Volume enclosed by a function in the given region
    - (C) Linear distance
    - (D) Curl of the function

18. Find the magnetic field when a circular conductor of very high radius is subjected to a current of 12 A and the point P is at the centre of the conductor :
    - (A) ∞
    - (B) 0
    - (C) $-\infty$
    - (D) 1

19. The Laplace transform of $i(t)$ tends to $I(s) = \dfrac{2}{s(1+s)}$. As $t \to \infty$, the value of $i(t)$ tends to :
    - (A) 0
    - (B) 1
    - (C) ∞
    - (D) 2

20. A system is defined by its impulse response $h(n) = 2^n u(n-2)$. The system is :
    - (A) Stable and causal
    - (B) Stable but not causal
    - (C) Causal but not stable
    - (D) Unstable and non-causal

21. The signal $x[n] = e^{j\omega n} + e^{j2\omega n}$ is :
    - (A) Eigen function for positive value of ω
    - (B) Eigen function of LTI system
    - (C) Not an Eigen function of LTI system
    - (D) May or may not be eigen function

22. If $u(t)$ denotes the unit step function, which of the following is an example of a bounded signal :
    - (A) $t\,u(t)$
    - (B) $e^{2t}\,u(t)$
    - (C) $e^{-2t}\,u(t)$
    - (D) $e^t \sin(t)\,u(t)$

23. Find the z-transform of $(n+1)^2$:
    - (A) $\dfrac{z^2(z+1)}{(z-1)^3}$
    - (B) $\dfrac{(2z+1)}{(z-1)^3}$
    - (C) $\dfrac{(2+z)}{(z-1)^2}$
    - (D) $\dfrac{(3z+2)}{z-1}$

24. The system $y(t) = x^2(t)$ is :

    (A)   Linear and non invertible
    (B)   Non linear and non invertible

    (C)   Linear and invertible
    (D)   Non linear and invertible

25. A 125 V, 50 Hz, single phase transformer has rated eddy current loss of 125 W. If the transformer is operated from 200 V, 40 Hz supply mains, then new eddy current loss is :

    (A)   125 W
    (B)   160 W

    (C)   250 W
    (D)   320 W

26. A 500 kVA transformer with 0.05 p.u. reactance is connected in parallel with a 250 kVA transformer with 0.04 p.u. reactance. The secondary voltage of each transformer is 400 V on no-load. Find the common load they can share without over loading any transformer at unity power factor :

    (A)   600 kVA
    (B)   625 kVA

    (C)   650 kVA
    (D)   675 kVA

27. A rectangular coil loop with effective conductor side length l, axial radius of the loop r, rotating at an angular velocity w, in a steady magnetic flux density B, then the e.m.f. induced in the loop is given by :

    (A) Blw
    (B) $2Blw$

    (C) $Blwr$
    (D) $2Blwr$

28. Identify correct and incorrect statements related to armature reaction and commutation process in DC machine :

I.   In a DC motor, due to armature reaction, the shift in magnetic neutral axis is in same direction of rotation.

II.   The polarity of the interpoles must be of the same polarity as the next upcoming main pole in a DC generator.

III.   Compensating winding cancel the armature reaction effect, but not $L\dfrac{di}{dt}$ effect.

    (A)   I and II are correct, but III is incorrect

    (B)   I is correct, but II and III are incorrect

    (C)   I and II are incorrect, but III is correct

    (D)   I is incorrect, but II and III are correct

29. Torque and speed relationship in a DC series motor is given by :

    (A) $\omega \propto \dfrac{1}{\sqrt{\tau_{in}}}$
    (B) $\omega \propto \dfrac{1}{\tau_{in}}$

    (C) $\sqrt{\omega} \propto \dfrac{1}{\tau_{in}}$
    (D) $\sqrt{\omega} \propto \dfrac{1}{\tau_{in}^2}$

30. A 100 hp, 250 V, 350 A dc shunt motor with an armature resistance of 0.05 Ω, is started by a starter having 4 stages of resistances. Starter is designed to limit maximum starting current to twice its rated value and its starting minimum current to rated value. The total resistance of starter is :

    (A) 1.60 Ω (B) 1.55 Ω

    (C) 1.50 Ω (D) 1.45 Ω

31. Identify correct and incorrect statements related to synchronous machine :

  I.   The synchronizing torque or stiffness of coupling, in a synchronous machine, increases with increase in load angle 'δ'

  II.   The Steady state stability limit or maximum power transfer condition, in cylindrical rotor and salient pole synchronous machine, occurs at load angle $\delta = 90°$

    (A) I and II both are incorrect

    (B) I and II both are correct

    (C) I is correct, but II is incorrect

    (D) I is incorrect, but II is correct

32. Identify the incorrect statement related to synchronous machine :

    (A) A largely Over Excited Synchronous Generator delivers P and Q, with lagging power factor

    (B) A largely Over Excited Synchronous Motor consumes P, but delivers Q, with leading power factor

    (C) A largely Under Excited Synchronous Generator delivers P, but consumes Q, with leading power factor

    (D) A largely Under Excited Synchronous Motor delivers P and consumes Q, with lagging power factor

33. The commutator pitch for 4 pole, 50 commutator segment, retrogressive, Duplex-wave wound DC machine is :

    (A) 12   (B) 14

    (C) 24   (D) 26

34. If a squirrel cage induction motor, when started with 50% tapping in case of auto-transformer starter and stator reactor starter, then the ratio of starting currents respectively is :

    (A) 0.25   (B) 0.50

    (C) 1   (D) 2

35. If the ratio of, slip at maximum torque to slip at full-load torque is 4, then the ratio of maximum torque to full-load torque is (neglect stator resistance) :

(A) $\dfrac{8}{17}$ (B) $\dfrac{17}{8}$

(C) $\dfrac{4}{17}$ (D) $\dfrac{17}{4}$

36. In a 4 pole dc machine brushes are moved 4° electrical from M.N.A. The mechanical angle through which brushes have been shifted is :

(A) 2°   (B) 4°

(C) 8°   (D) 0°

37. The node admittance matrix for a three bus system is given by $\begin{bmatrix} -J15 & J5 & J10 \\ J5 & -J25 & J20 \\ J10 & J20 & -J30 \end{bmatrix}$. If line connected between nodes (2) and (3) with line admittance of $-J20\,\mho$ is removed, then the new node admittance matrix is given by

(A) $\begin{bmatrix} -J15 & J5 & J10 \\ J5 & -J45 & J20 \\ J10 & J20 & -J50 \end{bmatrix}$ (B) $\begin{bmatrix} -J15 & J5 & J10 \\ J5 & -J5 & J20 \\ J10 & J20 & -J10 \end{bmatrix}$

(C) $\begin{bmatrix} -J15 & J5 & J10 \\ J5 & -J45 & 0 \\ J10 & 0 & -J50 \end{bmatrix}$ (D) $\begin{bmatrix} -J15 & J5 & J10 \\ J5 & -J5 & 0 \\ J10 & 0 & -J10 \end{bmatrix}$

38. If a power system consists of one slack bus, m generator buses, and n load buses, then the size of the J_2 sub-matrix in the Jacobian matrix $\begin{bmatrix} J_1 & J_2 \\ J_3 & J_4 \end{bmatrix}$ formulated in Newton Raphson polar form is given by :

(A) $(m+n)\times n$ (B) $(m+n)\times(m+n)$

(C) $n\times(m+n)$ (D) $n\times n$

39. The per unit impedance of a 400 MVA, 200 kV/400 kV transformer is 0.1. If the Base quantities on h.v. side of the transformer are given as 100 MVA and 100 kVA, then the per unit impedance of the transformer on new base quantities is :

(A) 0.025 p.u   (B) 0.04 p.u

(C) 0.40 p.u   (D) 0.10 p.u

40. The inductance per loop meter of a single-phase transmission line with horizontal layout as shown in figure below is :
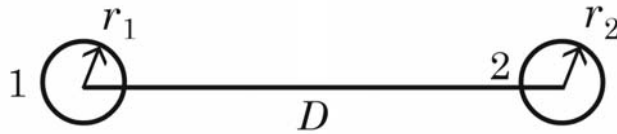
(A) $2 \times 10^{-7} \ln \dfrac{D}{r_1 \cdot r_2} H/m$

(B) $2 \times 10^{-7} \ln \dfrac{D}{\sqrt{0.6065 \times r_1 \times r_2}} H/m$

(C) $4 \times 10^{-7} \ln \dfrac{D}{\sqrt{r_1 r_2}} H/m$

(D) $4 \times 10^{-7} \ln \dfrac{D}{\sqrt{0.6065 \times r_1 \times r_2}} H/m$

41. A transmission line with line impedance Z has all its line charging admittance Y placed at receiving end. The ratio of sending end voltage to receiving end voltage under no-load condition is :

(A) 1

(B) ZY

(C) $1 + ZY$

(D) $1 + \dfrac{YZ}{2}$

42. A string of 4 disc insulators has a string efficiency of 75%. If C is the capacitance between the metal parts of the insulator and the tower structure, then the leakage current from bottom insulator pin to ground is (Take V as rated line voltage) :

(A) VwC

(B) $\dfrac{VwC}{3}$

(C) $\dfrac{2VwC}{3}$

(D) $\dfrac{VwC}{2}$

43. Identify the correct and incorrect statements, which refer to protective relays :

I. The ratio of reset to pickup value in case of electromagnetic attraction type relays is higher than that of electromagnetic induction type relays.

II. Induction cup type relay is more sensitive than induction disk type relay, and can be used for high speed application.

III. The actuating torque in induction type relays is proportional to cosine of the angle between the two fluxes.

IV. The rotation of the disk in an induction disk relay, is from unshaded pole to shaded pole.

(A) Only I is incorrect

(B) I, III are correct, but II, IV are incorrect

(C) II, IV are correct, but I, III are incorrect

(D) Only IV is incorrect

44. Match the following properties and applications of distance relays :

(i) Impedance relay   (i) Voltage restrained directional relay   (i) Long length lines

(ii) Reactance relay   (ii) Directional restrained over current relay   (ii) Medium length lines

(iii) Mho relay   (iii) Voltage restrained over current relay   (iii) Short length lines

    (A)   (i)-(i)-(ii),   (ii)-(ii)-(i),   (iii)-(iii)-(iii)

    (B)   (i)-(i)-(i),   (ii)-(iii)-(iii), (iii)-(ii)-(ii)

    (C)   (i)-(iii)-(ii), (ii)-(ii)-(i),   (iii)-(i)-(iii)

    (D)   (i)-(iii)-(ii), (ii)-(ii)-(iii), (iii)-(i)-(i)

45. Sequence impedances of a star connected synchronous generator with neutral shorted to ground are related to each other as :

    (A) $Z_1 > Z_2 > Z_0$ (B) $Z_0 > Z_2 > Z_1$

    (C) $Z_1 > Z_2 = Z_0$ (D) $Z_1 = Z_2 > Z_0$

46. The values indicated on the single line diagram, as shown below, are the reactances in per unit on a common system base. A three phase fault occurs at point 'P' at the middle of the line. Determine the transfer reactance between generator bus and infinite bus :


    (A)   J 1.0   (B)   J 1.1

    (C)   J 1.2   (D)   J 1.3

47. Identify the correct statement referring to Specific Energy Consumption (SEC) of an electric train :

    (A)   SEC increases with, increase in maximum speed and distance between the stops

    (B)   SEC increases with, increase in maximum speed and decrease in distance between the stops

    (C)   SEC increases with, decrease in maximum speed and increase in distance between the stops

    (D)   SEC decreases with, decrease in maximum speed and distance between the stops

48. A synchronous machine under steady state has initial load angle δ_0 and mechanical power input ρ_{m0} as shown in below figure. A sudden increase in mechanical power input from ρ_{m0} to ρ_{m1} causes the rotor oscillations between points a to c on the power angle curve, then :

    (A)   during the rotor swing from $a \to b \to c$: the rotor speed at point 'b' is greater than at point 'a' and rotor speed at point 'c' is greater than at point 'b'

    (B)   during the rotor swing from $c \to b \to a$: rotor speed at point 'b' is greater than at point 'c' and rotor speed at point 'a' is greater than at point 'b'

    (C)   during the rotor swing from $c \to b \to a$: rotor speed equals synchronous speed at point 'c' and 'a' and at point 'b' it is higher than the synchronous speed

    (D)   during the rotor swing from $a \to b \to c$: rotor speed equals synchronous speed at points 'a' and 'c' and at point 'b' it is higher than the synchronous speed

49. Of the following statements (i-iv) about protective devices, choose the correct option among those listed :

(i)   Interrupting rating of MCBs is upto 1800 A and that of MCCBs ranges from 10000A to 2,00,000A

(ii)   The current rating of an MCB is upto 100 amperes, while an MCCB has a current rating of between 10 to 200 amperes

(iii)   MCBs contain a movable tripping circuit while MCCBs have fixed tripping circuit.

(iv)   Both MCBs and MCCBs protect circuits against overloading and short circuit.

    (A)   (i), (ii), (iii) are correct   (B)   (ii), (iii), (iv) are correct

    (C)   (i), (ii), (iv) are correct   (D)   (i), (iii), (iv) are correct

50. Choose the right option from those listed concerning statements (i-iv) about protective devices :

(i)   RCCB disconnects an electric circuit as soon as it detects earth leakage current.

(ii)   MCB affords over current and earth leakage protection.

(iii)   The short circuit current rating of a 16 A, 'C' type MCB is approximately 10 kA.

(iv)   Incorrect short circuit withstand capacity of a circuit breaker can cause fire and can be fatal.

    (A)   (i), (ii), (iii) are correct   (B)   (ii), (iii), (iv) are correct

    (C)   (i), (ii), (iv) are correct   (D)   (i), (iii), (iv) are correct

51. Compute the ratio of illuminance at a point 5 metres just below a lamp emitting 100 candelas to the illuminance at a point 5 metres away from the first point on the same horizontal plane :

    (A)   1:2   (B)   2.83:1

    (C)   1:2.83   (D)   2:1

52. An average illuminance of 50 lux is needed in a 4 metre X3 metre rectangular room. Estimate the number of lamps each having 300 lumens to obtain the required illuminance :

    (A)   2   (B)   4

    (C)   5   (D)   6

53.
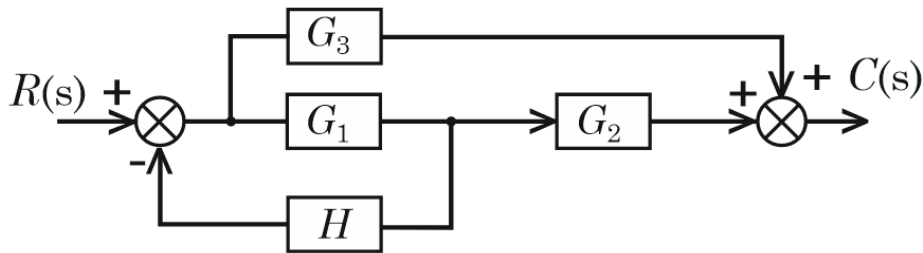
For the given block diagram representation of a system, evaluate $C(s)/R(s)$:

(A) $(G_1 G_3 + G_2)/(1 + G_1 G_2 G_3 H)$

(B) $G_1 G_2 G_3 /(1 + G_1 H)$

(C) $(G_1 G_2 + G_3)/(1 + G_1 H)$

(D) $[G_1 G_2 /(1 + G_1 H)] + G_3$

54. A unity feedback temperature control system has open loop transfer function $G(s) = \dfrac{10000}{(1+s)(1+0.5s)(1+0.02s)}$. If the setpoint temperature is 500 degrees Celsius, what is the steady state temperature in degrees Celsius?

(A) 499.02

(B) 499.26

(C) 499.58

(D) 499.92

55. The critical gain and critical frequency for the characteristic equation $s^4 + 22s^3 + 10s^2 + s + K = 0$ are given by :

(A) $K = 0.45$, $\omega = 0.212$ rad/s

(B) $K = 2.2$, $\omega = 0.212$ rad/s

(C) $K = 0.2$, $\omega = 0.45$ rad/s

(D) $K = 0.2$, $\omega = 2.2$ rad/s

56. For a type 1 system, the intersection of initial slope of Bode plot with 0 dB axis gives :

(A) Steady state error

(B) Static error constant

(C) Phase margin

(D) Gain crossover frequency

57. Which of the following statements about compensators is correct?

(i) Due to phase lag characteristic of lag compensators, it cannot be used to improve phase margin.

(ii) The pole and zero of lag compensator must be located substantially lower than gain crossover frequency of the compensated system.

(iii) The main effect of lag compensator is to attenuate the high frequency magnitude response without adding additional negative phase shift at these frequencies.

(iv) The zero of lag compensator is chosen one decade below the gain crossover frequency of compensated system

(A) (i), (ii), (iii) are correct

(B) (ii), (iii), (iv) are correct

(C) (i), (iii), (iv) are correct

(D) (i), (ii), (iii), (iv) are correct

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58. The state transition matrix of a control system is $\begin{bmatrix} e^{-4t} & e^{-6t} - e^{-2t} \\ e^{-8t} - e^{-5t} & e^{-0.5t} \end{bmatrix}$. The system matrix

A is :

(A) $\begin{bmatrix} -1/4 & -1/8 \\ -1/2 & -2 \end{bmatrix}$

(B) $\begin{bmatrix} -1/4 & -1/4 \\ -1/3 & -2 \end{bmatrix}$

(C) $\begin{bmatrix} -4 & -8 \\ -12 & -0.5 \end{bmatrix}$

(D) $\begin{bmatrix} -4 & -4 \\ -3 & -0.5 \end{bmatrix}$

59. Find the state transition matrix of $A = \begin{bmatrix} 0 & -2 \\ 1 & -3 \end{bmatrix}$.

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

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

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

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

60. The state space representation of a system is given by :

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & a_1 & 0 \\ 0 & 0 & a_2 \\ a_3 & 0 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u, \quad y = [1 \quad 0 \quad 0] \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

The system is controllable for

(A) $a_1 \neq 0, a_2 = 0, a_3 \neq 0$

(B) $a_1 = 0, a_2 \neq 0, a_3 = 0$

(C) $a_1 = 0, a_2 \neq 0, a_3 \neq 0$

(D) $a_1 \neq 0, a_2 \neq 0, a_3 = 0$

61. The state space representation of a system is given by $\dot{X} = AX + Bu, y = CX$, where

$A = \begin{bmatrix} -2 & 4 \\ 2 & 1 \end{bmatrix}, B = \begin{bmatrix} 0 \\ 1 \end{bmatrix}, C = [1 \quad 0]$. The given system is :

(A) controllable and stable

(B) uncontrollable and stable

(C) observable and unstable

(D) unobservable and unstable

62. Find all critical points of the given system and identify their nature :

$$\dot{x} = x - y - x^2 + xy, \quad \dot{y} = -x^2 - y$$

(A) (0, 0)-saddle, (1, –1)-stable node, (–1, –1)-unstable focus

(B) (0, 0)-saddle, (1, 1)-stable node, (1, –1)-stable focus

(C) (0, 0)-stable node, (1, –1)-saddle, (–1, –1)-unstable focus

(D) (0, 0)-stable node, (1,1)-stable focus, (1,–1)-saddle

63. Calculate the minimum sampling frequency to avoid aliasing when a continuous time signal is given by $x(t) = 5\cos 400\pi t$:

    (A)   100 Hz   (B)   200 Hz

    (C)   300 Hz   (D)   400 Hz

64. The Z transform of a signal is given by $X(z) = \dfrac{\frac{1}{4}z^{-1}(1 - z^{-4})}{(1 - z^{-1})^2}$. Its final value is :

    (A) $\dfrac{1}{4}$ (B)   0

    (C)   1   (D)   Infinite

65. Phantom loading for testing energy meters is used :

    (A)   To isolate pressure coil and current coil circuits

    (B)   To reduce power loss during loading

    (C)   To test energy meters with low current rating

    (D)   To test energy meters with large current rating

66. A spring controlled moving iron voltmeter draws a current of 1 milliampere for full scale value of 100 V. If it draws a current of 0.5 milliampere, the meter reading is :

    (A)   25 V   (B)   50 V

    (C)   100 V   (D)   200 V

67. A clamp-on ammeter measures 50 A, when wrapped around a current carrying conductor. If the winding turns on the jaws of the meter equal 8, what is the actual value of conductor current?

    (A)   400 A   (B)   50 A

    (C)   12.5 A   (D)   6.25 A

68. A single phase energy meter operating on 230 V and 5 A for 5 hours makes 1940 revolutions. If the energy meter constant is 400, power factor of the load is :

    (A)   1   (B)   0.8

    (C)   0.7   (D)   0.6

69. If the secondary winding of a current transformer is opened when the primary winding is carrying current, which of the following occurs?

    (A)   Transformer will burn immediately

    (B)   High induced emf is produced in the secondary winding

    (C)   Flux density in core gets weakened

    (D)   High current is produced in secondary winding

70. Match List 1 with List 2 :

	List 1		List 2
(a)	Haybridge	(i)	Capacitance
(b)	Maxwell bridge	(ii)	Frequency
(c)	Schering bridge	(iii)	High Q coil
(d)	Wein bridge	(iv)	Medium Q coil

(A)   (a)-(iv), (b)-(ii), (c)-(iii), (d)-(i)

(B)   (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i)

(C)   (a)-(iv), (b)-(ii), (c)-(i), (d)-(iii)

(D)   (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)

71. Which of the following statements are not correct about BJT Biasing?

(i)   Biasing is needed so that thermal runaway cannot take place.

(ii)   Biasing is done to operate BJT in saturation region.

(iii)   Fixed Bias circuit has very high stability factor so it is highly stable biasing circuit.

(A)   Only (ii) and (iii)   (B)   Only (i) and (ii)

(C)   Only (i) and (iii)   (D)   All the above are correct

72. Consider the following statements :

(i)   h-parameters of BJT can be used over wide range of frequencies.

(ii)   h-parameters represent input resistance and output conductance when output is shorted.

(iii)   h-parameters represent forward voltage gain and reverse current gain of BJT at certain conditions.

(iv)   Input resistance of CE amplifier is high compared to CB amplifier.

(v)   Output conductance of CC amplifier is high compared to CB amplifier.

Which of above statements are correct?

(A)   Only (i), (ii) and (iii)

(B)   Only (ii), (iii) and (iv)

(C)   Only (ii), (iv) and (v)

(D)   Only (i), (ii) and (iv)

73. The given oscillator circuit shown in figure is :
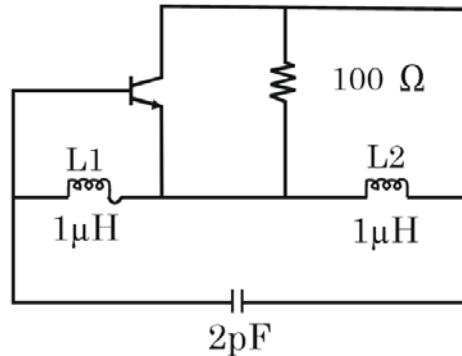
(A) Colpitts oscillator with $\omega_{oscillation} = 500$ MHz

(B) Hartley oscillator with $\omega_{oscillation} = 500$ MHz

(C) Colpitts oscillator with $\omega_{oscillation} = 1000$ MHz

(D) Hartley oscillator with $\omega_{oscillation} = 1000$ MHz

74. An op-amp gives triangular wave output as shown in figure for square wave input of 1 MHz and 8 V amplitude. What is the slew rate of op-amp?

(A) 20 V/μs (B) 10 V/μs
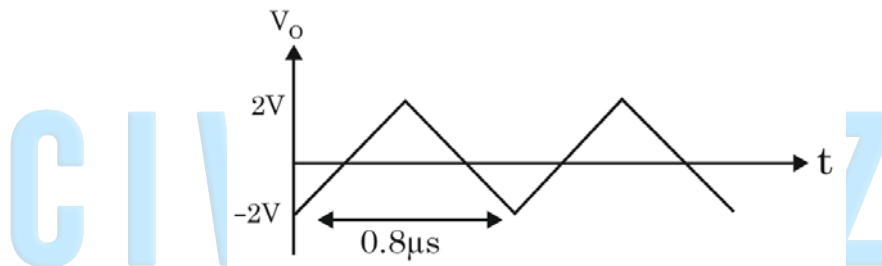
(C) 16 V/μs (D) 8 V/μs

75. Consider the following statements with respect to op-amp and VCO :

(i) The input offset voltage in op-amp is due to mismatch in transistor parameters

(ii) Op-amp is a voltage controlled current source

(iii) The output frequency of VCO depends on timing resistor and inductor only

(iv) The voltage to frequency conversion factor of VCO is given by 4fo/Vcc

Which of the above statements are not correct?

(A) Only (i), (ii) and (iii)   (B) Only (ii), (iii) and (iv)

(C) Only (i), (iii) and (iv)   (D) All the above

76. The following circuit has :
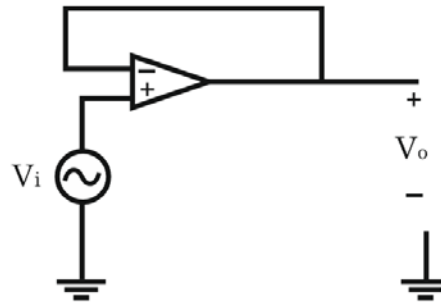
(i)   Unity gain
(ii) Infinite gain
(iii) High input impedance
(iv) High output impedance
(v)   Zero phase shift
(vi) 180° phase shift

Which of above statements are correct?

(A) Only (i), (iii) and (vi)   (B) Only (i), (iii) and (v)
(C) Only (ii), (iv) and (vi)   (D) Only (ii), (iii) and (v)

77. To avoid race around condition occurring in J-K flipflop :
(A) Propagation delay must be equal to clock pulse duration and clock time period
(B) Propagation delay should be less than clock pulse duration and more than clock time period
(C) Propagation delay should be more than clock pulse duration and less than clock time period
(D) Propagation delay should be equal to clock pulse duration and more than clock time period

78. A 5 Bit synchronous counter uses flip-flops with propagation delay time of 20 ns each. The maximum possible time required for change of state will be :
(A) 40 ns   (B) 20 ns
(C) 80 ns   (D) 100 ns

79. Which of the following statement about multiplexer is correct?
(A) A multiplexer is also called a data distributor and parallel to serial converter
(B) A 16 : 1 multiplexer can be implemented using four 4 : 1 multiplexers
(C) Two 2 : 1 MUX are required to implement universal gates
(D) All the above are correct

80. An Analog to Digital Converter has a total conversion time of 125 μs. What can be the allowable highest frequency of the analog input?

    (A) 4 kHz   (B) 8 kHz

    (C) 2 kHz   (D) 1 kHz

81. In a Schmitt trigger, Vsat is ± 25 V and the hysteresis width is 0.4 V. Feedback factor will be _____?

    (A) 0.002   (B) 0.016

    (C) 0.008   (D) 0.004

82. Which of the following statements regarding sample and hold circuit is correct?

    (A) Sample and hold circuit is must in digital to analog conversion

    (B) The hold mode time of sample and hold circuit is less than the conversion time of the converter

    (C) A good Sample and hold circuit has high input impedance and low output impedance

    (D) All the above are correct

83. Which of the following statements are correct about IGBT?

    (i)   Flow of current in IGBT is due to electrons only.

    (ii) IGBT is faster than BJT and MOSFET.

    (iii) On state losses of IGBT are less than MOSFET.

    (iv) It has high input impedance.

    (A) Only (iii) and (iv)   (B) Only (i) and (ii)

    (C) Only (ii) and (iii)   (D) Only (ii) and (iv)

84. A half wave thyristor converter supplies a purely inductive load. The triggering angle of thyristor is 120°. The extinction angle will be :

    (A) 180°   (B) 200°

    (C) 240°   (D) 360°

85. Consider the following statements on triggering circuits for thyristors :

    (i)   RC triggering can be used for automatic control systems

    (ii) The maximum firing angle is limited to 90° in R triggering circuit

    (iii) UJT triggering can be used for feedback control systems

    Which of the statements are correct?

    (A) Only (ii) and (iii)   (B) Only (i) and (ii)

    (C) Only (i) and (iii)   (D) All the above are correct

86. A single phase full-bridge inverter using SCRs and Diodes is feeding a resistance $5\,\Omega$ from an input 60V DC

(i) RMS value of output voltage is 60V

(ii) Output power will be 720 W.

    (A) Only (i) is correct   (B) Only (ii) is correct

    (C) Both are correct   (D) Both are not correct

87. Which of the following statements is correct?

    (A) In sinusoidal pulse width modulation, the carrier wave frequency is less than reference wave frequency

    (B) The ratio of reference wave voltage to carrier wave voltage is called modulation index

    (C) In sinusoidal pulse width modulation, the carrier wave frequency is equal to reference wave frequency

    (D) All the above statements are not correct

88. Find the fundamental component of RMS output voltage for the following circuit :
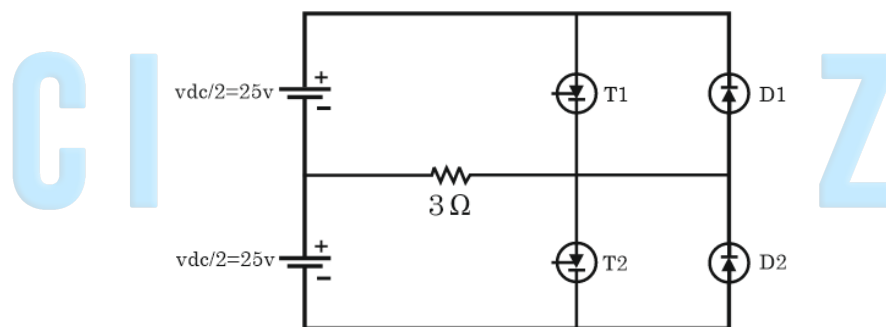
    (A) 11.25 V   (B) 22.5 V

    (C) 25 V   (D) 50 V

89. The percentage content of 7th harmonic with respect of fundamental output in single phase inverter is :

    (A) 14.28 %   (B) 18.18 %

    (C) 25.46 %   (D) 33.33 %

90. Consider the following statements :

(i) Type A chopper is also called as step-down chopper.

(ii) Type B chopper is also called as step-up chopper.

(iii) Two quadrant type A chopper always have a positive voltage.

(iv) Two quadrant type B chopper always have a positive voltage.

Which of the statements are correct?

(A) Only (i), (ii) and (iii) (B) Only (i), (ii) and (iv)

(C) Only (ii), (iii) and (iv) (D) All the above are correct

91. The chopper frequency of following circuit is 2000Hz. The on and off period of chopper is :
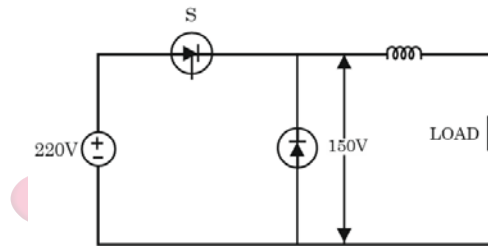
(A) $T_{on} = 340.9\,\mu s$ and $T_{off} = 159.1\,\mu s$

(B) $T_{on} = 170.45\,\mu s$ and $T_{off} = 79.55\,\mu s$

(C) $T_{on} = 340.9\,\mu s$ and $T_{off} = 79.55\,\mu s$

(D) $T_{on} = 170.45\,\mu s$ and $T_{off} = 159.1\,\mu s$

92. A Buck regulator, input voltage is 20V, time period is 10 seconds and duty ratio is 0.5. The inductor and capacitors are 1 Henry and 1 Farad respectively. The peak-to-peak current ripple of inductor will be :

(A) 20 A (B) 40 A

(C) 50 A (D) 60 A

93. Which of the following statements about SMPS is correct?

(A) SMPS provides good quality of efficient AC power supply

(B) SMPS is a two-stage conversion supply

(C) In second stage of SMPS devices used are MOSFET and IGBT

(D) All the above statements are correct

94. A single-phase controlled rectifier provides an output of 100 V from an AC source of 230V. This rectifier is driving a separately excited DC motor with armature resistance 5 Ω, armature current 2A and back EMF constant 0.01V/rpm. The speed of motor is :

(A) 2200 rpm (B) 1100 rpm

(C) 900 rpm (D) 450 rpm

95. Which of the following statements are correct about interrupts in 8085 microprocessors?
- (i)   RST-7.5, RST-6.5, RST-4.5 and RST-5.5 are software interrupts
- (ii) RST-4.5 interrupt has highest priority and only non-maskable interrupt
- (iii) RST-7.5 interrupt has highest priority and only maskable interrupt

    (A)   Only (iii)   (B)   Only (ii)
    (C)   Only (i)   (D)   All are correct

96. Consider the following statements on memories
- (i)   PROM is cheaper, permanent and simple to use
- (ii) EPROM is used to store data for long time
- (iii) EPROM is also called UV-ROM and it is permanent

    Which of the above statements are correct?

    (A)   Only (ii) and (iii)   (B)   Only (i) and (ii)
    (C)   Only (i) and (iii)   (D)   All the above are correct

97. The 7's compliment of octal number 6245 is

    (A)   5426   (B)   5427
    (C)   1532   (D)   1533

98. Which of the following statements is correct?

    (A)   MSB represents the sign of numbers
    (B)   – 64 is represented by 1100 0000
    (C)   – 14 is represented by 1000 1110
    (D)   All the above statements are correct

99. The solution of expression $\left(A + \overline{A}\,B\right)\left(A + C\right)$ is :

    (A) $A + B + C$ (B) $AB + AC$
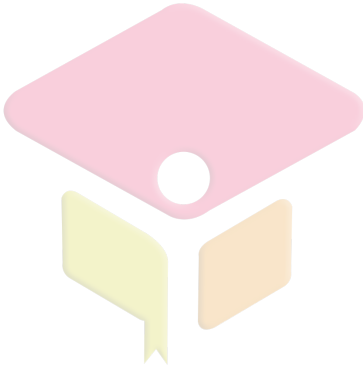   (C) $A + BC$ (D) ABC

100. Consider the following statements :
- (i)   IPv6 protocol has built in security
- (ii) lPv6 header does not include check sum field
- (iii) End to end connection integrity is achieved in both IPv4 and IPv6
- (iv) The number of header fields in IPv6 is less than IPv4
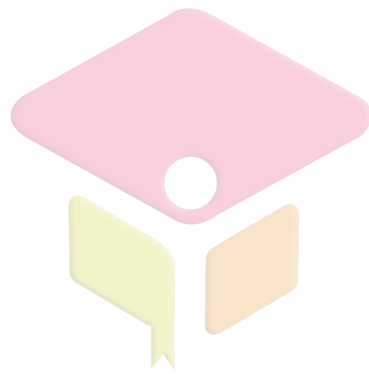
    Which of the above statements are correct?

    (A)   Only (i), (ii) and (iii)   (B)   Only (i), (ii) and (iv)
    (C)   Only (ii), (iii) and (iv) (D)   All the above are correct

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