1. The fundamental period N of a discrete time signal $e^{j\left(\frac{3\pi}{4}\right)n}$ is
   1) N = 1 2) N = 2 3) N = 4 4) N = 8

Ans : 4

Sol : To find the time period of discrete time signal

$\frac{\omega_0}{2\pi} = \frac{m}{N}$ ---- (1); $\frac{\omega_0}{2\pi} = \frac{\frac{3\pi}{4}}{2\pi} = \frac{3}{8}$ --- (2)

By comparing (1) and (2), the fundamental period N = 8

2. A single phase 200/125 volt autotransformer delivers 40 kVA to a load at 0.8 power factor lagging. Neglect leakage reactance and magnetizing current. For this loading condition the transformed KVA is
   1) 15 2) 40 3) 25 4) 32

Ans : 2

Sol : $(KVA)_{2winding\ inductively}$

$= (1-K)KVA_{autotransformer}$

$where\ K = \frac{LV}{HV}\ of\ autotransformer$

$\Rightarrow K = \frac{125}{200} = \frac{5}{8}$

$(KVA)_{2winding} = \left(1-\frac{5}{8}\right) \times 40 = 15\ KVA.$

$(KVA)_{2winding\ conductively}$

$= \left(\frac{5}{8}\right) \times 40 = 25\ KVA$

In autotransformer power is transferred both inductively and conductively = 40KVA.

3. A 3-phase induction motor runs at 3% slip and develops mechanical power equal to 10 kW. The air gap is
   1) 9.7 kW 2) $\left(\frac{10}{0.97}\right) kW$
   3) 10.30 kW 4) 10.03 kW

Ans : 2

Sol : Given mechanical power developed

$P_{gmd} = 10\ kW;$

$Given\ Slip\ (S) = 3\% = 0.03$

We know

$P_{ri} : P_{rc} : P_{gmd} = 1 : S : 1-S$

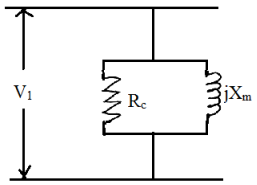
$\frac{P_{ri}}{P_{gmd}} = \frac{1}{(1-S)};\ P_{ri} = \frac{1}{(1-S)} P_{gmd}$

$= \frac{10}{1-0.03} = \frac{10}{0.97} kW$

4. A three-phase, 2000volt, Y-connected wound rotor induction motor has the following no-load test data.
   2000volt, 15.3 amp and 10.1 kW
   The core loss resistance r_c of the approximate equivalent circuit is nearly
   1) 396Ω 2) 686Ω
   3) 328Ω 4) 666Ω

Ans : 1

Sol : Equivalent circuit at no-load is



Power consumed at no-load is given as 10.1 kW.
Applied voltage is 200v (line voltage)

$$R_c = \frac{V_{ph}^2}{\frac{P}{ph}} = \frac{\left(\frac{200}{\sqrt{3}}\right)^2}{\frac{10.1\times10^3}{3}} = 396\Omega$$

5. A 230 V dc series motor has an armature circuit resistance of 0.2Ω and field resistance of 0.1Ω. At rated voltage, the motor draws a line current of 40A and runs at speed of
   1000 rpm. Assume that the flux
   at 20A line current is 60% of flux at 40 A line current. What is the speed of motor for a line current of 20A at 230V
   1) 1317 rpm 2) 1713 rpm
   3) 1137 rpm 4) 3117 rpm

Ans : 2

Sol : case i) Given $V_t = 230V, r_a = 0.2\Omega,$
$r_f = 0.1\Omega;\ I_{L1} = I_{a1} = 40A;$
$N_1 = 1000rpm\ ;$
$E_{b1} = V_t - I_{a1}(r_a + r_f)$
$= 230 - 40(0.3) = 218V$
Case ii) $V_t = 230V, I_{a2} = 20A$
$\emptyset_2 = 0.6\emptyset_1,$
$E_{b2} = V_t - I_{a2}(r_a + r_f)$
$= 230 - 20(0.3) = 224V\ ;$
$E_b \propto \emptyset N;\ \frac{E_{b2}}{E_{b1}} = \frac{\emptyset_2}{\emptyset_1}\frac{N_2}{N_1}$

$$\frac{224}{218} = \frac{0.6\emptyset}{\emptyset}\frac{N_2}{1000} \Rightarrow N_2 = 1713\, rpm$$

6. A three-phase Y-connected synchronous generator has synchronous reactance $X_S = 5\Omega$ per phase. It delivers 12 kVA load at unity power factor. The terminal voltage is 200 volts / phase. The induced emf per phase of the generator is
   1) $\sqrt{5} \times 100$ volts 2) $\sqrt{3} \times 100$ volts
   3) $\sqrt{2} \times 100$ volts 4) 200 volts

Ans :1

Sol : $S_A = 3V_{ph}I_{ph}$

$$I_{ph} = \frac{12000}{3(200)} = 20A$$

$$E = \sqrt{(V_t \cos\emptyset + I_a r_a)^2 + (V_t \sin\emptyset \pm I_a X_s)^2} \text{ –1)}$$

In equation 1)

'+' indicates lagging power factor

'-' indicates leading power factor

$$E = \sqrt{(200 \times 1 + 0)^2 + (0 \pm 20 \times 5)^2}$$

$$= \sqrt{50000} = \sqrt{5} \times 10000 = \sqrt{5} \times 100 \text{ V/ph.}$$

7. The emf induced per phase in the rotor winding of a 3-phase induction motor is 100V at stand still. Under full-load condition, this emf would be normally
   1) 100V 2) 50V
   3) 4V 4) 0.2V

Ans : 3

Sol : Given rotor stand still reactance

E_{20} = 100V. Operating slip of induction motor under full load condition is 2 to 6%.

∴ Rotor emf under full load condition

$E_2 = s \times E_{20} = 0.04 \times 100 = 4V$

8. A 3-phase induction motor has a starting torque of 200 N-m when switched on directly to supply. If an auto-transformer with 50% tapping is used for starting, the starting torque would be
   1) 400 N-m 2) 200 N-m
   3) 100 N-m 4) 50 N-m

Ans : 4

Sol : The relationship between starting torque of autotransformer to direct online starter is

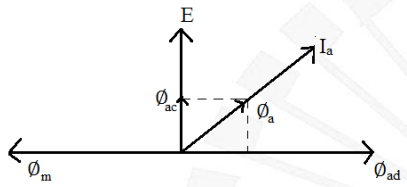
$T_{st(AT)} = K^2 T_{st(DOL)}$

Given $T_{st(DOL)} = 200\ N - m$;

$K = 50\% = 0.5$
$T_{st(AT)} = K^2 T_{st(DOL)}$
$= (0.5)^2 \times 200 = 50N - m$

9. A 3-phase synchronous generator is operating at 0.8 pf lagging with respect to the excitation voltage. The nature of armature reaction mmf produced by the armature currents is
   1) Magnetizing 2) Demagnetizing
   3) Cross magnetizing and partly demagnetizing
   4) Partly demagnetizing and partly cross-magnetizing

Ans : 4
Sol : Lagging power factor (R-Load)



∴ From the above figure partially demagnetizing and partially cross magnetizing.

10. When speed becomes more than the synchronous speed during hunting, the damper bars develop
    1) Synchronous motor torque
    2) Induction motor torque
    3) DC motor torque
    4) Induction generator torque

Ans : 4
Sol : When rotor speed is more than synchronous speed, induction generator torque is developed in the opposite direction of rotor rotation then the rotor will decelerate to reach synchronous speed.

11. Rotor slot of the squirrel cage induction motor are skewed slightly, so as to
    1) Increase the mechanical strength of rotor
    2) Make the rotor construction simple
    3) Eliminate locking tendency of the rotor and to reduce the noise
    4) Save the amount of copper required

Ans : 3
Sol : With skewed rotor of squirrel cage induction motor, the flux distribution will be uniform in the air gap because of uniform reluctance so the harmonics present in

airgap flux will reduce and this results in a more uniform torque. Because of reduction in slot harmonics, logging and crawling can be prevented.

12. Maximum torque developed by a three-phase induction motor
    1) increases with increase in rotor resistance
    2) decreases with increase in rotor resistance
    3) is independent of rotor resistance
    4) increases with decrease in rotor resistance

Ans : 3

Sol : $T_{max} = \frac{180}{2\pi N_s}\frac{E_{20}^2}{2X_{20}}$

$\therefore T_{max}$ is independent of rotor winding resistance

13. A synchronous machine has its field winding on the stator and armature winding on the rotor. When running under steady conditions, its air gap field is
    1) Stationary with respect to stator
    2) Stationary with respect to rotor
    3) Rotating at synchronous speed with respect to stator
    4) Rotating at synchronous speed in the direction of rotor rotating.

Ans : 1

Sol : Given field winding on the stator and armature winding on the rotor. When running under steady conditions, its air gap field is stationary with respect to rotor then only torque will develop in synchronous machine.

14. A long transmission line is energized at the sending end and is kept open circuited at the receiving end. The magnitude of receiving end line voltage is 400V. The magnitude of the sending end line voltage is
    1) < 400kv 2) = 400kV
    3) > 400kv 4) ≥ 400 kV

Ans : 1

Sol : According to Ferranti effect, under no load condition receiving end voltage is more than sending end voltage

$\therefore V_r$ is 400kV

$\therefore V_s < V_r < 400$ kV

15. The string efficiency of a string of suspension insulators of a 400 kV, 3-phase transmission line is 80%. The voltage across the string is

1) 400kV 2) (400/√3)kV
3) (500/√3)kV 4) 320 kV

Ans : 2
Sol : Voltage across suspension string is phase value of rated voltage
So $V_{ph} = \frac{V_L}{\sqrt{3}} = \frac{400}{\sqrt{3}} kV$

16. A 3-phase, 11kV, induction motor draws 100 kVA at 0.8 pf lagging from the system. A 3-phase capacitor bank rated 60 kVAR is installed across the motor in order to increase the power factor to unity. The apparent power supplied by the system to the motor with capacitor bank is
1) 100kVA 2) 40kVA
3) 160kVA 4) 80kVA

Ans : 4
Sol : Due to power factor improvement active power supplied by source will remain same.
$\therefore P_1 = P_2$
According to power triangle
$\text{Cos}\,\emptyset = \frac{P}{S}$;
$\therefore P = S \times \cos\emptyset = constant$
$S_1 \times \cos\emptyset_1 = S_2 \times \cos\emptyset_2$
$100 \times 0.8 = S_2 \times 1 \Rightarrow S_2 = 80kVA.$

17. As the moisture content in the air increases, the disruptive critical voltage
1) Decreases 2) Increases
3) Remains constant 4) Infinite

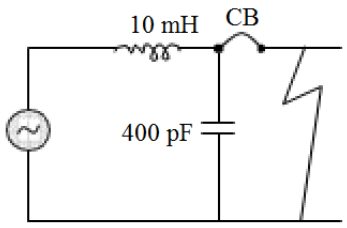
Ans : 1
Sol : As moisture in air increases, less voltage gradient is required. For sustain discharge, so critical disruptive voltage decreases.

18. The arc resistance causes distance relay
1) under reach 2) over reach
3) under reach or over reach depending on the length of the line
4) reach unchanged

Ans: 1

Sol : Due to effect of arc resistance effective impedance seen by the relay increases which results relay will not operate even if the fault inside the zone of protection. So it is called under reach problem.

19. Figure shows the single phase equivalent circuit for analyzing circuit breaker operation. The frequency of re-striking voltage is



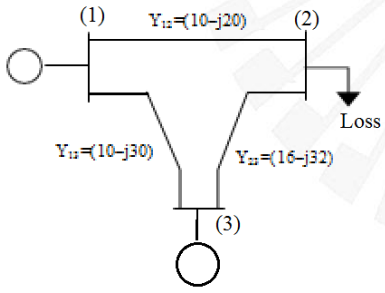
1) 1000 kHz 2) 5000 KHz
3) 500×10^3 rad/sec
4) 200×10^3 rad/sec

Ans : 3

Sol : $\omega = \frac{1}{\sqrt{LC}}\frac{rad}{s} = \frac{1}{\sqrt{10\times10^{-3}\times400\times10^{-12}}}$

$= \frac{1}{\sqrt{4\times10^{-12}}} = \frac{10^6}{2} = 500\times10^3 rad/s$

20. One-line diagram of a 3-bus power system is given in figure. The line admittances are marked in per unit. The first row of the Y_{BUS}



1) [(20-j50) (-10+j20) (-10+j30)]
2) [(20-j50) (10-j20) (10-j30)]
3) [(10-j20) (-10+j20) (-10+j30)]
4) [(20+j50) (-10+j20) (-10+j30)]

Ans : 1

Sol : Self admittance Y_{11} = sum of admittance connected between the buses

$Y_{11} = Y_{12} + Y_{13}$

$= 10 - j20 + 10 - j30 = 20 - j50$

Mutual admittance $Y_{12} = -y_{12}$
$= -(10 - j20) = -10 + j20$
Mutual admittance $Y_{13} = -y_{13}$
$= -(10 - j30) = -10 + j30$

21. Number of iterations required for convergence of a load flow algorithm increases significantly with increase of number of buses with
    1) G-S load flow algorithm
    2) N-R load flow algorithm
    3) both G-S and N-R load flow algorithms
    4) Fast decoupled load flow algorithm

Ans : 1
Sol : For Gauss-Siedal method, number of iterations increases with number of buses but in N-R method number of iterations is independent of number of buses.

22. For low head and high discharge, the hydraulic turbine used is
    1) Francis turbine
    2) Kaplan turbine
    3) Pelton wheel
    4) Impulse turbine

Ans: 2
Sol : Kaplan turbine is best suited for low head and high discharge.

23. Corona loss can be reduced by the use of hollow conductors because
    1) The current density is reduced
    2) Eddy current in the conductor is eliminated
    3) For a given cross-section, the radius of the conductor is increased
    4) Of better ventilation in the conductor

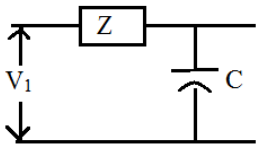
Ans : 3
Sol : By using hollow conductors, corona loss can be reduced because of larger area of cross section of conductor

24. A transmission line represented in End Condenser Method, the values of parameters A and D are ----- and ---- respectively.
    1) A = 1+ZY; D = 1+ZY
    2) A = 1+ZY; D = 1
    3) A = 1-ZY; D = 1+ZY

4) A = 1; D = 1+ZY

Ans : 2

Sol :



$$\begin{bmatrix} A & B \\ C & D \end{bmatrix} = \begin{bmatrix} 1 & Z \\ 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ Y & 1 \end{bmatrix}$$

$$= \begin{bmatrix} 1+YZ & Z \\ Y & 1 \end{bmatrix} \Rightarrow A = 1+YZ; D = 1$$

25. Overreaching of distance relay due to the decaying DC component is avoided by
    1) Electromechanical relay
    2) Solid state relay
    3) Digital relay
    4) Impedance relay

Ans : 3

Sol : Power swings and DC offset current causes overreach problem in distance relays, so this problem can be avoided by using Digital Relays.

Some other advantages of Digital Relay are

1) Flexibility 2) Lower cost
3) Self checking capability
4) Digital communication

26. Transfer function of a system has a zero at -1, and a pole at -2 and gain factor of 2. The unit step response is
    1) $e^{-2t} - 1$ 2) $1 - e^{-2t}$
    3) $1 + e^{-2t}$ 4) e^{-2t}

Ans : 2

Sol : Given zero ⇒ S = -1, pole ⇒ S = -2 & K = -2

$TF = \frac{C(S)}{R(S)} = \frac{2(S+1)}{S+2}$

Given input = unit step ⇒ $R(S) = \frac{1}{S}$

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

$C(S) = \frac{A}{S} + \frac{B}{S+2}; \ A = 1, B = 1$

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

Apply Inverse Laplace Transform

$C(t) = 1 - e^{-2t}$

27. An unity negative feedback control system has open-loop transfer function $G(s) = \frac{4}{s(s+1)}$. The damped natural frequency ω_d in rad/s is

1) $2 \times \sqrt{1-(0.5)^2}$
2) $4 \times \sqrt{1-(0.25)^2}$
3) $2 \times \sqrt{1+(0.25)^2}$
4) $2 \times \sqrt{1-(0.25)^2}$

Ans : 4

Sol : Given OLTF $G(s) = \frac{4}{s(s+1)}$

CLTF $G(s) = \frac{4}{s^2+s+4} = \frac{\omega_n^2}{s^2+2\xi\omega_n s+\omega_n^2}$

$\omega_d = \omega_n\sqrt{1-\xi^2};\ 2\xi\omega_n = 1;\ \omega_n = 2$

$\xi = \frac{1}{2\omega_n} = \frac{1}{4}\ ; \omega_d = 2\sqrt{1-(0.25)^2}$

28. For a feedback control system of type-2, the steady state error for a ramp input is

1) infinite 2) constant
3) zero 4) indeterminate

Ans : 3

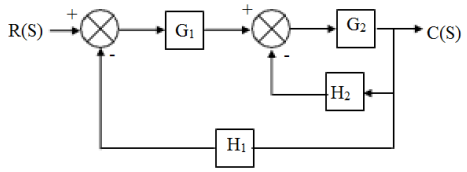
Sol : Let as type system

$G(s)H(s) = \frac{K(1+Z_1S)}{S^2(1+P_1S)}$

Steady state error for ramp input

$\Rightarrow \frac{1}{K_v} = \frac{1}{\infty} = 0$

29. The overall transfer function of the system shown below is----



1) $\frac{G_1G_2}{1-G_1H_1+G_1G_2H_2}$ 2) $\frac{G_1G_2}{1+G_2H_2+G_1G_2H_1}$

3) $\frac{G_1G_2}{1+G_2H_2+G_1G_2H_2}$ 4) $\frac{G_1G_2}{1-G_2H_2-G_1G_2H_1}$

Ans : 2

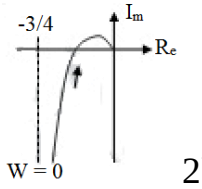
Sol : Overall gain = $\frac{C}{R} = \frac{G_1G_2}{1+G_2H_2+G_1G_2H_1}$

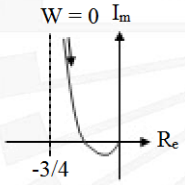
30. An electric motor with high torque/inertia ratio has -----
    1) lower motor time constant and faster dynamic response
    2) Higher motor time constant and slow dynamic response
    3) Lower motor time constant and slow dynamic response
    4) Higher motor time constant and faster dynamic response

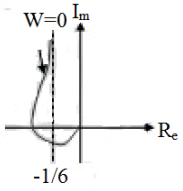
Ans : 1

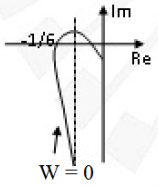
Sol : High torque / inertia ratio of motor has more maximum acceleration. So, time constant of motor is very less. Dynamic response is faster.

31. The frequency response of
$G(s) = \frac{1}{s(s+1)(s+2)}$ plotted in the complex G(jω) plane (for $0 < \omega < \infty$) is

1) 

2) 

3) 

4) 

Ans : 1

Sol : Given, system is type 1 hence polar plot starts in 2nd quadrant

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

$= \frac{1}{2s(1+s)\left(1+\frac{s}{2}\right)} = \frac{1}{2s(1+s)(1+0.5s)}$

$K = \frac{1}{2};\ T_1 = 1\ ;\ T_2 = \frac{1}{2}$

$\therefore K(T_1 + T_2) = \frac{1}{2}\left(1 + \frac{1}{2}\right) = \frac{3}{4}$

32. The constant M loci plot is symmetrical with respect to

1) real axis and imaginary axis
2) M=1 straight line and the real axis
3) M =1 straight line and the imaginary axis
4) M=1 straight line

Ans : 2

33. Consider the state space model of a system, as given below

$$\begin{bmatrix}\dot{x_1}\\ \dot{x_2}\\ \dot{x_3}\end{bmatrix} = \begin{bmatrix}-1 & 1 & 0\\ 0 & -1 & 0\\ 0 & 0 & -2\end{bmatrix}\begin{bmatrix}x_1\\ x_2\\ x_3\end{bmatrix} + \begin{bmatrix}0\\ 4\\ 0\end{bmatrix}u$$

$$y = [1 \quad 1 \quad 1]\begin{bmatrix}x_1\\ x_2\\ x_3\end{bmatrix}$$ The system is -----

1) Controllable and observable
2) Uncontrollable and observable
3) Uncontrollable and unobservable
4) Controllable and unobservable

Ans : 2
Sol : Applying Gilberts test X_3 not controllable and system is observable

34. High voltage Schering bridge is used for the measurement of
1) Resistance and inductance of a coil
2) Frequency of the ac source
3) Loss angle of a capacitor
4) Q of a coil

Ans : 3
Sol : High voltage Schering bridge is used for measurement of capacitances and property of insulators and capacitors.

35. An ammeter of 0.1Ω resistance is connected across the secondary of a 400/5. A current transformer (CT). The CT burden is
1) 0.5 VA 2) 2.5 VA
3) 5.0 VA 4) 25 VA

Ans : 2
Sol : Ammeter resistance $R_a = 0.1\Omega$
Secondary current rating (I) = 5A
Burden on $CT = I^2R_a$
$= 5^2 \times 0.1 = 2.5VA$

36. An aquadag is used in a CRO to collect --------
    1) Primary electrons
    2) Secondary emission electrons
    3) Both primary and secondary emission electrons
    4) The frequency of the signal

Ans : 2
Sol : An aquadag is used in a CRO to collect secondary emission electrons in CRO.

37. A PMMC meter has an internal resistance 200Ω and the current required for its full scale deflection is 50μA. The meter is capable of measuring, on its own, a maximum voltage of -------
    1) 5μV 2) 10μV 3) 5mV 4) 10mV

Ans : 4
Sol : Maximum voltage it can measure
$= I_{FL} \times 10^{-6} \times 200$
$= 50 \times 10^{-6} \times 200 = 10mV.$

38. Errors which may be variable both in magnitude and nature (positive or negative) are classified as
    1) Hysteresis error
    2) Random errors
    3) Systematic errors
    4) Interaction errors

Ans : 2

39. The input voltage to a full wave bridge rectifier is V(t)=200sinωt volts. The peak inverse voltage of the diodes is
    1) 200 volt 2) $\sqrt{2} \times 200$ volt
    3) $\sqrt{2} \times 100$ volt 4) 400 volt

    Ans : 1
    Sol : Given input voltage V(t)=200sinωt
    For a full wave bridge rectifier
    PIV = V_m = 200Volts

40. As the temperature is increased, the voltage across a semiconductor diode carrying a constant current
    1) increases 2) decreases

3) remains constant
4) may increase or decrease depending upon the doping levels in the junction.

Ans : 2
Sol : As the temperature of semiconductor diode is increased, resistance decreases.
∴ The voltage drop decreases as the current is constant.

41. The frequency of ac voltage in a single phase PWM converter is regulated by
1) increasing the amplitude of sine wave
2) varying the frequency of sine wave
3) varying the frequency of triangular wave
4) amplitude of the triangular wave

Ans : 2
Sol : The frequency of ac voltage in a single phase PWM converter is varied by varying the frequency of sine wave.

42. A single phase half wave converter with freewheeling diode fed separately excited DC drive operates at 1000 rpm at firing angle α = 45°. If single phase half wave converter is replaced by single phase semi-conductor, the motor rotates at
1) 2000 rpm 2) 1500 rpm
3) 1000 rpm 4) 500 rpm

Ans : 1
Sol : For 1-Ø half wave rectifier

$V_t = \frac{V_m}{2\pi}[1 + \cos\alpha]$

For 1-Ø semi converter

$V_t = \frac{V_m}{\pi}[1 + \cos\alpha]$

$E_b \propto N\emptyset$

As separately excited motor has flux constant.

$\frac{E_{b2}}{E_{b1}} = \frac{N_2}{N_1} = \frac{\frac{V_m}{\pi}[1+\cos\alpha]}{\frac{V_m}{2\pi}[1+\cos\alpha]} = \frac{N_2}{N_1}$

$N_2 = 2N_1 \Rightarrow N_2 = 2 \times 1000$

$= 2000rpm$

43. A three phase full wave controlled rectifier is connected to a separately excited DC motor and the machine has the following data :

$T_e = 150N - m;\ \omega = 75\ rad/s$

$I_a = 50A$; What will be the back emf of the motor?
1) 200V 2) 225V
3) 250V 4) 275V

Ans : 2
Sol : For a dc motor
$P_{out} = E_b I_a = T\omega$
$\Rightarrow E_b \times 50 = 150 \times 75 = 225V.$

44. Which of the following is an 8-bit register in Intel 8085 microprocessor
1) Accumulator
2) Programme counter
3) Stack counter
4) Both accumulator and stack counter

Ans: 1
Sol : Accumulator is a 8 bit register, program counter is 16-bit special purpose register, Stack pointer is 16 bit special purpose register

45. Consider a second order linear system. Which one of the following gives the correct relationship between bandwidth and natural frequency of the system?
1) Bandwidth is equal to natural frequency
2) Bandwidth doesn't have any relationship with natural frequency
3) Bandwidth is inversely proportional to natural frequency
4) Bandwidth is directly proportional to natural frequency

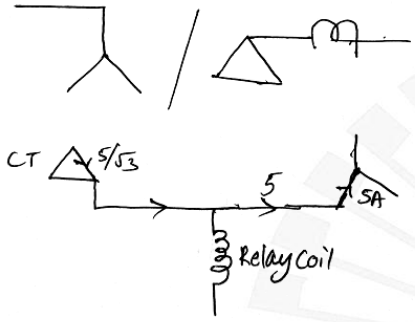
Ans : 4
Sol : For second order system
Bandwidth $\omega_b = \omega_n\sqrt{(1-2\xi^2)+\sqrt{(1-2\xi^2)^2+1}}$
$\therefore \omega_b \propto \omega_n$

46. The voltage at the receiving end of the line can be controlled by installing
1) Synchronous condenser supplying leading kVAR
2) Synchronous condenser supplying lagging kVAR depending on excitation of condenser
3) Synchronous condenser supplying leading kVAR depending on excitation of condenser
4) Synchronous condenser supplying lagging kVAR.

Ans : 3

47. The power transformer having a capacity of 10 MVA with 132/66kV (Star-Delta) configuration is protected by circulating current protection system. Calculate the CT ratio on both sides of the transformer for a circulating current of 5A in the pilot wires
1) 43.71/5, 87.4/5
2) 43.71/(5/1.732), 87.4/5
3) 87.4/5, 43.71/(5/1.732)
4) 43.71/5, 87.4/(5/1.732)

Ans : 2
Sol :



For star connector

$\sqrt{3}V_{L1}I_{L1} = 10MVA$

$\Rightarrow I_{L1} = \frac{10\times10^6}{\sqrt{3}\times132\times10^3} = 43.74A$

For Δ connection

$\sqrt{3}V_{L2}I_{L2} = 10MVA$

$\Rightarrow I_L = \frac{10\times10^6}{\sqrt{3}\times66\times10^3} = 87.48A$

$CT_1(\Delta - connection) = 43.7/5\sqrt{3}$

$CT_2(Y - connection) = 87.48/5$

48. BJT amplifier configuration which acts as buffer is
1) Common emitter
2) Common base
3) Common collector
4) Cascode amplifier

Ans : 3
Sol : For common collector, voltage gain (A_v) = 1 so it can be also called as buffer amplifier

49. Hexa decimal equivalent value of decimal number 757.25 is

1) 7B2.2B 2) 2F5.40
3) 3E4.60 4) 42A.8

Ans : 2
Sol :

16 | 757
16 | 47 - 5
2 - 15 (F)

$0.25 \times 16 = 4.000$

$\Rightarrow$ 2F5

50. Frequency of oscillation of Colpitt's oscillator is
1) $f = \frac{1}{2\pi\sqrt{L\left(\frac{C_1C_2}{C_1+C_2}\right)}}$
2) $f = \frac{1}{2\pi\sqrt{L(C_1+C_2)}}$
3) $f = \frac{1}{2\pi\sqrt{C(L_1+L_2)}}$
4) $f = \frac{1}{2\pi\sqrt{C(L_1+L_2+2M)}}$

Ans : 1
Sol : $f = \frac{1}{2\pi\sqrt{L\left(\frac{C_1C_2}{C_1+C_2}\right)}}$

51. The type of feedback used in wien bridge oscillator is
1) Negative feedback only
2) Positive feedback only
3) No feedback
4) Both negative and positive feedback

Ans : 4
Sol : Feedback used in Weinbridge oscillator is both negative & positive feedback.

52. The clock frequency of an 8-bit successive approximation type A to D converter is 2MHz. The conversion time for an analog signal sample to be converted to digital equivalent value is
1) 2μs 2) 1μs 3) 4μs 4) 16μs

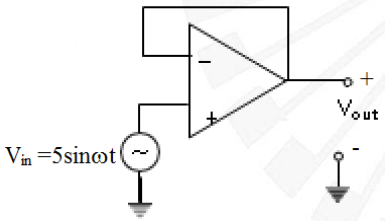
Ans : 3
Sol : $T_c = nT_{Clk} = 8T_{Clk} = \frac{8}{2\times10^6} = 4\mu s$

53. The present outputs of the flip-flops of a 3 bit synchronous down converter are 110. After 7 clock pulses the outputs change to
1) 110 2) 111 3) 101 4) 100

Ans : 2
Sol : 1st clock – 101
2nd clock – 100
3rd clock – 011
4th clock – 010
5th clock – 001
6th clock – 000
7th clock – 111

54. The highest priority interrupt in Intel 8085 microprocessor is
1) INTR 2) RST7.5
3) TRAP 4) RST6.5
Ans : 3
Sol : The priority of interrupts TRAP > RST7.5 > RST6.5 > RST5.5 > INTR

55. The figure shows a circuit with an ideal operational amplifier $V_{in} = 5 \sin \omega t \, mV$ V_{out} is ------ mV



1) 5sinωt 2) -5sinωt
3) 10sinωt 4) 2.5sinωt

Ans : 1
Sol : Given circuit is a voltage follower. So for a voltage follower output voltage is equal to input voltage V_0=5sinωt

56. $\int_{|z+1|=2} \frac{z^2}{4-z^2} dz =$
1) 0 2) 2πi
3) -2πi 4) 1

Ans : 2

Sol : $\int_{|z+1|=2} \frac{z^2}{4-z^2} dz = \int_{|z+1|=2} \frac{\frac{z^2}{2-z}}{2+z} dz$

$= 2\pi i$

$[By\ using\ Cauchys\ Integral\ Formula]$

57. Which of the following is not an Eigen vector of the matrix $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$

1) $\begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix}$ 2) $\begin{bmatrix} -3 \\ 0 \\ 3 \end{bmatrix}$

3) $\begin{bmatrix} 3 \\ 0 \\ -3 \end{bmatrix}$ 4) $\begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}$

Ans : 4

Sol : Let $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$

Any option can be considered as an eigen vector 'X' of 'A'. Then we can verify that AX = λX for some constant value of λ (i.e., an eigen value of A)

First 3 options are satisfied with λ = -2, but last option is not satisfied.

58. The Fourier transform of the function $f(x) = xe^{4x^2}\ is$

1) 0 2) $\frac{\sqrt{\pi}}{2} e^{-\frac{\omega^2}{16}}$

3) $-i\frac{\sqrt{\pi}}{16}\omega e^{-\frac{\omega^2}{16}}$ 4) $i\frac{\sqrt{\pi}}{8}\omega e^{-\frac{\omega^2}{8}}$

Ans : 3

59. Let X be a random variable that follows Binomial distribution with expectation E(X) = 7 and variance V(X) = 6. Then the probability of success p is

1) $\frac{6}{7}$ 2) $\frac{36}{49}$ 3) $\frac{1}{7}$ 4) $\frac{1}{49}$

Ans : 3

Sol : Given that np = 7 ----(1)

npq = 6 ----(2)

$\frac{(2)}{(1)} = q = \frac{6}{7} \Rightarrow p = \frac{1}{7}$

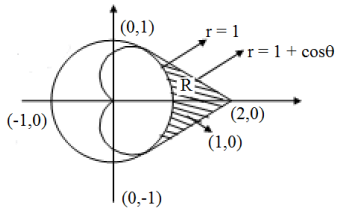
60. The area of the region that lies inside the cardioid r = 1+ cosθ and outside the circle r = 1 is

1) $\frac{\pi}{4}$ 2) $\frac{\pi}{4}+1$

3) $\frac{\pi}{4}+2$ 4) $\frac{\pi}{4}+4$

Ans : 3

Sol :



The required area $= \iint_R r dr d\theta$

$= \int_{\theta=-\frac{\pi}{2}}^{\frac{\pi}{2}} \int_{r=1}^{r(1+\cos\theta)} r dr d\theta$

$= \int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \left(\frac{r^2}{2}\right)_1^{1+cos\theta} d\theta$

$= \frac{1}{2}\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} ((1+\cos\theta)^2 - 1) d\theta$

$= \frac{1}{2} \times 2 \int_0^{\frac{\pi}{2}} \left(2\cos\theta + \left(\frac{1+\cos\theta}{2}\right)\right) d\theta$

$= \left[2\sin\theta + \frac{1}{2}\left(\theta + \frac{\sin\theta}{2}\right)\right]_0^{\frac{\pi}{2}}$

$= 2 + \frac{1}{2}\left(\frac{\pi}{2} + 0\right) - 0 = 2 + \frac{\pi}{4}$

61. A coil with a certain number of turns has a specified time constant. If the number of turns is doubled, its time constant would be

1) Remain unaffected
2) Become doubled
3) Become fourfold
4) Get halved

Ans : 2

Sol : $L \propto N^2;\ R \propto N$

If N is doubled

$\frac{L_1}{L_2} = \frac{1}{4};\ \frac{R_1}{R_2} = \frac{1}{2};\ \frac{T_2}{T_1} = \frac{1}{2}.\frac{4}{1} = 2$

$\therefore\ T_2 = 2T_1$

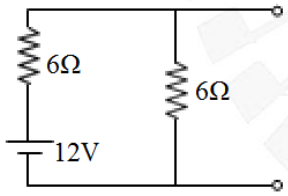
62. The instantaneous power of a balanced three-phase load is 2000W when phase A is at its peak voltage. What will be the instantaneous power 30° later?
1) 1kW 2) 4kW
3) √3kW 4) 2kW

Ans : 4
Sol : The instantaneous power in a 3-phase system is constant at any instant and it is equal to 3 times the average power.

63. A balanced three phase delta connected load is supplied by a balanced 3-phase, 400V supply. The phase current is 10A at a 0.8 power factor lagging. The total reactive power absorbed by the load is
1) 7.2kVAR 2) 2.4kVAR
3) 3.2kVAR 4) 9.6kVAR

Ans : 1
Sol : Reactive power $= \sqrt{3} \times V_L I_L \sin\theta$
$= 3V_{ph}I_{ph} \sin\theta$
$= 3 \times 400 \times 10 \times 0.6 = 7.2\ kVAR.$

64. The Thevenin's equivalent of the circuit shown in figure is a voltage source of



1) 6V in series with resistance of 3Ω
2) 12V in series with resistance of 3Ω
3) 6V in series with resistance of 6Ω
4) 6V in series with resistance of 12Ω

Ans : 1
Sol : $V_{th} = \frac{12\times6}{12} = 6V;\ R_{th} = 6||6 = 3\Omega$

65. The combined inductance of two coils connected in series is 0.6H or 0.1H, depending upon the relative directions of the currents in the coils. How much is the mutual inductance between the coils?
1) 0.25H 2) 0.3H
3) 0.05H 4) 0.125H

Ans : 4

Sol : $L_1 + L_2 + 2M = 0.6$

$L_1 + L_2 - 2M = 0.1$

$4M = 0.5 \Rightarrow M = 0.125H$

66. An initially relaxed RC-series network with R = 2M ohm and C=1 microFarad is switched on to a 10V step input. The voltage across the capacitor after 2 seconds will be

1) zero 2) 3.68V

3) 6.32V 4) 10V

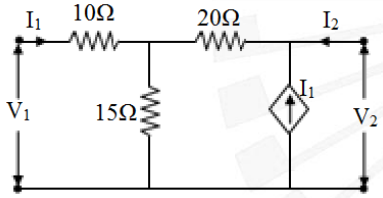
Ans : 3

Sol : $V_c = V\left[1 - e^{-\frac{t}{T}}\right];\ T = RC$

$= 2 \times 10^6 \times 10^{-6} = 2 \Rightarrow t = 2sec$

$V_c = 10[1 - e^{-1}] = 6.38V.$

67. The parameter Z_{11} of the below circuit is -------



1) 50Ω 2) 15Ω 3) 35Ω 4) 40Ω

Ans : 4

Sol : $Z_{11} = \left.\frac{V_1}{I_1}\right|_{I_2=0}$;

$V_1 = 10I_1 + 15 \times 2I_1 = 40I_1;$

$Z_1 = \frac{V_1}{I_1} = 40\Omega$

68. The network function

$f(s) = \frac{(s+2)}{(s+1)(s+3)}$ represents

1) RC impedance

2) RL impedance

3) RC impedance and RL impedance

4) RC admittance and RL impedance

Ans : 3

69. For a series RLC circuit, the power factor at the lower half power frequency is
1) 0.5 lagging 2) 0.5 leading
3) unity 4) 0.707 leading

Ans : 4
Sol : Net reactance = R
$Z = R \pm jR;\ \theta = \tan^{-1}[1] = 45°$
$\cos\theta = \cos 45° = 0.707\ leading$

70. An electric field is given as $E = 6y^2z\hat{x} + 12xyz\hat{y} + 6xy^2\hat{z}\ V/m$. An incremental path is represented by $\Delta L = -3\hat{x} + 5\hat{y} - 2\hat{z}\mu m$. How much is the work done in moving a 2μC charge along this path if the location of the path is at (0, 2, 5)?
1) 360 pJ 2) 720 pJ
3) 180 pJ 4) 1440 pJ

Ans : 2

71. A point charge of 500 pC is located at the origin of the coordinate system. How much is the potential difference between two point A and B, which are at radial distances of 5m and 15m, respectively, from the charge?
1) 0.9V 2) 0.6V
3) 0.3V 4) 1.2V

Ans : 2

72. The unit of relative permeability is -----
1) a Number 2) $\frac{AT}{m^2}$
3) $\frac{AT}{m}$ 4) $\frac{N}{\omega b}$

Ans : 1

73. A circular loop conductor, having the a radius of 0.1m and a resistance of 5Ω, lies in the z = 0 plane with its center at the origin of the coordinate system. The magnetic flux density in the region is 0.2 sin 1000t $\hat{z}\ Wb/m^2$. How much is the current flowing in the conductor?
1) $0.4\pi \cos 1000t\ A$

2) $0.02\pi \sin 1000t\ A$
3) $-0.4\pi \cos 1000t\ A$
4) $-0.02\pi \sin 1000t\ A$

Ans : 3

74. The magnetic field strength in a region is given as $H = y \cos ax\, \hat{x} + (y + e^{x})\hat{z}$
What is the value of $\nabla \times$ H at the origin?
1) $\hat{x} + \hat{y} + \hat{z}$ 2) $\hat{x} + \hat{y} - \hat{z}$
3) $-\hat{x} - \hat{y} - \hat{z}$ 4) $\hat{x} - \hat{y} - \hat{z}$

Ans : 4

75. A hollow metal sphere of radius 5cm is charged such that the potential on its surface is 10V. The potential at a
distance of 2cm from the centre of the sphere is -------
1) 4V 2) 10V 3) 10/3V 4) zero

Ans : 2

76. The Maxwell equation for time varying field is ------
1) $\nabla \times H = J + \frac{\partial D}{\partial t}$
2) $\nabla . H = J + \frac{\partial D}{\partial t}$
3) $\nabla \times H = J \frac{\partial D}{\partial t}$
4) $\nabla \times H = J - \frac{\partial D}{\partial t}$

Ans : 1

77. How much is the energy of the discrete-time signal x[n] given by:
$x[n] = (-0.5)^{n} u[n]$,
where $u[n]$*is the unit step sequence*
1) $\frac{3}{4}$ 2) $\frac{1}{2}$ 3) $\frac{4}{3}$ 4) 2

Ans : 3

78. The Laplace transform of signal $x(t) = -e^{-2t}u(-t)$ is ----, where u(t) is the unit step signal

1) $\frac{1}{s-2}$ 2) $\frac{1}{s+2}$ 3) $-\frac{1}{s+2}$ 4) $-\frac{1}{s-2}$

Ans : 2

79. The amplitude spectrum $|X(j\omega)|$ of a real signal x(t) is ------
1) an even function
2) an odd function
3) an even and odd function both
4) neither even nor odd function

Ans : 1

80. Which of the following discrete time system is not causal
1) $y[n] = x[-n]$
2) $y[n] = \sum_{k=-\infty}^{n} x[k]$
3) $y[n] = x[n-1]$
4) $y[n] = y[n-1] + x[n]$

Ans : 1

SECTION B :GENERAL AWARENESS AND NUMERICAL ABILITY

81. Who wrote the book The Tragedy of Hyderabad?
1) Mir Laiq Ali
2) Mohammad Hyder
3) Narendra Luther 4) John Zubrzyki

Ans : 1
Sol : Tragedy of Hyderabad is a historical book written by the last Prime Minister of Hyderabad Mir Laiq Ali

82. Who was the first Martyr of Telangana Struggle?
1) M.A.Rasheed 2) B.Narsi Reddy
3) K.Venkateshwar Rao
4) Mir Laiq Ali

Ans : 1

83. Which of the following is not a valid IP address
1) 192.10.9.20 2) 192.30.23.189
3) 192.10.23.350 4) 192.10.50.230

Ans : 3

Sol :We cannot allow 350 in fourth octant since max allowed value in any octant is 255 only.

84. Which of the following is not class of IP addresses?
    1) Class A 2) Class C
    3) Class E 4) Class F

Ans : 4

85. Process of inserting an element in an array is called -----
    1) Create 2) Push
    3) Pop 4) Evaluate

Ans : 2

Sol : The Push method add one or more elements to end of an array and returns the new length of array.

86. DNS stands for -----
    1) Domain Name Server
    2) Domain Name System
    3) Dynamic Name System
    4) Domain Network Service

Ans : 2

Sol : DNS stand for Domain Name System

87. Find the missing term in the following series 2,5,10,17,26,37,?,65
    1) 48 2) 49 3) 50 4) 51

Ans : 3

Sol : $2= 1^2+1$; $5= 2^2+1$; $10 = 3^2+1$; $17= 4^2+1$; $26= 5^2+1$; $37= 6^2+1$; $50= 7^2+1$; $65= 8^2+1$

88. Complete the analogous pair. Terrible : Serene :: Roof : ?
    1) Door 2) Floor 3) Walls 4) Pillars

Ans : 2

89. The price of a commodity increases first by 20% and then by 10%. What is the net increase in the price?
    1) 28% 2) 30% 3) 32% 4) 34%

Ans : 3

Sol : $20 + 10 + \frac{20\times10}{100} = 32$

90. Find the average of the first 97 natural numbers?
1) 47 2) 48 3) 49 4) 50

Ans : 3

Sol : First 'n' natural numbers average $= \frac{n(n+1)}{2n} = \frac{n+1}{2} = \frac{97+1}{2} = 49$

91. Who is empowered to transfer a Judge from one High Court to another High Court
1) Chief Justice of India
2) President of India
3) Law Minister of India
4) The Union Cabinet

Ans : 2

Sol : According to article 222, judges of high court are transferred from one court to other by President of India in consultation with the Chief Justice of India.

92. Conventional Rainfall occurs in
1) Equatorial Region
2) Temperate Region
3) Tropical Region
4) Polar Region

Ans : 3

93. Eden Garden stadium in Kolkata is associated with
1) Basket Ball 2) Foot Ball
3) Cricket 4) Hockey

Ans : 3

94. Which in the following is a stringed instrument?
1) Tabla 2) Shehnai
3) Santoor 4) Mridangam

Ans : 3

95. Someone is sitting ---- the shade of a tree today because someone planted it a long time ago
1) Under 2) On
3) Above 4) In

Ans : 4

96. The teacher ---- us some advice on taking tests.
1) Did 2) Gave
3) Made 4) Took

Ans : 2

97. If you were the Prime Minister of India, what ---- you -----
1) Would, do
2) Would, have done
3) Will, do 4) Had, done

Ans : 1

98. Sachin retired from his ----- cricket career in 2013
1) Illustrate 2) Illustrious
3) Illustrations 4) Illusive

Ans : 2
Sol : Illustrious means brilliantly outstanding because of dignity or actions.

99. Who of the following has called Hyderabad as Bagh City?
1) Thevenot 2) Methold
3) Tavernier 4) Manucci

Ans : 3

100. Who was the principal deity of Kakatiyas?
1) Goddess Laxmi
2) Lord Vishnu
3) Swayambhu Shiva
4) Goddess Durga

Ans : 3

Sol : Kakatiyas followed Shaivism. Shaivism reached its zenith under the kakatiya rule.

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