UPPCL AE 2018 EE
01 Jan 2019

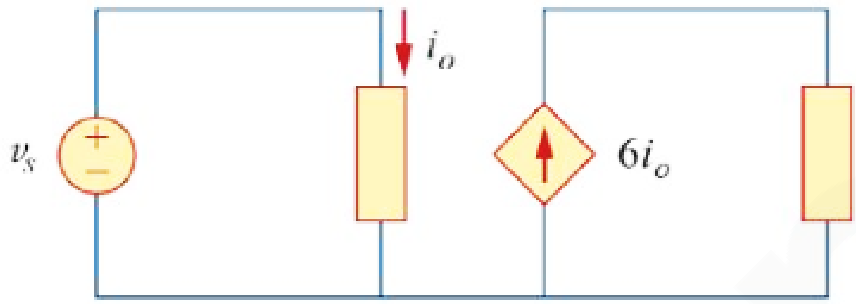
Evening Shift Questions & Solutions

POWERED BY:

gradeup

UPPCL AE EE EVENING SHIFT QUESTIONS AND SOLUTIONS

Q1. In dependent source in the figure is



A. Voltage-controlled voltage source

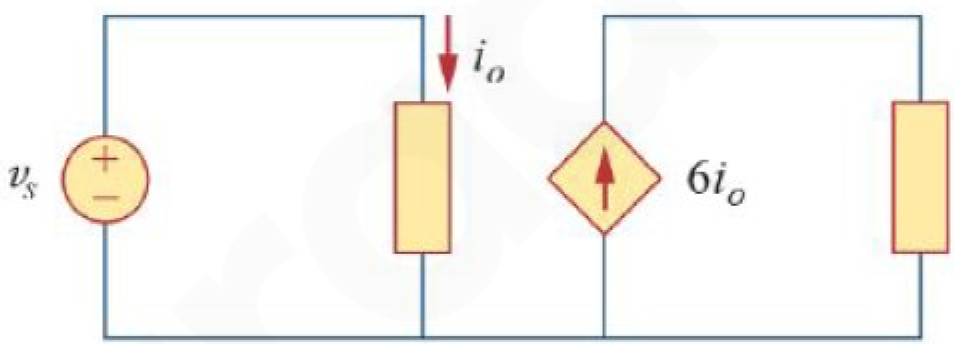
B. Current-controlled voltage source

C. Current-controlled current source

D. Voltage-controlled current source

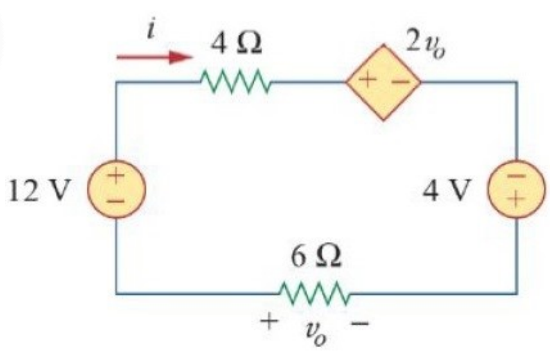
Ans C

Sol –



The dependent source given in the circuit is current controlled current source.

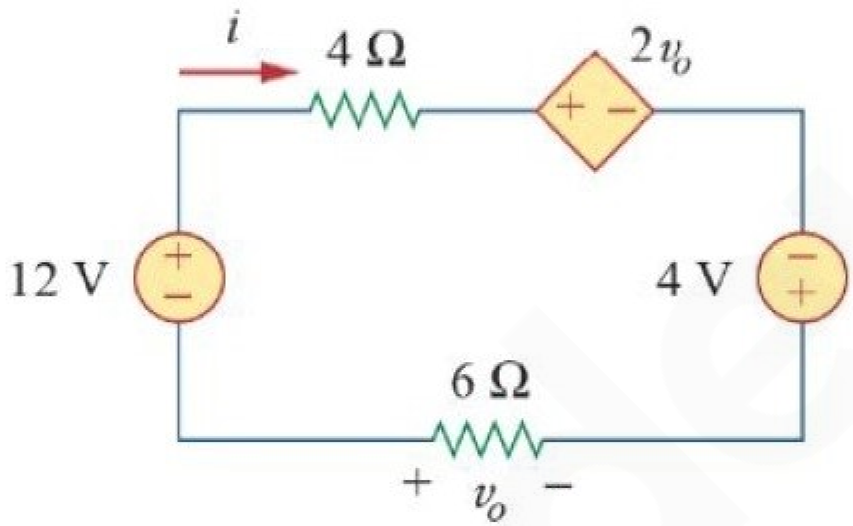
Q2. Find current i in the circuit given below.



A. i = - 8A
B. i = 8A
C. i = 12A
D. i = - 12A

Ans A

Sol –



Applying KVL analysis in the loop

$$12 - 4i - 2v_o + 4 - 6i = 0 \quad ....eq(1)$$

$$v_o = -6i \quad ....eq(2)$$

$$12 - 4i - 2\times(-6i) + 4 - 6i = 0$$
$$16 + 2i = 0$$
$$i = -8A$$

Q3. X_d, X_d', X_d'' are the steady state d-axis reactance, transient d-axis reactance, and sub-transient d-axis reactance of a salient pole alternator respectively. Which of the following statements is correct?

A. $X_d'' > X_d' > X_d$
B. $X_d'' > X_d > X_d'$
C. $X_d' > X_d > X_d''$
D. $X_d > X_d' > X_d''$

Ans D

Sol –

The relation among steady state d-axis reactance, transient d-axis reactance, and sub-transient d-axis reactance of a salient pole alternator is as given

$$X_d > X_d^{'} > X_d^{''}$$

Q4. Two SCRs having forward on-state resistances of 0.05 Ω and 0.04 Ω respectively, are connected in parallel to supply a load. If the load current is 90 A, the current taken by the SCRs, respectively, are

A. 50 A and 40 A

B. 40 A and 50 A

C. 30 A and 60 A

D. 10 A and 80 A

Ans B

Sol –

Two SCR’s having forward resistance are

$$R_1 = 0.05\Omega$$
$$R_2 = 0.04\Omega$$

Which are connected in parallel and a load current of 60 A

The current flowing in SCR 1 and 2 is calculated using current division rule

$$I_1 = 90 \times \frac{0.04}{0.04 + 0.05} = 90 \times \frac{0.04}{0.09} = 40\text{A}$$
$$\text{I}_2 = 90 \times \frac{0.05}{0.05 + 0.04} = 90 \times \frac{0.05}{0.09} = 50\text{A}$$

Q5. In a circuit breaker, the stability of arc in vacuum depends upon

A. Contact material and its vapour pressure, and circuit parameters

B. Contact material and its vapour pressure

C. Circuit parameters only

D. Contact material and circuit parameters

Ans A

Sol –

In a circuit breaker, the stability of arc in vacuum depends upon the contact material and its vapour pressure, and circuit parameters.

Q6. A single phase half controlled converter bridge is feeding a load with constant ripple free current. If the triggering angle is 60°, the displacement power factor of the converter is

A. 0.707

B. 0.866

C. 0.913

D. 0.5

Ans B

Sol –

The displacement power factor of a single phase half controlled converter is

$$DF = \cos\left(\alpha/2\right)$$

$$= \cos\left(60°/2\right) = \cos(30°) = 0.866$$

Q7. An insulating solid sphere of radius R has uniform positive volume charge density and total charge Q. Find the electric potential at a point outside the sphere, at a distance r from the center of the sphere. Coulomb constant is given by, $k_e = \frac{1}{4\pi\varepsilon_0}$.

A. $-\frac{k_e Q}{r}$

B. $-\frac{k_e Q^2}{r}$

C. 0

D. $\frac{k_e Q}{r}$

Ans D

Sol –

According to the equation

$$V = -\int E \cdot dl$$

The electric field E at a point 'r' distance from the center of an insulating solid sphere of radius R and charge Q is given by

$$E = \frac{K_e Q}{r^2}$$

Now, the electric potential at that point is calculate by the above formula:

$$V = -\int_{\infty}^{r} \frac{K_e Q}{r^2} dr$$

$$V = -K_e Q \int_{\infty}^{r} \frac{1}{r^2} dr$$

$$V = -K_e Q \left[-\frac{1}{r} \right]_{\infty}^{r} = \frac{K_e Q}{r} \text{Volts}$$

Q8. A DC generator is connected to a load through a double circuit transmission line. If the generator is transferring maximum power, say P_m, to the load, the total loss of the system is

A. $P_m/4$

B. P_m

C. Insufficient data

D. $P_m/2$

Ans D

Sol –

When a DC generator is connected to a load through a double transmission line, and the generator is transferring maximum power of P_m to the load, then the total losses in the line will be $\frac{P_m}{2}$.

Q9. It is desirable to eliminate 5th harmonic voltage from the phase voltage of an alternator. The coils should be short-pitched by an electrical angle of

A. 18°

B. 36°

C. 72°

D. 30°

Ans B

Sol –

Pitch factor of an alternator is given by the formula:

$$K_c = \cos\left(\frac{n\alpha}{2}\right)$$

Where n is the nth harmonic

And α is the chording angle

And to eliminate 5th harmonic component of voltage, it is desired to make the value of K_c = 0 for 5th harmonic.

$$K_c = \cos\left(\frac{n\alpha}{2}\right) = \cos\left(\frac{5\alpha}{2}\right) = 0$$

$$\frac{5\alpha}{2} = \frac{\pi}{2}$$

$$\alpha = 36°$$

Q10. A charge q_1 = 2 μC is located at the origin in a Cartesian coordinate system, and a charge q2 = 6 μC is located at (0, 3) m. Find the total electric potential due to these charges at the point P, whose coordinates are (4, 0) m. Coulomb constant is given by, $k_e = \frac{1}{4\pi\varepsilon_0}$ = 8.99 × 10^9 N.m^2/C^2 ; ϵ_0 is the permittivity of free space.

A. -6.29 × 10^3 V

B. 5.32 × 10^3 V

C. -5.32 × 10^3 V

D. 6.29 × 10^3 V

Ans A

Sol –

The electric potential due to these charges is given as

$$V = \frac{Q}{4\pi \in_o r}$$

$$V = \frac{1}{4\pi \in_o}\left[\frac{Q_1}{r_1} + \frac{Q_2}{r_2}\right]$$

$$V = \frac{1}{4\pi \in_o}\left[\frac{2\mu C}{4} + \frac{(-6\mu C)}{5}\right]$$

$$V = 8.99 \times 10^9 \times 10^{-6}\left[\frac{2}{4} - \frac{6}{5}\right]$$

$$V = -6.293 \times 10^3 \text{ V}$$

Q11. Find the correct statement related to the HVDC transmission.

A. HVDC can be used to interconnect two AC systems of different frequencies.

B. HVDC eliminates the reactive power requirement in the operation.

C. HVDC is always economical when compared with the AC transmission of same voltage level.

D. HVDC minimizes harmonics at the converter stations.

Ans A

Sol –

HVDC can be used to interconnect two AC systems of different frequencies.

Q12. For the causal system, $G(s) = \frac{4}{s^2 + 5s + 4}$, the percentage overshoot in the output for a unit-step input is

A. 10%

B. No overshoot

C. 16.3%

D. 5%

Ans B

Sol –

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

Comparing with the standard equation, we get

$$\omega_n = 2rad / s$$
$$\xi = 1.25$$

As ξ is greater than 1 therefore there is no overshoot.

Q13. A list of relays and the power system components protected by the relays are given in the group I and group II, respectively. Choose the correct matches from the choices given below:

Group I

P –Distance Relay

Q-Under Frequency Relay

R-Differential Relay

S – Buchholz Relay

Group II

1. Transformer
2. Turbines
3. Bus bars
4. Shunt capacitors
5. Alternators
6. Transmission Lines

A. P-4, Q-3, R-2, S-1

B. P-6, Q-4, R-5, S-3

C. P-5, Q-2, R-1, S-6

D. P-6, Q-5, R-3, S-1

Ans D

Sol –

Distance relay is used in transmission lines.

Frequency relay is used in alternators.

Differential relay is used in bus-bars.

Buchholz relay is used in transformers.

Q14. Two in-phase 50 Hz sinusoidal waveforms of unit amplitude are fed into channel 1 and 2, respectively, of an oscilloscope. Assuming that the voltage scale, time scale, and other settings are exactly the same for both the channels, what would be observed if the oscilloscope is operated in X-Y mode?

A. A parabola

B. A straight line inclined at 45° with respect to the X-axis

C. An ellipse

D. A circle of unit radius

Ans B

Sol –

The frequency of the x-axis is 50 Hz

And the frequency of the y-axis is 50 Hz

As, frequency of both the axis are same.

Therefore on the CRO screen straight line having a slope of 1 making an angle 45° with the positive x-axis.

Q15. A parallel-plate capacitor has plates of dimensions 2 cm by 3 cm, separated by a 1 mm thickness of paper with relative permittivity 3.7. Permittivity of free space, $\epsilon_0 = 8.85 \times 10^{-12} \frac{C^2}{Nm^2}$. Find the capacitance.

A. 20 pF

B. 20 µF

C. 10 nF

D. 10 µF

Ans A

Sol –

Area of the plate of the capacitor is $A = 3cm \times 2cm = 6cm^2 = 6 \times 10^{-4} m^2$

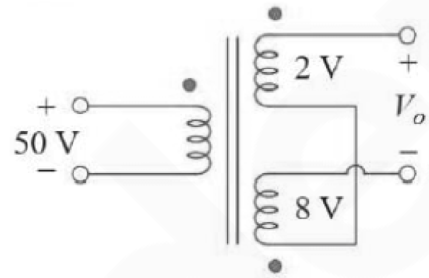
The thickness of the plate is $d = 1mm = 10^{-3} m$

The relative permittivity is $\in_r = 3.7$

Therefore the capacitance is

$$C = \frac{\in A}{d}$$
$$C = \frac{\in_o \in_r A}{d}$$
$$C = \frac{8.85\times10^{-12}\times3.7\times6\times10^{-4}}{10^{-3}}$$
$$C = 19.64\text{pF} \approx 20\text{pF}$$

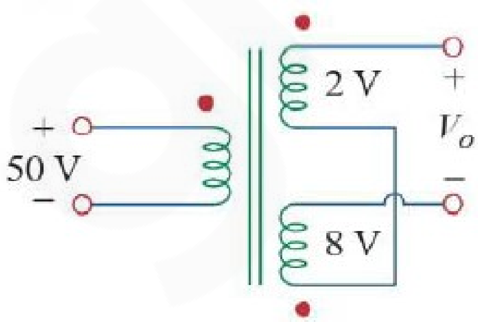
Q16. A three-winding transformer is connected to a 50 V rms AC voltage source as shown in figure. Voltage induced in the secondary windings are 2 V rms and 8 V rms. The rms output voltage V_0 is,



A. 6 V
B. -10 V
C. 10 V
D. -6 V

Ans C

Sol –



Let the current entering to the winding at dot side be positive terminal

Therefore, applying KVL loop

$$V_o - 2 - 8 = 0$$
$$V_o = 10\text{V}$$

Q17. Which of the following represents a causal, linear and time-invariant system?

A. y[n] = nx[n]

B. y[n] = x[n] + x[2n]

C. y[n] = x[n] + x^2[n]

D. y[n] = x[n] + x[n – 1]

Ans D

Sol –

Among all the options only D option is linear, causal and time-invariant because

For causality the system has zero value for t less than 0 and does not depends on future values.

For linearity, the system follows superposition principle and homogeneity principle.

And the system is time invariant as any shift in time domain does not changes the shape of the system.

Q18. In a single stage RC coupled BJT CE amplifier circuit, the emitter bypass capacitor C_E is removed. The AC small mid-band voltage gain of the amplifier will

A. increase

B. decrease

C. be infinity

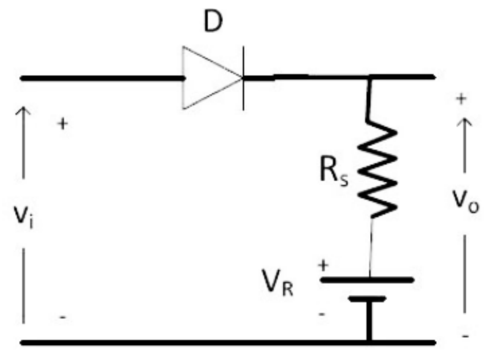
D. be unaffected

Ans B

Sol –

In a single stage RC coupled BJT CE amplifier, if the emitter bypass capacitor is removed then the AC small signal mid-band voltage gain of the amplifier will decrease.

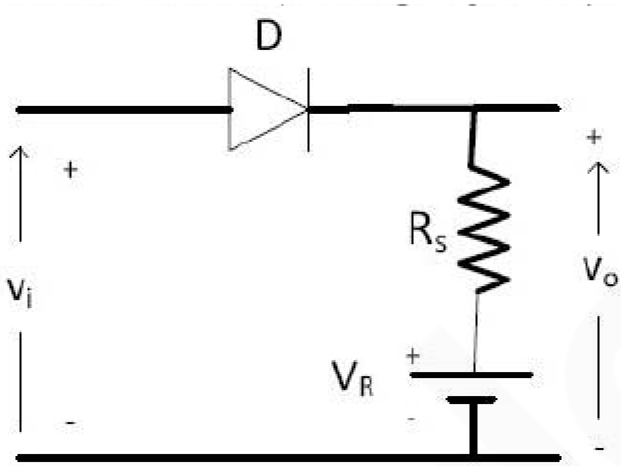
Q19. In the diode circuit shown V_i = 10 sin 314.159 t V, V_R = 5 V. Assume diode 'D' to be ideal. The maximum and minimum values of the output voltage, V0, are respectively



A. +5 V and -5 V
B. +10 V and – 10 V
C. +5 V and 0 V
D. + 10 V and +5 V

Ans D

Sol –



For the positive half cycle, the diode is forward biased when the input voltage is greater than V_R

And therefore, the output voltage becomes the input voltage and the maximum voltage is 10 V.

Now, for the negative half cycle, the diode will be reverse biased and therefore the output voltage will always be 5 V.

Q20. Consider a real-valued function f(t) such that f(t + 2π) = f(t) for all t ≥ 0. Such a f(t) can be represented as

$$f(t) = \frac{a_0}{2}\sum_{n=1}^{\infty}\left[a_n \cos(nt) + b_n \sin(nt)\right]$$

If f (t) = cos (3t) + sin (4t), then the coefficient a_4 in the summation series, as indicated above, is
A. 9
B. 12
C. 1
D. 0

Ans D

Sol –

Consider a real valued function $f(t)$ such that $f(t+2\pi) = f(t)$ for all $t \geq 0$

If $f(t) = \cos(3t) + \sin(4t)$

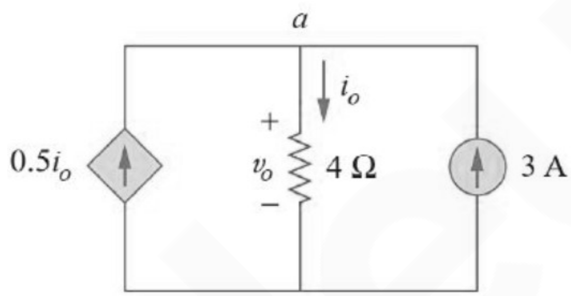
Then the value of a_4 is

$$a_4 = \frac{2}{2\pi}\int_{-\pi}^{+\pi}\left[\cos(3t) + \sin(4t)\right]\cdot\cos(4t)\,dt$$

Evaluating the integral using the trigonometric formulas, we get

$$a_4 = 0$$

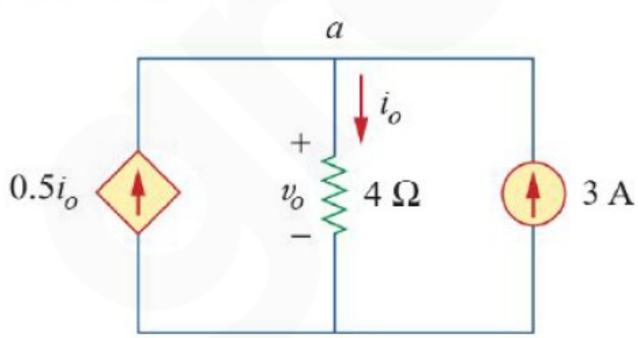
Q21. Find current i_0 in the circuit.



A. 6 A
B. 9 A
C. -6 A
D. -9 A

Ans A

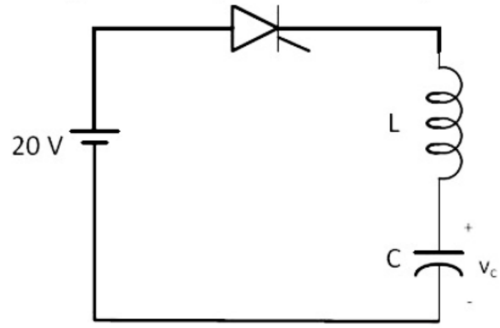
Sol –



Appling KCL at point ‘a’

$$i_o = 0.5i_o + 3$$
$$0.5i_o = 3$$
$$i_o = 6\text{A}$$

Q22.The thyristor in the figure is turned on at t = 0. The inductor and capacitor are initially uncharged. The steady state value of the capacitor voltage v_c, is



A. 40 V

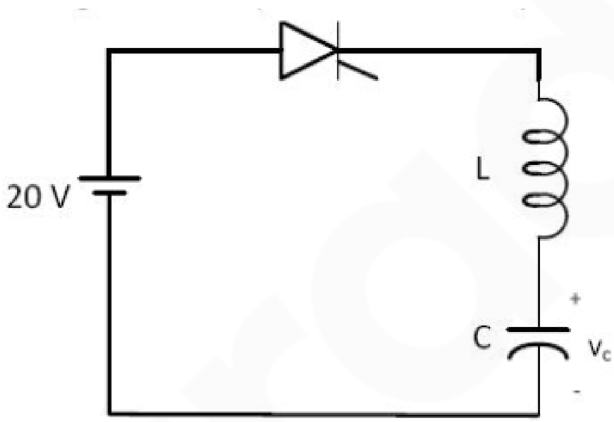
B. 10 V

C. 20 V

D. 30 V

Ans A

Sol –



In LC circuit, the voltage across the capacitor at steady state is twice the input voltage

Therefore, $V_C = 40\text{V}$

Q23. Consider the following Laplace transforms of certain signals. For which of the following, final value theorem is not applicable?

A. $\frac{s-2}{(s+1)(s+3)}$

B. $\frac{s}{s+1}$

C. $\frac{s+1}{(s+1)(s+3)}$

D. $\frac{s}{(s-1)(s+2)}$

Ans D

Sol –

The final value theorem of the Laplace transform is applicable to stable systems.

Q24. An overhead line having a surge impedance of 400 Ω is connected in series with an underground cable having a surge impedance of 100 Ω. If the surge of 50 kV travels from the line end towards the line-cable junction, the value of the transmitted voltage wave at the junction is

A. 20 kV

B. 50 kV

C. 30 kV

D. 80 kV

Ans A

Sol –

The value of the transmitted voltage wave at the junction is

$$V_r = V_{in} \times \left(\frac{2Z_O}{Z_S + Z_O}\right)$$

$$V_r = 50 \times \left(\frac{2\times 100}{400+100}\right) = 50\times\frac{200}{500} = 20\text{KV}$$

Q25. A current I (t) = 6 sin (2πft) A with f = 50 Hz passes through a coil with an inductance of 2 mH. The net change in energy stored in the coil over a time interval of 20 ms is

A. 0.036 J

B. 0.072 J

C. 0 J

D. 0.018 J

Ans C

Sol –

The current of $i(t) = 6\sin(2\pi ft)\,\text{A}$ having frequency of 50 Hz

$$L = 2mH$$

The energy stored in the inductor over a time interval of 20 millisecond is

$$E = \frac{1}{2} L i^2$$

The current at time 20 millisecond is

$$i = 6\sin\left(2\pi \times 50 \times 20 \times 10^{-3}\right)$$
$$i = 6\sin\left(2\pi\right) = 0\text{A}$$
$$E = 0$$

Q26. A current impulse, 5 δ (t) units, is forced through an ideal capacitor C. The voltage, V_c (t), across the capacitor is given by

A. 5t

B. 5 u (t) – C

C. $\frac{5u(t)}{C}$

D. $\frac{5t}{C}$

Ans C

Sol –

The current through an ideal capacitor C is $5\delta(t)$

The voltage across the capacitor

$$V_c(t) = \frac{1}{C}\int i dt$$
$$V_c(t) = \frac{5}{C}\int \delta(t) dt$$
$$V_c(t) = \frac{5u(t)}{C}\text{V}$$

Q27. The maximum phase attained for the frequency response of a causal system, $G(s) = \frac{s+1}{(2s+1)(s+3)}$ as the frequency varies from 0 to ∞ rad/s is

A. 90 degrees

B. -180 degrees

C. -90 degrees

D. 0 degrees

Ans C

Sol –

The minimum phase system is

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

$$G(s)=\frac{1}{2}\frac{(s+1)}{(s+0.5)(s+3)}$$

$$\angle G(j\omega)=\tan^{-1}\left(\frac{\omega}{1}\right)-\tan^{-1}\left(\frac{\omega}{0.5}\right)-\tan^{-1}\left(\frac{\omega}{3}\right)$$

At $\omega=0\Rightarrow G(j\omega)=0$

At $\omega=\infty\Rightarrow G(j\omega)=-90°$

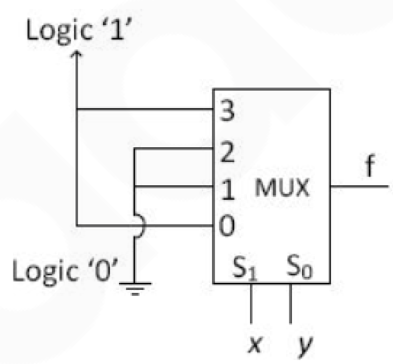
Q28. The output f of the 4-to-1 MUX is shown in the figure. The function, f, is given as Logic '1'

A. $\overline{x}\overline{y}+xy$

B. $\overline{x}y+x\overline{y}$

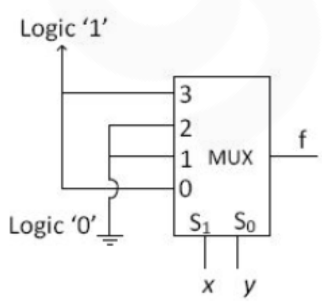
C. x + y

D. $\overline{x}+\overline{y}$



Ans A

Sol –



x	y	F
0	0	1
0	1	0
1	0	0
1	1	1

From the above truth table function f is simplified as

$$f = \overline{xy} + xy$$

Q29. Consider a polynomial, $s^3 - 2s^2 + s + 1$. The number of roots of the polynomial on the open left half of complex x-plane is

A. Less than or equal to 3.

B. Strictly less than 3.

C. Equal to 3.

D. Strictly greater than 3.

Ans B

Sol –

The characteristic equation is given as $s^3 - 2s^2 + s + 1$

As, there is a sign change in the given polynomial means that the some open loop poles lie in the right side of the s-plane.

Therefore, the left side poles are less than 3.

Q30. A DC A-h meter is rated for 15 A, 250 V. The meter constant is 14.4 A-s/rev. The meter constant at rated voltage can be expressed as

A. 3600 rev/kWh

B. 1000 rev/kWh

C. 3750 rev/kWh

D. 960 rev/kWh

Ans B

Sol –

Given that meter constant = 14.4 A-s/rev

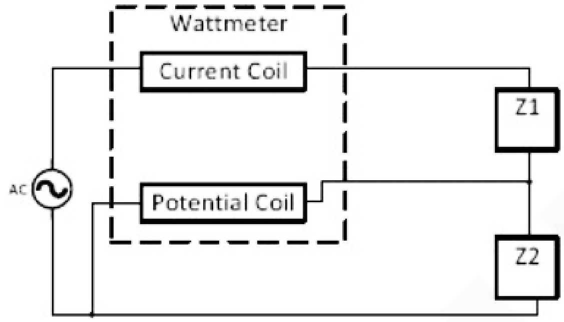
V = 250 volts

Power = 250 x 14.4 VA-s/rev

= 3600 watt-sec/rev

$$= \frac{3600}{1000 \times 3600} \text{KWhr/rev}$$
$$= 10^{-3} \text{KWhr/rev}$$
$$= 1000 \text{rev/KWhr}$$

Q31. A wattmeter is connected as shown in the figure. The wattmeter reads



A. Power consumed by Z_2

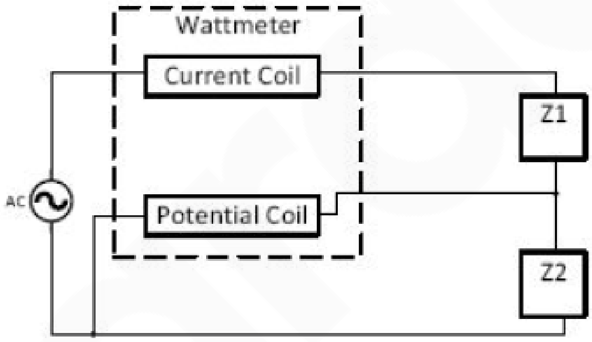
B. Power consumed by Z_1

C. Total power consumed by Z_1 and Z_2

D. Always zero

Ans A

Sol –



The wattmeter reads the power consumed by the load Z_2 because the potential coil is placed in parallel to the load and current coil will have the current through it.

Q32. A buck-boost converter with continuous inductor current is operated with a duty cycle of 0.4. If the input voltage is 50 V (DC), the output voltage is

A. 33.33 V

B. 16.66 V

C. 93.33 V

D. 66.66 V

Ans A

Sol –

The output voltage of the buck-boost converter is given as

$$V_o = \frac{\delta V_s}{(1-\delta)}$$

$$V_o = \frac{0.4\times 50}{(1-0.4)} = \frac{20}{0.6} = 33.33\text{V}$$

Q33. For harnessing low variable water heads, the suitable hydro turbine with high percentage of reaction and runner adjustment vanes is

A. Pelton

B. Kaplan

C. Impeller

D. Francis

Ans B

Sol –

For harnessing low voltage water heads, Kalpan turbine is used for high percentage of reaction and runner adjustment vanes.

Q34. An 8 : 1 multiplexer has how many select inputs?

A. 2

B. 1

C. 3

D. 8

Ans C

Sol –

In a 8:1 multiplexer the number of input select lines is 3.

From $2^n : 1$ where n means the no of select lines.

Q35. For an induction motor operating at a slip s, the ratio of the gross mechanical power output to air-gap power is equal to

A. s

B. 1-s

C. 1-s^2

D. 1-√s

Ans B

Sol –

Air gap power is P_g

The total gross power developed is $P_m = P_g - P_{cu}$

Where P_{cu} is the copper losses

The rotor copper losses is equal to the $P_{cu} = sP_g$

Therefore, the ratio of gross mechanical power developed to the air-gap power is

$$\frac{P_m}{P_g} = \frac{(1-s)P_g}{P_g} = (1-s)$$

Q36. R_1 and R_4 are the opposite arms of a Wheatstone bridge as are R_2 and R_3. The source voltage is applied across R_1 and R_3. Under balanced conditions which one of the following is true?

A. $R_1 = R_2 + R_3 + R_4$

B. $R_1 = R_3R_4/R_2$

C. $R_1 = R_2R_4/R_3$

D. $R_1 = R_2R_3/R_4$

Ans D

Sol –

Under the balanced conditions of the wheat stone bridge

$$R_1R_4 = R_2R_3$$
$$R_1 = \frac{R_2R_3}{R_4}$$

Q37. The minimized from of the function, F which is shown in the figure, is

F

X \ YZ	00	01	11	10
0	0	1	0	0
1	1	1	1	0

A. XY + YZ + ZX

B. $\overline{Y}Z + X\overline{Y} + XZ$

C. $\overline{Y}Z + XZ$

D. X + ZY

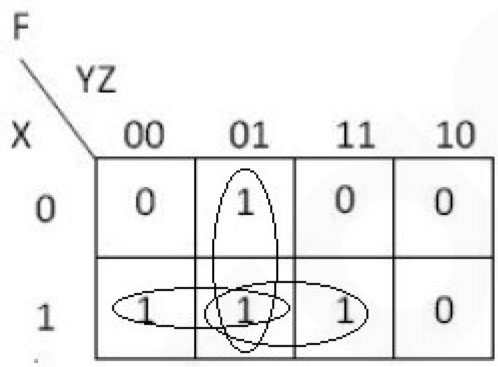
Ans B

Sol –

F

X \ YZ	00	01	11	10
0	0	1	0	0
1	1	1	1	0

After pairing or making quads, the table reduced to



Now, simplifying the function F

$$F = \overline{Y}Z + X\overline{Y} + XZ$$

Q38. The insulation strength of an EHV transmission line is designed mainly with the following consideration

A. Harmonics

B. Load power factor

C. Corona

D. Switching over voltage

Ans D

Sol –

The insulation strength of an EHV transmission line is designed mainly with consideration of switching over voltage.

Q39. A signal Kcos(ωt) is given as an input to a real causal linear time-invariant system. The steady state output of the system for this input is obtained as Lcos(ηt + φ) with L, K, ω, η, φ as

A. L is equal to K, and η need not be equal to ω.

B. L is equal to K, and η is equal to ω.

C. L need not be equal to K, and η need not be equal to ω.

D.L need not be equal to K, and η is equal to ω.

Ans D

Sol –

An input signal of $K\cos(\omega t)$ is applied to a given causal linear time-invariant system.

Then, the output signal is $L\cos(\eta t+\phi)$

Now, the L need not be equal to K and η is need not be equal to ω, this totally depends on the transfer function of the system.

Q40. Which of the following is a linear system?

A. y = 2x

B. $y = x^3 + x$

C. $y = x^2$

D. y = x + 1

Ans A

Sol –

Y = 2x is linear equation among all the options.

Q41. For a non-ideal single-phase transformer, which of the following is true?

A. The power factor observed on the primary side leads and on the secondary side lags for any load connected to the transformer's secondary side.

B. The power factor observed on the primary side and secondary side of the transformer are always same.

C. The power factor observed on the primary side lags and on the secondary side lags for any load connected to the transformer's secondary side.

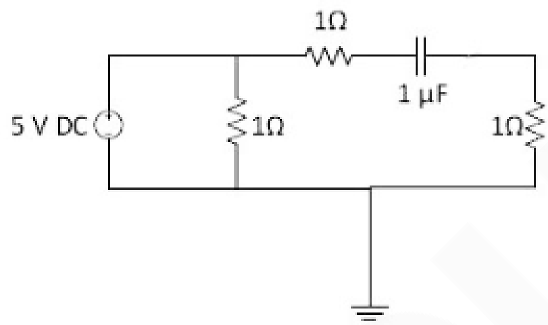
D. The power factor observed on the primary side and secondary side of the transformer depends on the load connected to the transformer.

Ans D

Sol –

For a non-ideal single phase transformer the power factor observed on the primary side and the secondary side of the transformer depends on the load connected to the transformer.

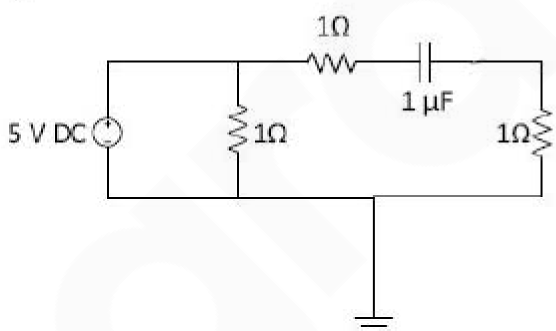
Q42. In the given circuit, with the shown ideal 5 V DC source, the magnitude of the total current drawn from the source of steady-state is



A. 7.5 A
B. 10 A
C. 2.5 A
D. 5 A

Ans D

Sol –



At steady state, the capacitor will behave as open-circuited.

Therefore, magnitude of current drawn from the source at steady state will be

$$I = \frac{5}{1} = 5\text{A}$$

Q43. A half controlled single phase bridge converter is supplying an R-L load. The triggering angle is α. If the load current is continuous, the duration for which the freewheeling of the load tasks place in a half cycle of the input voltage is

A. 2π - α

B. π - α

C. π - 2α

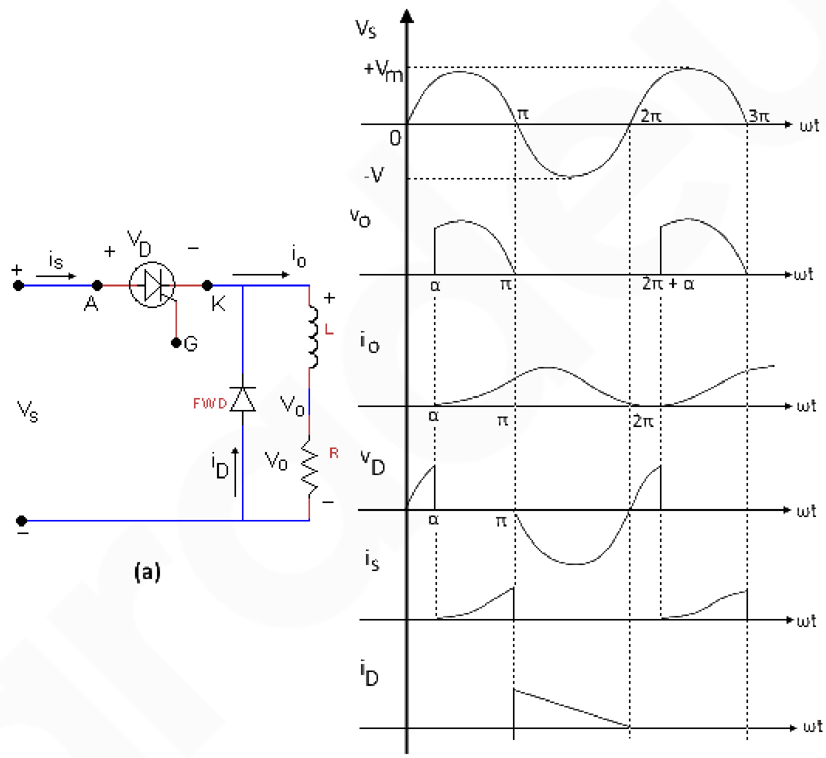
D. α

Ans D

Sol –

In a single phase half controlled bridge converter with R-L load, the duration of diode conduction takes place in half cycle is α

Where, α is the firing angle of the thyristor.



Q44. Which of the following is not true for damper windings in a grid-connected three-phase synchronous machine?

A. Damper windings help in starting of synchronous generator.

B. Damper windings help in damping out oscillations in a synchronous motor.

C. Damper windings help in starting of synchronous motor.

D. Damper windings help in damping out oscillations in a synchronous generator.

Ans A

Sol –

Damper windings does not used in starting of synchronous generators.

Q45. The average output voltage of a single phase full controlled bridge converter is measured to be 103.5 V. The load current is assumed to be continuous. If the bridge is supplied from a 230 V, 50 Hz sinusoidal source, the triggering angle of the thyristors in the bridge is approximately

A. 90°

B. 60°

C. 120°

D. 30°

Ans B

Sol –

In a single phase fully controlled bridge converter,

The average output voltage is 103.5 V

$$V_o = \frac{2V_m}{\pi}\cos\alpha$$

$$V_o = \frac{2\times 230\times\sqrt{2}}{\pi}\cos\alpha$$

$$103.5 = 207.07\cos\alpha$$

$$\cos\alpha = 0.4998 \approx 0.5$$

$$\alpha = 60°$$

Q46. The coil span of winding in an alternator is 150° electrical. The pitch factor of the coil is

A. 0.9659

B. 0.9396

C. 0.9914

D. 0.8660

Ans A

Sol –

The coil span of the winding in an alternator is 150 degrees.

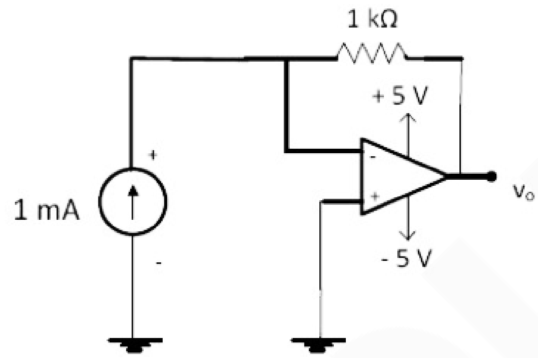
Then, the chording angle will be 180 – 150 = 30 degrees.

Therefore, the pitch factor is

$$K_C = \cos\left(\frac{\alpha}{2}\right)$$

$$K_C = \cos\left(\frac{30°}{2}\right) = \cos(15°) = 0.9659$$

Q47. The circuit shown in the figure uses an ideal op-amp working with +5V and -5V power supplies. The output voltage V_o, is equal to



A. -1 V

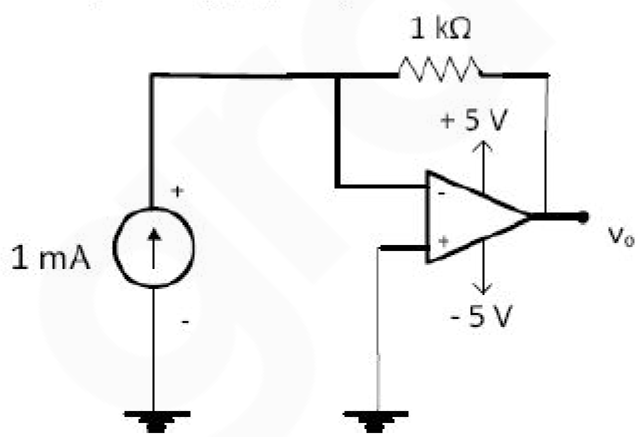
B. +5 V

C. -2 V

D. +1 V

Ans A

Sol –



Applying nodal analysis at V^-

$$1\text{mA} = \frac{0 - V_o}{1\text{K}\Omega}$$

$$V_o = -1\text{V}$$

Q48. A unity feedback system has the forward path transfer function G(s). The steady state error is zero if

A. G(s) is Type-1 and input is unit-ramp.

B. G(s) is Type-0 and input is unit-step.

C. G(s) is Type-1 and input is unit-step.

D. G(s) is Type-0 and input is unit-ramp.

Ans C

Sol –

The steady state error will be zero for type 1 system with unit step input i.e.

$$K_p = \lim_{s\to 0} G(s)H(s) = \infty$$

$$e_{ss} = \frac{1}{1+K_p} = 0$$

Q49. An ideal air-core coil has an inductance of 1 mH. The number of turns of the coil is halved and its length is doubled. Assuming that the inner cross-sectional area of the core remains constant, the new inductance of this altered air-core coil is

A. 8 mH

B. 2 mH

C. 0.5 mH

D. 0.125 mH

Ans D

Sol –

The inductance of the coil is given as $L = \frac{\mu_o n^2 A}{l}$

$$L_1 = 1\text{mH}$$

Now, the number of turns is halved, and the length of the coil is doubled.

Assuming the area of cross-section to be constant.

$$L_2 = \frac{L_1}{8} = 0.125\text{mH}$$

Q50. A DC shunt motor is running at 1000 rpm when supplied from a 240 V DC. Neglecting losses and magnetic saturation, the speed of the motor when connected to 180 V DC source will be

A. 1000 rpm

B. 750 rpm

C. 1350 rpm

D. 1200 rpm

Ans A

Sol –

The speed of the DC motor will remains the same because the speed is independent of the terminal voltage applied at the motor terminals.

Therefore, $N = 1000\text{rpm}$

Q1. A solid sphere made of insulating material has a radius R and has a total charge Q distributed uniformly in its volume. What is the magnitude of the electric field intensity, E, at a distance r (0<r<R) from the center of the sphere?

A. $\frac{1}{4\pi\varepsilon_0} \times \frac{Qr}{R^3}$

B. $\frac{3}{4\pi\varepsilon_0} \times \frac{Qr}{R^3}$

C. $\frac{1}{4\pi\varepsilon_0} \times \frac{Q}{r^3}$

D. $\frac{1}{4\pi\varepsilon_0} \times \frac{QR}{r^3}$

Ans A

Sol –

The total charge from the center of the sphere to the distance r (0<r<R)

$$Q \rightarrow \frac{4}{3}\pi R^3$$

$$Q' \rightarrow \frac{4}{3}\pi r^3$$

$$Q' = \frac{Qr^3}{R^3}$$

The electric field at point distance r from the center is given as

$$E = \frac{1}{4\pi \in_o} \frac{Q'}{r^2}$$

$$E = \frac{1}{4\pi \in_o} \frac{Qr^3}{R^3} \frac{1}{r^2}$$

$$E = \frac{1}{4\pi \in_o} \frac{Qr}{R^3}$$

Q2. Consider an ideal DC shunt generator. Under no-load condition, the net steady-state torque experienced by the rotor at rotational speed of N rpm is τ_N Nm. Under no-load conditions, this rotor experiences net steady-state torque of τ_{2N} Nm for a rotational speed of 2N rpm. Which of the following is true?

A. $\tau_N = \tau_{2N} = 0$

B. $\tau_{2N} = \frac{\tau_N}{2}, \tau_N \neq 0$

C. $\tau_{2N} = 2\tau_N, \tau_N \neq 0$

D. $\tau_{2N} = \tau_N \neq 0$

Ans A

Sol –

In an ideal DC generator, under no-load condition the net steady state torque at rotational speed N is τ_N. And also at no-load at rotational speed 2N torque is τ_{2N}.

But, the torque at no-load in case of DC generator is always Zero means

$$\tau_N = \tau_{2N} = 0$$

Q3. Which of the following transfer function does not have negative real part for s = jω for all ω ∈ [0, ∞)?

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

B. $\frac{s+1}{(s+2)(s+3)}$

C. $\frac{1}{s^2}$

D. $\frac{1}{(s+2)(s+3)}$

Ans B

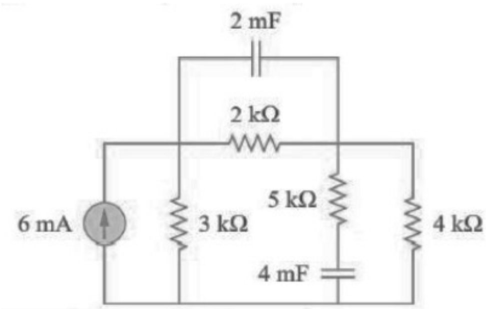
Sol –

Putting $s = j\omega$ in all the transfer function and separating the real and imaginary parts.

And check for different values of ω for which real part of $G(j\omega)$ is positive.

Therefore, option B will be correct.

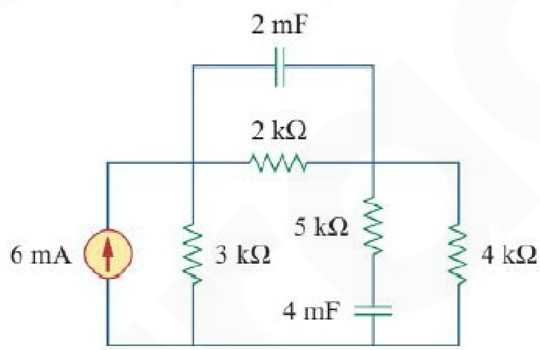
Q4. Find the energy stored in the capacitors in the given circuit below under steady state condition.



A. 10 mJ, 120 mJ
B. 0 J, 0 J
C. 4 mJ, 64 mJ
D. 16 mJ, 128 mJ

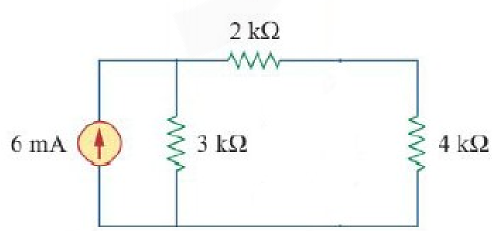
Ans D

Sol –



Under steady state conditions, the capacitor is replaced by open circuited.

Therefore the network reduces to



Now, applying current division rule,

Current in 3 Kohms resistor is

$$I_1 = 6\text{mA} \times \frac{6\text{K}\Omega}{9\text{K}\Omega} = 4\text{mA}$$

Current in 2 Kohm resistor and 4 Kohm resistor is

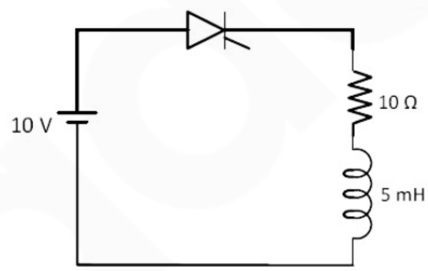
$$I_2 = 6\text{mA} \times \frac{3\text{K}\Omega}{9\text{K}\Omega} = 2\text{mA}$$

Voltage across the 2 Kohm is 4 volts and the voltage across the 4 Kohm resistor is 8 volts.

Therefore, the energy stored in capacitors will be

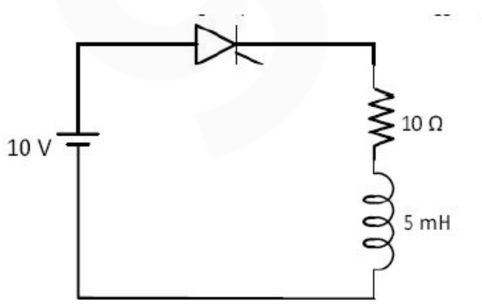
$$E_1 = \frac{1}{2}C_1V_1^2 = \frac{1}{2} \times 2mF \times (4)^2 = 16mJ$$
$$E_2 = \frac{1}{2}C_2V_2^2 = \frac{1}{2} \times 4mF \times (8)^2 = 128mJ$$

Q5. A thyristor circuit in the figure. If the latching current of the thyristor is 10 mA, the minimum width of the gate pulse for successful triggering of the thyristor is



A. 1 μs
B. 4 μs
C. 5 μs
D. 3 μs
Ans C

Sol –



The latching current of the thyristor is 10 mA

$$E = IR + L\frac{di}{dt}$$

Solving the above differential equation for current i, we get

$$i = \frac{E}{R}\left(1 - e^{-\frac{R}{L}t}\right)\text{A}$$

$$10\times10^{-3} = \frac{10}{10}\left(1 - e^{-\frac{10}{5\times10^{-3}}t}\right)$$

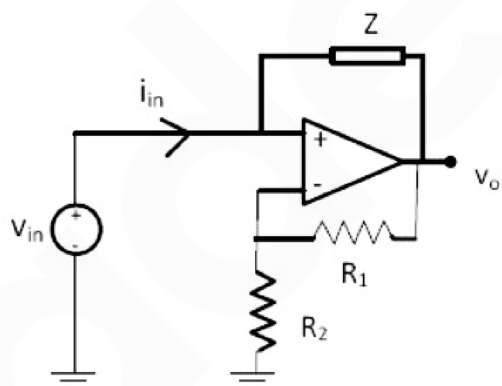
$$e^{-2000t} = 0.99$$

Taking natural log on both sides

$$-2000t = -0.01$$

$$t = 5\mu\text{sec}$$

Q6. The op-amp shown in the figure is ideal. The input impedance V_{in}/i_{in} is given by



A. $-Z\frac{R_1}{R_1+R_2}$

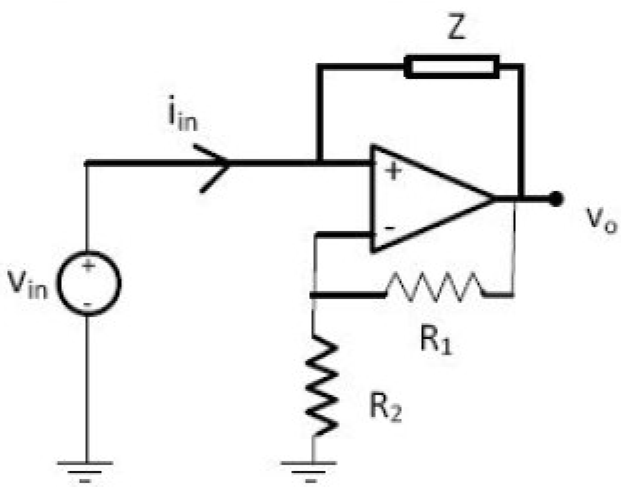
B. $Z\frac{R_2}{R_1}$

C. Z

D. $-Z\frac{R_2}{R_1}$

Ans D

Sol –



Applying nodal analysis at V^-

$$\frac{V^- - 0}{R_2} + \frac{V^- - V_o}{R_1} = 0$$

Applying nodal analysis at V^+

$$I_{in} = \frac{V^+ - V_o}{Z}$$

As the op-amp is ideal therefore, $V^- = V^+ = V_{in}$

$$\frac{V_{in}}{R_2} = \frac{V_o - V_{in}}{R_1} = \frac{V_o}{R_1} - \frac{V_{in}}{R_1}$$

$$\left[\frac{1}{R_1} + \frac{1}{R_2}\right] V_{in} = \frac{V_o}{R_1}$$

$$V_o = \frac{(R_1 + R_2)}{R_2} V_{in}$$

$$ZI_{in} = V_{in} - \frac{(R_1 + R_2)}{R_2} V_{in}$$

$$ZI_{in} = -\frac{R_1}{R_2} V_{in}$$

$$\frac{V_{in}}{I_{in}} = -Z\frac{R_2}{R_1}$$

Q7. A generator delivers power of 1 p.u. to an infinite bus through a purely reactive network. The maximum power that could be delivered by the generator is 2.0 p.u. A three-phase fault occurs at the terminals of the generator which reduces the generator output to zero. The fault is cleared after t_c seconds. The original network is then restored. The maximum swing of the rotor angle (δ) of the generator is found to be δ_{max} = 120 electrical degrees. The value of cos δ at time t = t_c is

A. 0.285

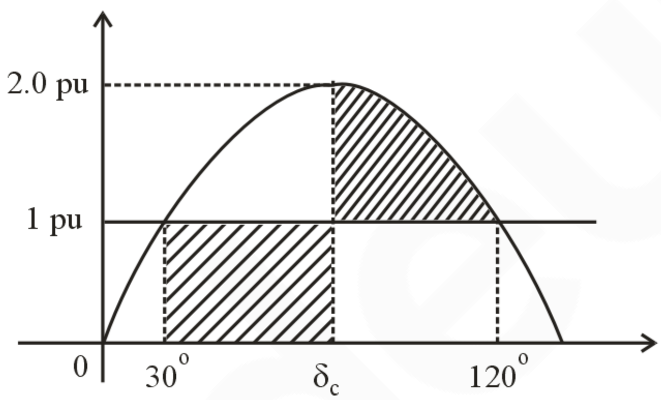
B. 0.471

C. 0.512

D. 0.352

Ans A

Sol –



$$P_a = 1\left[\delta_c - 30° \times \frac{\pi}{180°}\right]$$

$$P_d = 2[\cos\delta_c - \cos 120°] - 1\left[120° \times \frac{\pi}{180°}\right]$$

$$P_a = P_d$$

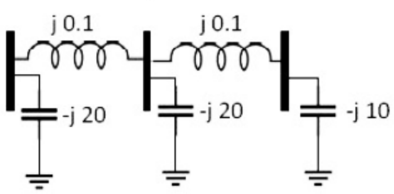
$$\delta_c - \frac{\pi}{6} = 2\cos\delta_c - 2\cos 120° - \frac{2\pi}{3} + \delta_c$$

$$\frac{2\pi}{3} - \frac{\pi}{6} - 2\cos 120° = 2\cos\delta_c$$

$$\delta_c = 73.417°$$

$$\cos\delta_c = 0.2853$$

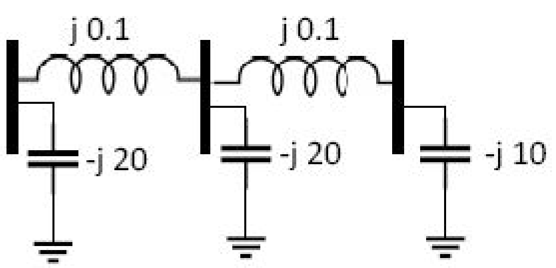
Q8. The network shown in the given figure has impedances in p.u. as indicated. The diagonal elements of Y_{BUS} matrix are



A. -j 19.9, -j 19.8, -j 9.9
B. j 9.95, j 19.95, j 9.9
C. j 19.9, j 19.8, j 9.9
D. -j 9.95, -j 19.95, -j 9.9

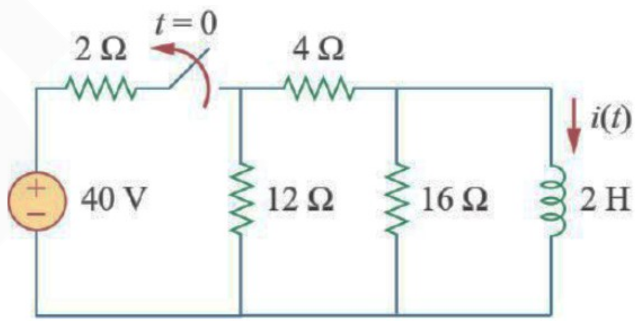
Ans D

Sol –



$$Y_{11} = y_{12} + y_{10}$$
$$Y_{11} = -j10 + j0.05$$
$$Y_{11} = -j9.95$$
$$Y_{22} = y_{21} + y_{23} + y_{20}$$
$$Y_{22} = -j10 - j10 + j0.05$$
$$Y_{22} = -j19.95$$
$$Y_{33} = y_{31} + y_{30}$$
$$Y_{33} = -j10 + j0.1$$
$$Y_{33} = -j9.9$$

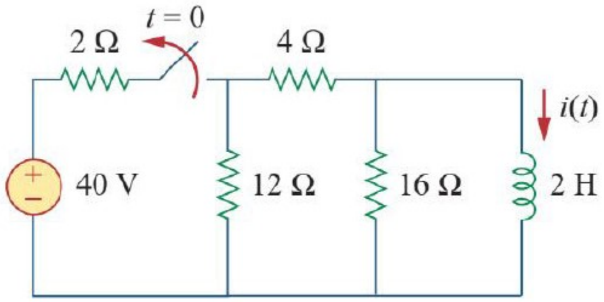
Q9. The switch in the circuit below has been closed for a long time. At time t = 0, the switch is opened. Calculate i(t) for t ≥ 0.



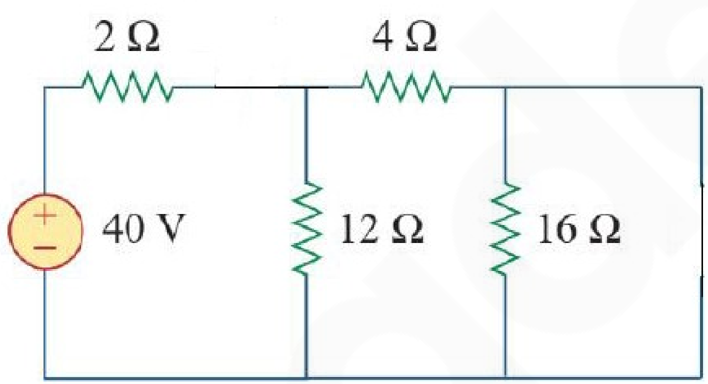
A. $10e^{-4t}$ A
B. $8e^{-5t}$ A
C. $10e^{4t}$ A
D. $6e^{-4t}$ A

Ans D

Sol –



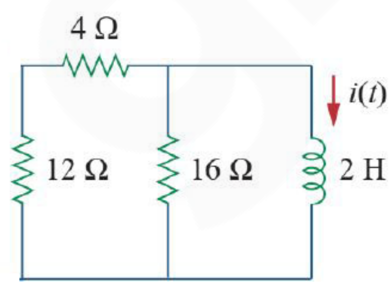
For $t<0$ the inductor will behave as short-circuited and hence the circuit reduces to



The current through the short-circuited path or 4 ohm resistor is

$I=6\text{A}$

For $t\geq 0$ the circuit will reduces to



The circuit is source free therefore the current equation for first order systems will be

$$i(t)=i(0^{+})e^{-\frac{R}{L}t}$$

$R_{eq} = 8\Omega$

$L = 2H$

$\frac{R}{L} = 4$

$i(t) = 6e^{-4t}\text{A}$

Q10. Find the force on a straight conductor of length 0.3 m in $-\hat{k}$ direction, carrying current of 5 A, where the field is, $\vec{B} = 3.5\times10^{-3}(\hat{i}-\hat{j})T$. The unit vectors along x, y, z axes are $\hat{i}$, $\hat{j}$, $\hat{k}$, respectively.

A. $-5.25\times10^{-3}(\hat{i}+\hat{j})$N

B. $5.25\hat{k}$N

C. $-5.25\hat{i}+3.75\hat{j}$N

D. $6.25\times10^{3}(\hat{i}+\hat{j}+\hat{k})$N

Ans A

Sol –

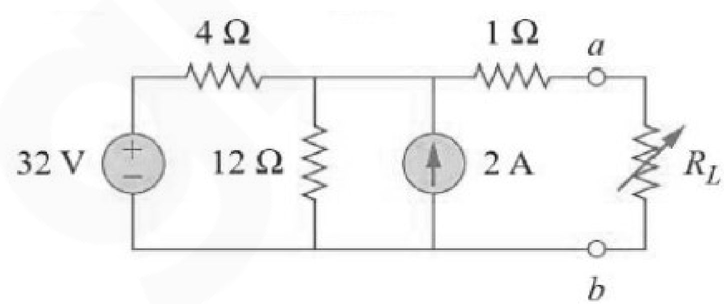
$F = -I\cdot(\vec{B}\times l)$

$F = -5\cdot\left(3.5\times10^{-3}(\hat{i}-\hat{j})\times0.3\times(-\hat{k})\right)$

$F = -5.25\times10^{-3}\left[(\hat{i}-\hat{j})\times(-\hat{k})\right]$

$F = -5.25\times10^{-3}(\hat{i}+\hat{j})\text{N}$

Q11. Find Thevenin equivalent voltage V_{th} and resistance R_{th} of the given circuit below, to the left of the terminals a and b.



A. R_{th} = 12 Ω, V_{th} = 32 V

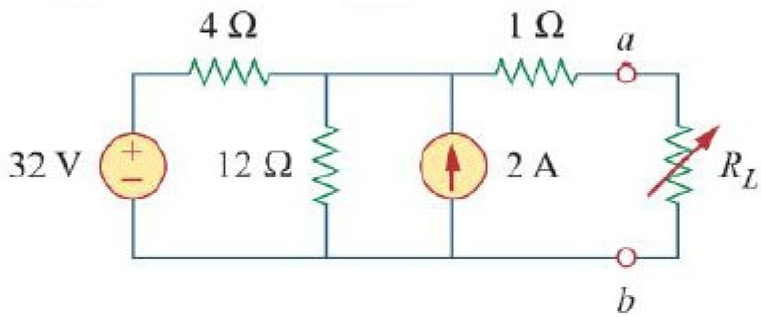
B. R_{th} = 13 Ω, V_{th} = 24 V

C. R_{th} = 4 Ω, V_{th} = 30 V

D. R_{th} = 4 Ω, V_{th} = 32 V

Ans C

Sol –



For calculating thevenin's resistance, all the source are replaced by their internal resistances.

Therefore, voltage source is replaced by short-circuit and current source is replaced by open-circuit.

$$R_{th} = 1 + (4 \| 12) = 4\Omega$$

For calculating the thevenin's voltage

Current source is transformed to voltage source with 12 ohm resistor and a-b terminal is open-circuited means that no current in 1 ohm resistor and then apply KVL in the loop

$$32 - 4I - 12I - 24 = 0$$
$$16I = 8$$
$$I = 0.5$$

$$V_{th} - (12 \times 0.5) - 24 = 0$$
$$V_{th} = 30\text{V}$$

Q12. Consider a causal $G(s) = \frac{1}{s^3}$. Assuming that the units of the input and output are the same, amplitude of the steady-state output for an input r(t) = 10sin(100 t) given to G(s) is

A. 10^{-4}
B. 10^{-5}
C. 10^{-6}
D. 10^{-3}

Ans B

Sol –

The amplitude of the steady-state output will be

$$A_o^{'} = A_o \left|G(j\omega)\right|_{\omega=100 rad/\sec}$$

$$A_o^{'} = 10 \times \frac{1}{(100)^3} = 10^{-5}$$

Q13. $\int_{-\pi}^{\pi} \cos(t)\cos(3t)\,dt =$

A. 0

B. π

C. π/2

D. 2

Ans A

Sol –

$$\int_{-\pi}^{+\pi} \cos(t)\cos(3t)\,dt = \frac{1}{2}\int_{-\pi}^{+\pi} 2\cos(t)\cos(3t)\,dt$$

The function is even function

$$\int_{0}^{\pi}\left[\cos(4t)+\cos(2t)\right]dt$$

$$\left[\frac{\sin(4t)}{4}\right]_0^{\pi} + \left[\frac{\sin(2t)}{2}\right]_0^{\pi} = 0$$

Q14. A sequence u[n] is defined as $u[n] = \begin{cases} 1, \text{if } n \geq 0 \\ 0, \text{if } n < 0 \end{cases}$ for n = {-∞, …, -1,0,1, …, ∞}. Consider a sequence x[n] = ne^{-an} u[n], where a is a positive constant. The z-transform of the sequence with appropriate region of convergence is

A. $\frac{Z}{(z-a)^2}$

B. $\frac{1}{z}$

C. $\frac{Ze^{-a}}{(z-e^{-a})^2}$

D. $\frac{z}{z-e^{-a}}$

Ans C

Sol –

$$u[n]=\begin{cases}1, n\geq 0\\ 0, n<0\end{cases}$$ For $n=\{-\infty,......,-1,0,1,.....\infty\}$

$$x[n]=ne^{-an}u[n]$$

$$Z\{x[n]\}=$$

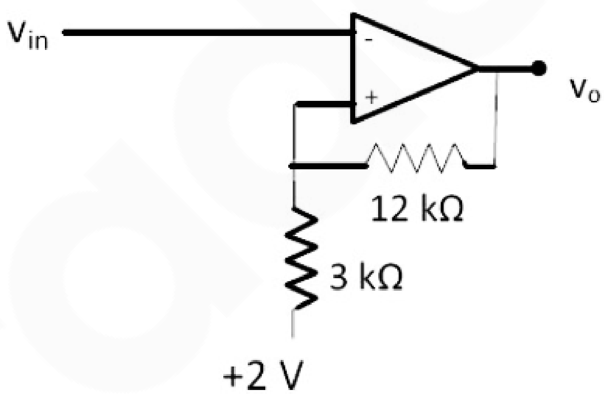
$$Z\{e^{-an}u[n]\}=\frac{z}{z-e^{-a}}$$

$$Z\{n.x[n]\}=-z\frac{d}{dz}(x[n])$$

$$Z\{ne^{-an}u[n]\}=-z\frac{d}{dz}\left\{\frac{z}{z-e^{-a}}\right\}$$

$$=-z\left\{\frac{1\cdot(z-e^{-a})-1\cdot z}{(z-e^{-a})^2}\right\}=\frac{ze^{-a}}{(z-e^{-a})^2}$$

Q15. The output saturation voltages of the Schmitt trigger circuit shown in the figure is ± 15 V. The input trip point voltages are



A. 4.6 V and -1.4 V

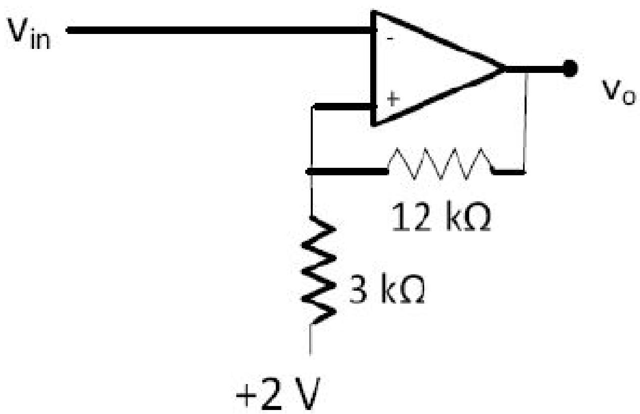
B. +3 V and -3 V

C. +15 V and -15 V

D. 2.3 V and -0.7 V

Ans A

Sol –



Applying nodal analysis at V^+

$$\frac{V^+ - 2}{3} + \frac{V^+ - V_o}{12} = 0$$
$$5V^+ - 8 = V_o$$

The output of the Schmitt trigger goes to $\pm V_{sat}$ i.e. $\pm 15\text{V}$

$$V^+ = V_{in}$$

For $\begin{array}{l} V_o = +15V \\ V_{in} = 4.6V \end{array}$

For $\begin{array}{l} V_o = -15V \\ V_{in} = -1.4V \end{array}$

Q16. An 800 kV 3-phase transmission line is having per phase line inductance of 1.1 mH/km and per phase line capacitance of 11.68 nF/km. Its power transfer capability under surge impedance loading is

A. 1204 MW

B. 2606 MW

C. 2085 MW

D. 1504 MW

Ans C

Sol –

$$Z_C = \sqrt{\frac{L}{C}} = \sqrt{\frac{1.1\times 10^{-3}}{11.68\times 10^{-9}}} = 306.88\Omega$$
$$P_{SIL} = \frac{V^2}{Z_C} = \frac{800^2}{306.88} = 2085.47\text{MW}$$

Q17. A short circuit test is conducted on a 1100/110 V, 50 Hz single-phase transformer with instruments connected on the high voltages side of the transformer. The voltmeter reads 40 V. The ammeter reads 10 A. The wattmeter reading is 300 W. The approximate winding resistance and leakage reactance, referred to high-voltage side, are respectively,

A. 30 Ω, 26.4 Ω

B. 3.0 Ω, 2.64 Ω

C. 0.3 Ω, 0.264 Ω

D. 0.003 Ω, 0.00264 Ω

Ans B

Sol –

In SC test:

V = 40 volt

I = 10 Amp

P = 300 Watt

$$Z = \frac{V}{I} = 4\Omega$$

$$P = I^2 R = 300$$

$$300 = (10)^2 R$$

$$R = 3\Omega$$

$$X = \sqrt{(4)^2 - (3)^2} = 2.645\Omega$$

Q18. An 8085 assembly language program is given as follows.

```
LXI H, 8100 H
MVI M, 20 H
MVI A, 40 H
INX H
MVI M, 30 H
ADD M
HLT
```

The value of A at the end of the execution of the program is

A. 90 H

B. 0 H

C. 40 H

D. 60 H

Ans B

Sol –

HL 8100 H

$$M \leftarrow 20H$$
$$A \leftarrow 40H$$
$$M \leftarrow 30H$$
$$A \leftarrow A + M$$
$$A \leftarrow (30)_H + (40)_H$$
$$A \leftarrow (70)_H$$

Q19. A single phase fully controlled bridge converter supplies a load drawing constant and ripple free load current. If the triggering angle is 60°, the input power factor will be

A. 0.45

B. 0.55

C. 0.71

D. 0.86

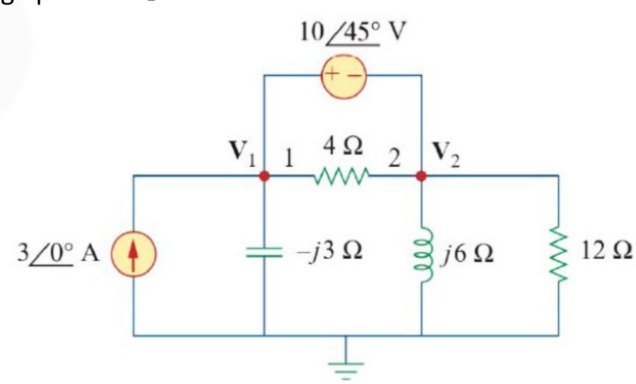
Ans A

Sol –

The input power factor will calculated as follows:

$$P_o = V_0 I_o$$
$$P_{in} = V_S I_S Cos\phi_o$$
$$P_{in} = P_o$$
$$\cos\phi_o = \frac{V_o I_o}{V_s I_s} = \frac{V_o}{V_s} = \frac{1}{V_s} \times \frac{2\sqrt{2}V_s \cos\alpha}{\pi} = \frac{2\sqrt{2}}{\pi}\cos\alpha = \frac{2\sqrt{2}}{\pi}\cos 60° = 0.45$$

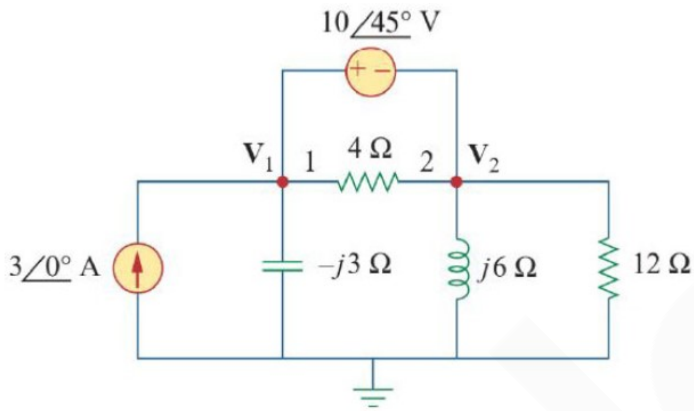
Q20. Compute node voltage phasor $\overline{V}_2$ in the circuit below.



A. 31.41 ∠- 87.18° V
B. 10∠45° V
C. -120∠79.34° V
D. 120∠79.34° V

Ans A

Sol –



Applying concept of super node

$$3\angle 0° = \frac{V_1}{-j3} + \frac{V_2}{j6} + \frac{V_2}{12} + \frac{V_1 - V_2}{4} \quad ....eq(1)$$

$$V_1 - V_2 = 10\angle 45° \quad ....eq(2)$$

Solving the above equations by substitution method

$$V_1 = 25.785\angle -70.475°$$
$$V_2 = 31.41\angle -87.18°$$

Q21. Four ammeters M1, M2, M3 and M4 with the following specifications are available:

Instrument	Type	Full Scale Value	Accuracy % of Full Scale
M1	31/2 digital dual slope	20	± 0.10
M2	PMMC	10	± 0.20
M3	Electrodynamic	5	± 0.50
M4	Moving Iron	1	± 1.00

A current of 1 A is to be measured. To ensure minimum error in the reading, one should select the meter

A. M3
B. M4
C. M1
D. M2

Ans B

Sol –

Instrument	Type	Full Scale Value	Accuracy % of Full Scale
M1	$3^{1/2}$ digital dual slope	20	±0.10
M2	PMMC	10	±0.20
M3	Electrodynamic	5	±0.50
M4	Moving Iron	1	±1.00

To ensure the minimum error in the reading, absolute error in the meter must be maintained.

Absolute error of M1:

$$e_1 = 20 \times 0.1\% = 2\%$$

Absolute error of M2:

$$e_2 = 10 \times 0.2\% = 2\%$$

Absolute error of M3:

$$e_3 = 5 \times 0.5\% = 2.5\%$$

Absolute error of M4:

$$e_4 = 1 \times 1\% = 1\%$$

As we can see that M4 have least absolute error.

Q22. A 50 Hz transformer has equal hysteresis and eddy current losses at rated operating condition. If the voltage is reduced to 80% of the rated value and frequency is made 40 Hz, compared to the rated operating condition, the core loss of the transformer is reduced by

A. 15%
B. 10%
C. 8%
D. 28%

Ans D

Sol –

Given that $\frac{V}{f}$ is constant.

$$P_{e_1} = P_{h_1}$$
$$P_i = 2P_{h_1}$$
$$P_{h_2} = \frac{40}{50}P_{h_1} = 0.8P_{h_1}$$
$$P_{e_2} = \left(\frac{40}{50}\right)^2 P_{e_1} = 0.64P_{e_1}$$
$$P_{i_2} = (0.8 + 0.64)P_{h_1}$$
$$P_{i_2} = 1.44P_{h_1}$$

The percentage reduction will be

$$= \frac{2 - 1.44}{2} \times 100$$
$$= \frac{0.56}{2} \times 100 = 28\%$$

Q23. A three phase diode bridge rectifier is feeding a highly inductive load. The load current is assumed to be 100 A ripple free DC. If the three phase input is 400 V, 50 Hz, AC, the rms value of the current through each diode is

A. 57.73 A

B. 33.33 A

C. 66.67 A

D. 16.67 A

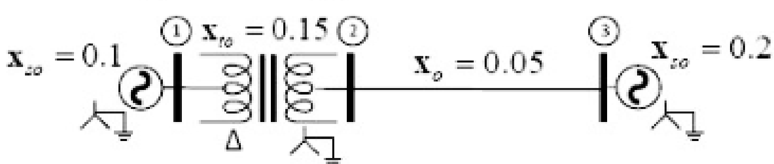
Ans A

Sol –

The rms value of the current through each diode in a three phase bridge rectifier with highly inductive load.

$$I_{d_{rms}} = 0.5773I_m = 0.5773 \times 100 = 57.73A$$

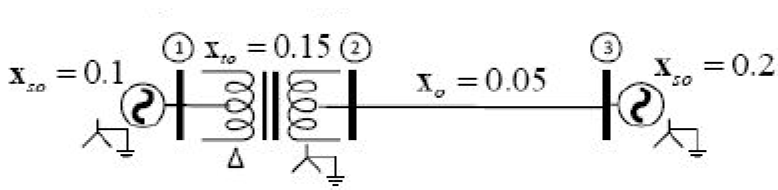
Q24. The zero sequence reactances (in p.u.) are indicated in the network shown in the figure below. The zero sequence driving point reactance of node 3 will be



A. 0.1
B. 0.05
C. 0.3
D. 0.2

Ans A

Sol –



$X_o = (0.2 \| 0.2) = 0.1\text{p.u.}$

Q25. Two 100 V full scale PMMC type DC volt meters having figure-of-merit (FOM) of 10kΩ/V and 20 kΩ/V are connected in series. The series combination can be used to measure maximum DC voltage of
A. 100 V
B. 50 V
C. 200 V
D. 150 V

Ans D

Sol –

$R_{1_{total}} = 1000\text{K}\Omega$

$R_{2_{total}} = 2000\text{K}\Omega$

$R_{series} = 3000\text{K}\Omega$

$I_{1_{max}} = \frac{1}{10} = 0.1\text{mA}$

$I_{2_{max}} = 0.05\text{mA}$

$V_{measure} = 3000\text{K}\Omega \times 0.05\text{mA} = 150\text{V}$

Q1. दिए गए विकल्पों में से कौन-सा विकल्प दिए हुए शब्द का पर्यायवाची नहीं हैं?
शब्द : पक्षी
A. वारि

B. पखेरू

C. विहंग

D. खग

Ans A

Sol –

वारि

Q2. नीचे दिए गए दोनों वाक्यों को पढिए |

वाक्य 1. “रामचरितमानस” की रचना गोस्वामी तुलसीदास ने की थी |

वाक्य 2. “गोदान” उपन्यास के लेखक मुंशी प्रेमचंद हैं |

नीचे दिए गए विकल्पों में से कौन सा विकल्प सही है?

A. दोनों वाक्य सही हैं

B. वाक्य 2 सही है किन्तु वाक्य 1 सही नहीं है

C. दोनों वाक्य सही नही हैं

D. वाक्य 1 सही है किन्तु वाक्य 2 सही नहीं है

Ans A

Sol –

वाक्य १. “रामचरितमानस” की रचना गोस्वामी तुलसीदास ने की थी ।

वाक्य २. “गोदान” उपन्यास के लेखक मुंशी प्रेमचंद हैं ।

दोनों वाक्य सही हैं

Q3. दिए गए विकल्पों में से कौन सा विकल्प नीचे लिखे शब्द का सही सन्धि-विग्रह है?

शब्द : स्वेच्छा

A. स्व: + एच्छा

B. स्वे : च्छा

C. स्वे : इच्छा

D. स्व + इच्छा

Ans D

Sol –

स्व + इच्छा

Q4. दिए गएवाक्यांशों में से सर्वोचित वाक्यांश चुनकर नीचे दिए गए मुहावरे को पूरा करे |
मुहावरा : दूध का दूध _____________
A. दही की नदी
B. दही का दही
C. दूध में पानी
D. पानी का पानी

Ans D

Sol –

पानी का पानी

Q5. दिए गए विकल्पों में से कौन सा वाक्यांश नीचे लिखे शब्द का सही अर्थ है?
शब्द : अवैतनिक
A. जिसका वेतन निर्धारित ना किया जा सके
B. बिना वेतन के कार्य करने वाला
C. अनैतिक कार्य करने वाला
D. अनैतिक कार्य करने की उम्र (वय)

Ans B

Sol –

बिना वेतन के कार्य करने वाला

Q1. The Aligarh Muslim University was founded by which of the following persons?
A. Maulana Azad
B. Mohammed Ali Jinnah
C. Syed Ahmed Khan
D. Feroze Gandhi

Ans C

Sol –

Aligarh Muslim University was founded by Syed Ahmed Khan.

Q2. ‘Light-years’ is a unit of measurement for which of the following?
A. Illumination
B. Time
C. Total solar energy incident on the earth in a year
D. Distance

Ans D

Sol –

Light-year is the unit of measurement of Distance.

Q3. Who is the author of the collection of short stories ‘The Canterbury Tales’?
A. Geoffrey Chaucer
B. William Shakespeare
C. William Langland
D. T. S. Eliot

Ans A

Sol –

Geoffrey Chaucer is the author of collection of short-stories “The Canterbury Tales”.

Q4. Who was the first person to set foot on the moon?
A. Micheal Collins
B. Neil Amstrong
C. Yuri Gagarin
D. Rakesh Sharma

Ans B

Sol –

Neil Amstrong was the first person to set foot on the moon.

Q5. Where is the headquarter of the International Court of Justice located?
A. Paris
B. The Hague
C. New York
D. Geneva

Ans B

Sol –

The headquarter of the International Court of Justice is located in The Hague.

Q6. Which of the following positions is associated with T.N. Seshan?
A. Chief Justice of India
B. Governor of the Reserve Bank of India
C. Chief Election Commissioner of India
D. Vice Chairman of the Planning Commission

Ans C

Sol –

T. N. Seshan is associated with Chief Election Commissioner of India.

Q7. In which of the following cities Kumbh Mela is not held?
A. Nasik
B. Haridwar
C. Prayagraj (Allahabad)
D. Varanasi

Ans C

Sol –

Varanasi is the city where Kumbh Mela is not held.

Q8. Where was the first Asian Games held?
A. Manila
B. Jakarta
C. New Delhi
D. Tokyo

Ans C

Sol –

The first Asian Games was held in New Delhi.

Q9. What is the narrow stretch of water separating India and Sri Lanka called?
A. Palk Strait
B. Berring Strait
C. Tamil Strait

D. Vasco Strait

Ans A

Sol –

Palk Strait is the narrow stretch of water separating India and Sri Lanka.

Q10. Which of the following Army Generals is not known as one of the leaders in World War II?
A. Manekshaw
B. De Gaulle
C. Rommel

D. Eisenhower

Ans A

Sol –

Manekshaw was not Army General who was known to be one of the leader in the World War II.

Q1. If 20% of a = b, then b% of 20 is the same as
A. 4% of a
B. 10% of a
C. 6% of a
D. 8% of a

Ans A

Sol –

$$\frac{20}{100}\times a=b$$
$$a=5b$$
$$\frac{b}{100}\times 20=x\Rightarrow x=\frac{b}{5}$$
$$\frac{4}{100}\times a=\frac{4}{100}\times 5b=\frac{20}{100}\times b=\frac{b}{5}=x$$

Q2. Consider the matrix,

$$A = \begin{bmatrix} 2 & 3 & 5 & 6 \\ 1 & 4 & 7 & 8 \\ 0 & 0 & 0 & 0 \\ 3 & 7 & 9 & 8 \end{bmatrix}$$

Which of the following statements is not correct?

A. A-1 does not exist

B. Matrix A is singular

C. rank (A) = 4

D. det(A) = 0

Ans C

Sol –

The given matrix is

$$\mathbf{A} = \begin{bmatrix} 2 & 3 & 5 & 6 \\ 1 & 4 & 7 & 8 \\ 0 & 0 & 0 & 0 \\ 3 & 7 & 9 & 8 \end{bmatrix}$$

Seeing the rows of the matrix, one of the row of the matrix is completely zero which means that the rank of the matrix will be less than 4.

Q3. Which word does not belong with other?

A. Flute

B. Violin

C. Guitar

D. Sitar

Ans A

Sol –

Flute does not belong to the category of Violin, Guitar and Sitar.

Q4. Arrange the words given below in a meaningful sequence:

1. Poverty
2. Population
3. Death
4. Unemployment

5. Disease

A. 2, 3, 4, 5, 1

B. 2, 4, 1, 5, 3

C. 1, 2, 3, 4, 5

D. 3, 4, 2, 5, 1

Ans B

Sol –

The ascending order of the sequence will be

$$Population \Rightarrow Unemployment \Rightarrow Poverty \Rightarrow Disease \Rightarrow Death$$

Q5. The minimum point of the function $\frac{x^3}{3} - x$ is at

A. x = 0

B. $x = \frac{1}{\sqrt{3}}$

C. x = - 1

D. x = 1

Ans C

Sol –

The point at which the function gives minimum value will be

$$f(x) = \frac{x^3}{3} - x$$

$$\frac{d}{dx}\{f(x)\} = \frac{3x^2}{3} - 1 = x^2 - 1 = 0$$

$$x = \pm 1$$

$$f(1) = \frac{-1}{3}$$

$$f(-1) = \frac{-4}{3}$$

Therefore, the minimum value of the function is attained at $x = -1$

Q1. The directional derivative of the surface, f = $(x^2 + y^2 + z^2)$ at the point P:$[2, -2, 1]^T$ along the vector a = $[-1, -1, 0)^T$ is given by

A. 0

B. 8

C. 4

D. 6

Ans A

Sol –

The directional derivative of the function f is given by:

$$\nabla \cdot f = \frac{\partial f}{\partial x}\hat{i} + \frac{\partial f}{\partial y}\hat{j} + \frac{\partial f}{\partial z}\hat{k}$$

$$\nabla \cdot f = 2x\hat{i} + 2y\hat{j} + 2z\hat{k}$$

$$[\nabla \cdot f]_{(2,-2,1)} = 4\hat{i} - 4\hat{j} + 2\hat{k}$$

[illegible]

$$a = \frac{-\hat{i} - \hat{j}}{\sqrt{2}}$$

$$\{(\nabla \cdot f)a\} = \frac{-4+4+0}{\sqrt{2}} = 0$$

Q2. Look at the series:

1, 2, 6, 12, 25, 48, ____

What number should come next.

A. 65

B. 91

C. 100

D. 75

Ans B

Sol –

$$1, 2, 6, 12, 25, 48, \_\_\_\_\_\_$$

$$1 \times 1 = 1$$

$$2 \times 1 = 2$$

$$3 \times 2 = 6$$

$$4 \times 3 = 12$$

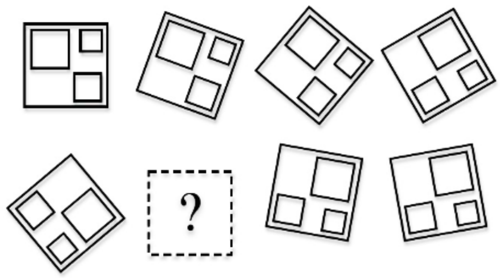
$$5 \times 5 = 25$$

$$6 \times 8 = 48$$

$$7 \times 13 = 91$$

The multiplied number is the sum of the two previous number i.e. $8+5=13$.

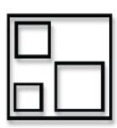
Q3.



Which of the shapes below continues the sequence?

A. 

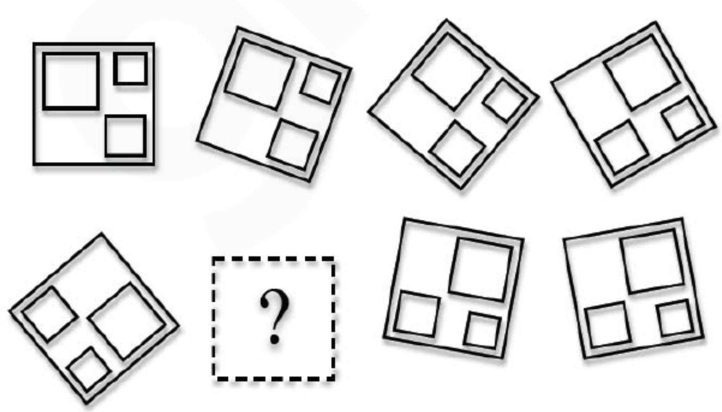
B. 

C. 

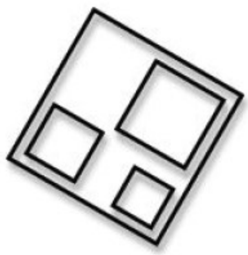
D. 

Ans B

Sol –



The next figure is the rotation of figures in the box.



Q4. 

Which of the shapes below continues the sequence?

A. 

B. 

C. 

D. 

Ans B

Sol –

The next figure is likely to be opening a slide-screen of a desktop.

Q5. Consider the matrix,

$$A = \begin{bmatrix} a & b \\ -b & a \end{bmatrix}$$

Eigenvalues of the matrix are given by,

A. $\lambda_1 = a + b, \lambda_2 = a - b$

B. $\lambda_1 = a^2, \lambda_2 = b^2$

C. $\lambda_1 = a - jb, \lambda_2 = a + jb$

D. $\lambda_1 = b - ja, \lambda_2 = b + ja$

Ans C

Sol –

The given matrix is

$$\mathbf{A} = \begin{bmatrix} a & b \\ -b & a \end{bmatrix}$$

$$[A - \lambda I] = 0$$
$$(a-\lambda)^2 + b^2 = 0$$
$$(a-\lambda)^2 = -b^2$$
$$(a-\lambda) = \pm jb$$
$$\lambda_1 = a - jb$$
$$\lambda_2 = a + jb$$

BEST OF LUCK FOR YOUR RESULTS