Q. No. 1 – 25 Carry One Mark Each

1. Two independent random variables X and Y are uniformly distributed in the interval [-1, 1]. The probability that max [X, Y] is less than ½ is

(A) 3/4 (B) 9/16 (C) 1/4 (D) 2/3

Answer:- (B)

Exp:- Uniform distribution X, Y on $[-1,1]; f(x) = f(y) = \frac{1}{2}$

$$P\left(\max(x,y) \le \frac{1}{2}\right) = P\left(X = \frac{1}{2},\ -1 \le Y \le \frac{1}{2}\right).P\left(-1 \le X \le \frac{1}{2},\ Y = \frac{1}{2}\right)$$

$$= \int_{-1}^{1/2} \frac{1}{2}dx \int_{-1}^{1/2} \frac{1}{2}dy = \frac{3}{4} \times \frac{3}{4} = \frac{9}{16}$$

2. If $x = \sqrt{-1}$, then the value of x^x is

(A) $e^{-\pi/2}$ (B) $e^{\pi/2}$ (C) x (D) 1

Answer:- (A)

Exp:- Given, $x=\sqrt{-1}$; $x^x = \left(\sqrt{-1}\right)^{\sqrt{-1}} = i^i$

We know that $e^{i\theta} = \cos\theta + i\sin\theta \Rightarrow e^{i\frac{\pi}{2}} = \cos\frac{\pi}{2} + i\sin\frac{\pi}{2} = i$

$\therefore\ (i)^i = \left(e^{i\pi/2}\right)^i = e^{-\pi/2}$

3. Given $f(z) = \frac{1}{z+1} - \frac{2}{z+3}$. If C is a counter clock wise path in the z-plane such that $|z+1| = 1$, the value of $\frac{1}{2\pi j}\oint_C f(z)\,dz$ is

(A) -2 (B) -1 (C) 1 (D) 2

Answer:- (C)

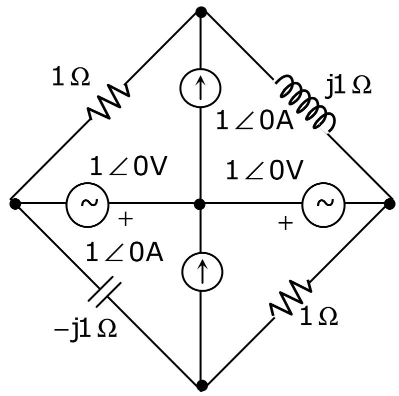
Exp:- $$\frac{1}{2\pi i}\oint_C f(z)\,dz = \frac{1}{2\pi i}\left[\underbrace{\oint_C \frac{1}{z+1}dz}_{I_1} - \underbrace{\oint_C \frac{z}{z+3}dz}_{I_2}\right]$$

$z = -1$ is singularity in c and z=-3 is not in c

By cauchy's integral formula $I_2 = \oint_C \frac{z}{z+3}dz = 0$

$\therefore I_1 = \oint_C \frac{1}{z+1}dz = 1;\ I_1 - I_2 = 1$

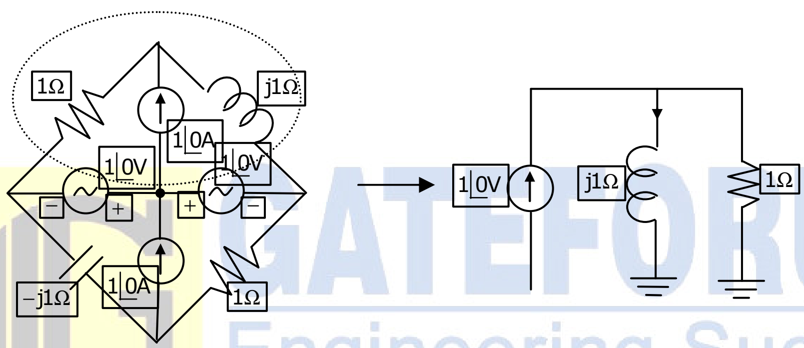
4. In the circuit shown below, the current through the inductor is



(A) $\frac{2}{1+j}$ A (B) $\frac{-1}{1+j}$ A (C) $\frac{1}{1+j}$ A (D) 0 A

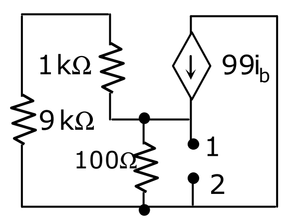
Answer:- (C)

Exp:-



$$I_L = 1\angle 0 \times \frac{1}{1+j1} = \frac{1}{1+j1}\ A$$

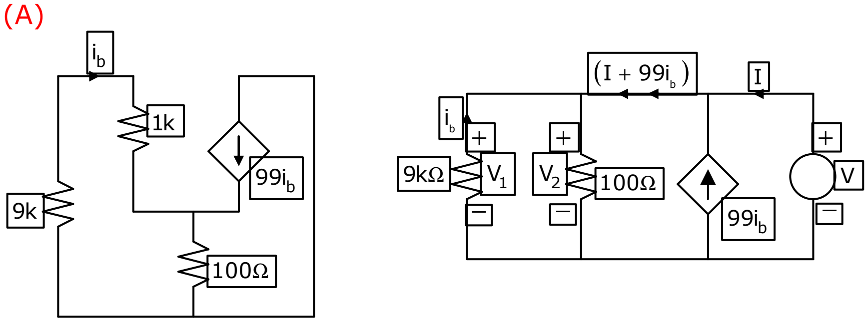
5. The impedance looking into nodes 1 and 2 in the given circuit is



(A) 50 Ω (B) 100 Ω (C) 5 KΩ (D) 10.1 kΩ

Answer:- (A)

Exp:-



After connecting a voltage source of V

$V_1 = V_2 \Rightarrow \; (10k)(-i_b) = 100(I + 99i_b + i_b);$

$-10000i_b = 100I + 100\times 100i_b = 100I + 10000i_b$

$-20000i_b = 100I \Rightarrow i_b = -\left(\frac{100}{20000}\right)\dot{I} = \left[-\frac{I}{200}\right]$

$V = 100\left[I + 99i_b + i_b\right] = 100\left[I + 100\left(\frac{-I}{200}\right)\right] = 50I$

$R_{th} = \frac{V}{I} = \frac{50I}{I} = 50\Omega$

6. A system with transfer function

$$G(s) = \frac{(s^2+9)(s+2)}{(s+1)(s+3)\,(s+4)}$$

is excited by sin (ωt). The steady-state output of the system is zero at

(A) $\omega = 1\text{rad/s}$ (B) $\omega = 2\text{rad/s}$

(C) $\omega = 3\text{rad/s}$ (D) $\omega = 4\text{rad/s}$

Answer:- (C)

Exp:- Steady state output of system is

$y(t) = |G(j\omega)| \sin\left(\omega t + \angle G(j\omega)\right)$

for $y(t)$ to be zero

$|G(j\omega)|$ can be zero

$$|G(j\omega)| = \frac{(-\omega^2+9)\sqrt{\omega^2+4}}{\sqrt{\omega^2+1}\sqrt{\omega^2+9}\sqrt{\omega^2+16}}$$

$\Rightarrow$ at $\omega = 3$ rad/sec

$|G(j\omega)| = 0$, thus $y(t) = 0$

7. In the sum of product function f(*X*,*Y*,*Z*) = $\sum(2,3,4,5)$, the prime implicants are

(A) $\bar{X}Y, X\bar{Y}$ (B) $\bar{X}Y, X\bar{Y}\bar{Z}, X\bar{Y}Z$

(C) $\bar{X}Y\bar{Z}, \bar{X}YZ, X\bar{Y}$ (D) $\bar{X}Y\bar{Z}, \bar{X}YZ, X\bar{Y}\bar{Z}, X\bar{Y}Z$

Answer:- (A)

Exp:- .

z \ xy	00	01	11	10
0	0	1	0	1
1	0	1	0	1

Implicates are $\bar{x}y\bar{z}, \bar{x}yz, x\bar{y}\bar{z}, x\bar{y}z$

The prime implicants are $\bar{x}y$ and $x\bar{y}$

8. If $x[n] = (1/3)^{|n|} - (1/2)^n u[n]$, then the region of convergence (ROC) of its Z-transform in the Z-plane will be

(A) $\frac{1}{3} < |z| < 3$ (B) $\frac{1}{3} < |z| < \frac{1}{2}$

(C) $\frac{1}{2} < |z| < 3$ (D) $\frac{1}{3} < |z|$

Answer:- (C)

Exp:- $x[n] = \left(\frac{1}{3}\right)^{|n|} - \left(\frac{1}{2}\right)^n u[n]$

for $(1/3)^{|n|}$ ROC is $\frac{1}{3} < |z| < 3$

for $(1/2)^n u[n]$ ROC is $|z| > \frac{1}{2}$

Thus common ROC is $\frac{1}{2} < |z| < 3$

9. The radiation pattern of an antenna in spherical co-ordinates is given by

$$F(\theta) = \cos^4\theta;\ 0 \le \theta \le \pi/2$$

The directivity of the antenna is

(A) 10dB (B) 12.6dB (C) 11.5dB (D) 18 dB

Answer:- (A)

Exp:- Directivity $= \frac{|F(\theta)|_{max}}{|F(\theta)|_{ave}}$

$|F(\theta)|_{max} = 1$

$F[\theta]_{ave} = \frac{1}{4\pi}\int_0^{2\pi}\int_0^{\pi/2} \cos^n\theta \sin\theta \, d\theta \, d\phi$

$= \frac{1}{4\pi}[2\pi]\left[-\int_1^0 t^4 dt\right] = \frac{1}{10}$

Directivity $= \frac{1}{\frac{1}{10}} = 10$

$= 10\log 10 = 10\,dB$

10. A coaxial cable with an inner diameter of 1mm and outer diameter of 2.4 mm is filled with a dielectric of relative permittivity 10.89. Given $\mu_0 = 4\pi \times 10^{-7}\,H/m$, $\varepsilon_0 = \frac{10^{-9}}{36\pi}\,F/m$, the characteristic impedance of the cable is

(A) $330\,\Omega$ (B) $100\,\Omega$ (C) 143.3Ω (D) $43.4\,\Omega$

Answer:- **Answer is Not in the Options**

Exp:- Characteristic impedance

$$Z_0 = \frac{1}{2\pi}\sqrt{\frac{\mu}{\epsilon}}\ \ln\left(\frac{b}{a}\right) = \frac{1}{2\pi}\sqrt{\frac{\mu}{\epsilon}}\ \ln\left(\frac{2.4}{1}\right)$$

Substitute, the values, we have $Z_0 = 15.3\,\Omega$

Note: If $\frac{1}{2\pi}$ is not considered then the answer will be option (B)

11. A source alphabet consists of N symbols with the probability of the first two symbols being the same. A source encoder increases the probability of the first symbol by a small amount ε and decreases that of the second by ε. After encoding, the entropy of the source

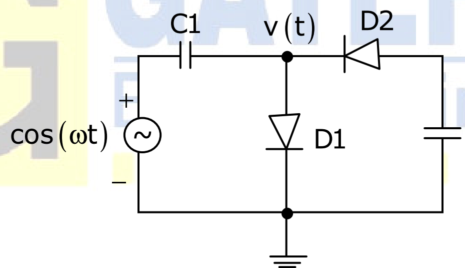
(A) increases
(B) remains the same
(C) increases only if N = 2
(D) decreases

Answer:- (D)

Exp:- Entropy is maximum when all symbols are equiprobable

If the probability of symbols at different then entropy in going to decrease

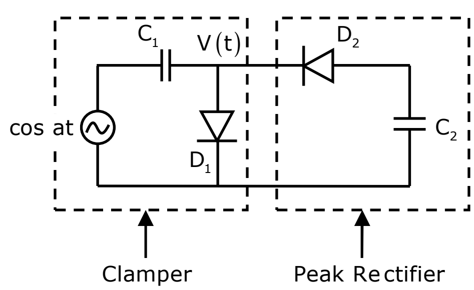
12. The diodes and capacitors in the circuit shown are ideal. The voltage v(t) across the diode D1 is



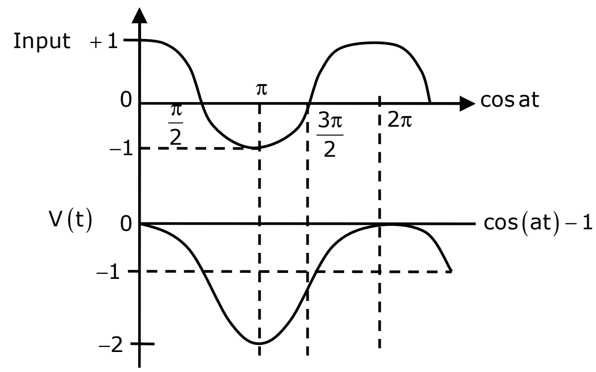
(A) $\cos(\omega t) - 1$
(B) $\sin(\omega t)$
(C) $1 - \cos(\omega t)$
(D) $1 - \sin(\omega t)$

Answer:- (C)

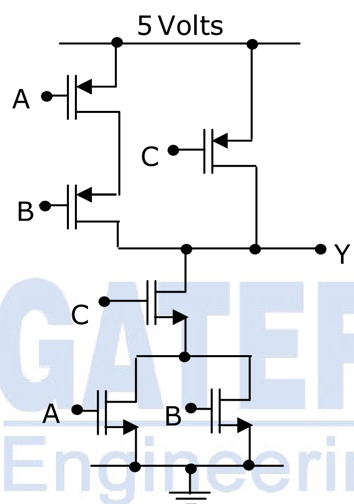
Exp:-



When excited by cos (ωt), the clamping section clamp the positive peak to 0 volts and negative peak to −2 volts. So whole cos(ωt) is lower by −1 volts



13. In the circuit shown



(A) $Y = \overline{A}\,\overline{B} + \overline{C}$ (B) $Y = (A + B)c$

(C) $Y = (\overline{A} + \overline{B})\overline{C}$ (D) $Y = AB + C$

Answer:- (A)

Exp:- $Y = \overline{A + B.C} = \overline{A + B} + \overline{C} = \overline{A}.\overline{B} + \overline{C}$

14. With initial condition x(1) = 0.5, the solution of the differential equation, $t\frac{dx}{dt} + x = t$ is

(A) $x = t - \frac{1}{2}$ (B) $x = t^2 - \frac{1}{2}$ (C) $x = \frac{t^2}{2}$ (D) $x = \frac{t}{2}$

Answer:- (D)

Exp:- Given DE is $t\frac{dx}{dt} + x = t \Rightarrow \frac{dx}{dt} + \frac{x}{t} = 1$

$IF = e^{\int \frac{1}{t}dt} = e^{\log t} = t$; solution is $x(IF) = \int (IF)\,tdt$

$xt = \int t \cdot tdt \Rightarrow xt = \frac{t^2}{2} + c$; Given that $x(1) = 0.5 \Rightarrow 0.5 = \frac{1}{2} + c \Rightarrow c = 0$

$\therefore$ the required solution is $xt = \frac{t^2}{2} \Rightarrow x = \frac{t}{2}$

15. The unilateral Laplace transform of f(t) is $\frac{1}{s^2+s+1}$. The unilateral Laplace transform of tf(t) is

(A) $-\frac{s}{\left(s^2+s+1\right)^2}$ (B) $-\frac{2s+1}{\left(s^2+s+1\right)^2}$

(C) $\frac{s}{\left(s^2+s+1\right)^2}$ (D) $\frac{2s+1}{\left(s^2+s+1\right)^2}$

Answer:- (D)

Exp:- If $f(t) \leftrightarrow F(s)$, then $t\,f(t) \leftrightarrow -\frac{d}{ds}F(s)$

Thus if $F(s) = \frac{1}{s^2+s+1}$

$t\,f(t) \rightarrow -\frac{d}{ds}\left(\frac{1}{s^2+s+1}\right) = \frac{2s+1}{s^2+s+1}$

16. The average power delivered to an impedance $(4-j3)\,\Omega$ by a current $5\cos(100\pi t+100)$ A is

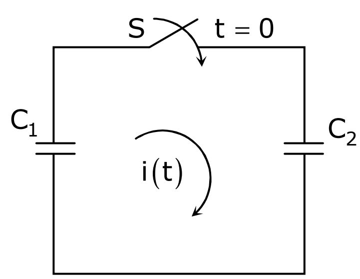
(A) 44.2W (B) 50W (C) 62.5W (D) 125W

Answer:- (B)

Exp:- $Z = 4 - j3 = R_L - JX_C$; $R_L = 4$; $I = 5\cos(100\pi t+100) = I_m\cos(\omega t+\alpha)$

$P = \frac{1}{2}I_m^{\,2}R_L = \frac{1}{2}\times 5^2 \times 4 = 50W$

17. In the following figure, C_1 and C_2 are ideal capacitors. C_1 has been charged to 12 V before the ideal switch S is closed at t = 0. The current i(t) for all t is



(A) zero (B) a step function

(C) an exponentially decaying function (D) an impulse function

Answer:- (D)

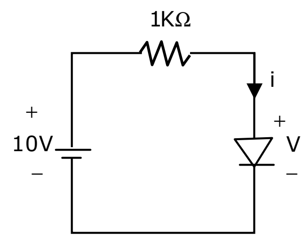
Exp:- When the switch in closed at t = 0

Capacitor C_1 will discharge and C_2 will get charge since both C_1 and C_2 are ideal and there is no-resistance in the circuit charging and discharging time constant will be zero.

Thus current will exist like an impulse function.

18. The i-v characteristics of the diode in the circuit given below are

$$i = \begin{cases} \frac{\upsilon - 0.7}{500} A, & \upsilon \geq 0.7V \\ 0\ A, & \upsilon < 0.7V \end{cases}$$



The current in the circuit is

(A) 10mA (B) 9.3mA (C) 6.67mA (D) 6.2mA

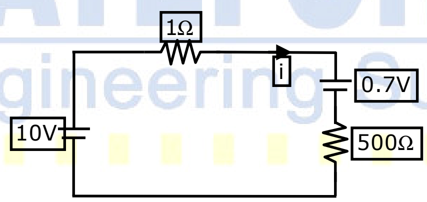
Answer:- (D)

$i = \frac{V - 0.7}{500}$

$\frac{di}{dV} = \frac{1}{500}$

$\Rightarrow r_d = 500\Omega$

Since diode will be forward biased voltage across diode will be 0.7V



$i = \frac{10 - 0.7}{1000 + 500}$

$= \frac{9.3}{1500} = 6.2\,mA$

19. The output Y of a 2-bit comparator is logic 1 whenever the 2-bit input A is greater than the 2-bit input B. The number of combinations for which the output is logic 1, is

(A) 4 (B) 6 (C) 8 (D) 10

Answer:- (B)

Exp:-

Input A		Input B		Y
A_2	A_1	B_2	B_1	
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	1

0	1	0	1	0
0	1	1	0	0
0	1	1	1	0
1	0	0	0	1
1	0	0	1	1
1	0	1	0	0
1	0	1	1	0
1	1	0	0	1
1	1	0	1	1
1	1	1	0	1
1	1	1	1	0

Thus for 6 combinations output in logic 1

20. Consider the given circuit

In this circuits, the race around

(A) does not occur

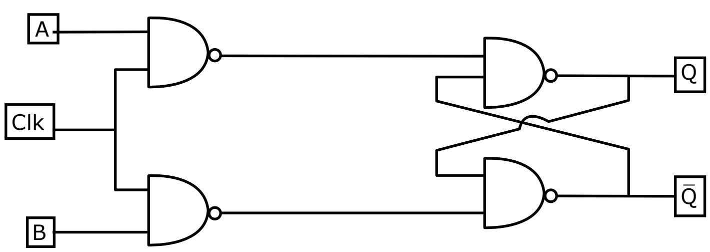
(B) occurs when CLK = 0

(C) occur when CLK = 1 and A = B = 1

(D) occurs when CLK = 1 and A = B = 0

Answer:- (A)

Exp:- .



$Q_{next} = \overline{\overline{A.CLK}.\overline{Q}}$

$= A.CLK + Q$

$\overline{Q}_{next} = A.CLK + \overline{Q}$

If CLK = 1 and A and B = 1

then $\left.\begin{array}{l} Q_{next} = 1 \\ \overline{Q}_{next} = 1 \end{array}\right\}$ No race around

If CLK = 1 and A = B = 0

$\left.\begin{aligned} Q_{next} &= Q \\ \bar{Q}_{next} &= \bar{Q} \end{aligned}\right\}$ No race around

Thus race around does not occur in the circuit

21. The electric field of a uniform plane electromagnetic wave in free space, along the positive x direction, is given by $\vec{E} = 10\left(\hat{a}_y + j\hat{a}_z\right)e^{-j25x}$. The frequency and polarization of the wave, respectively, are

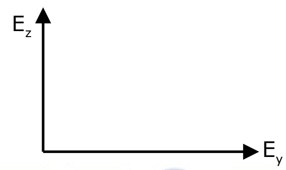
(A) 1.2 GHz and left circular
(B) 4 Hz and left circular
(C) 1.2 GHz and right circular
(D) 4 Hz and right circular

Answer:- (A)

Exp:- $\frac{2\pi}{\lambda} = 25$

$\Rightarrow \lambda = \left(\frac{2\pi}{25}\right)$

$f = \frac{3\times10^8}{\frac{2\pi}{25}} = 1.2\,\text{GHz}$



Let $E_y = \cos\omega t$

then $E_z = \cos\left(\omega t + \frac{\pi}{2}\right)$

Now if we increase 't', we will see that it in left circular polarization.

22. A plane wave propagating in air with $\vec{E} = \left(8\hat{a}_x + 6\hat{a}_y - 5\hat{a}_z\right)e^{j(\omega t+3x-4y)}\,V/m$ is incident on a perfectly conducting slab positioned at $x \le 0$. The $\bar{E}$ field of the reflected wave is

(A) $\left(-8\hat{a}_x - 6\hat{a}_y - 5\hat{a}_z\right)e^{j(\omega t+3x+4y)}\,V/m$

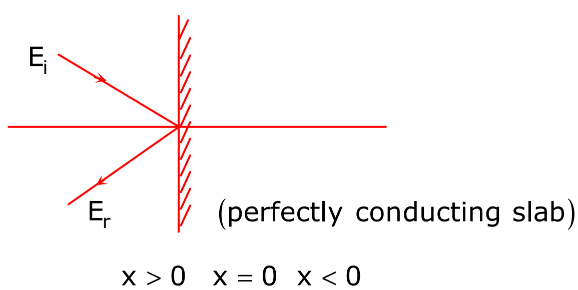
(B) $\left(-8\hat{a}_x + 6\hat{a}_y - 5\hat{a}_z\right)e^{j(\omega t+3x+4y)}\,V/m$

(C) $\left(-8\hat{a}_x - 6\hat{a}_y - 5\hat{a}_z\right)e^{j(\omega t-3x-4y)}\,V/m$

(D) $\left(-8\hat{a}_x + 6\hat{a}_y - 5\hat{a}_z\right)e^{j(\omega t-3x-4y)}\,V/m$

Answer: (C)

$E_i = \left(8a_x + 6a_y + 5a_z\right)e^{j(\omega t+3x-4y)}\,V/m$



1. Electric field inside a perfect conductor = 0

   $\therefore$ Etransmitted = 0

2. For E_i and Er_1 y direction is same since the slabe is Positioned at x = 0 and only x is reversed.

   $\therefore E_i + E_r = 0$

   $E_r = E_i = -(8ax + 6ay + 5az)e^{j(\omega t - 3x - 4y)}$

23. In a baseband communications link, frequencies up to 3500 Hz are used for signaling. Using a raised cosine pulse with 75% excess bandwidth and for no inter-symbol interference, the maximum possible signaling rate in symbols per seconds is

(A) 1750 (B) 2625 (C) 4000 (D) 5250

Answer:- (C)

Exp:- $B_T = \frac{1}{2}R_S(\beta + 1)$

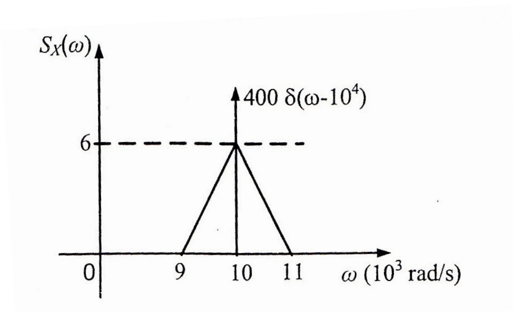
$R_S \rightarrow$ Symbol rate

$\Rightarrow R_S = \frac{2 \times \beta_T}{\beta + 1}$

$\beta = 0.75$

$\Rightarrow R_S = \frac{2 \times 3500}{1 + 0.75} = 4000$ symbols / sec

24. The power spectral density of a real process X(t) for positive frequencies is shown below. The values of $E[X^2(t)]$ and $[E[X(t)]]$, respectively, are



(A) $6000/\pi, 0$

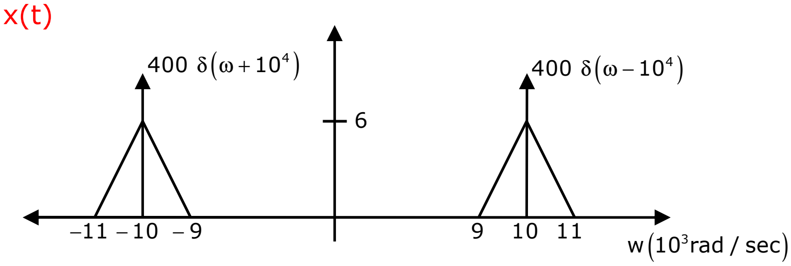
(B) $6400/\pi, 0$

(C) $6400/\pi, 20/(\pi\sqrt{2})$

(D) $6000/\pi, 20/(\pi\sqrt{2})$

Answer:- (B)

Exp:- PSD of x(t)



$E\left[x^2(t)\right] = R_{xx}(0)$

$R_{xx}(0) = \frac{1}{2\pi}\int_{-\infty}^{\infty} S_{xx}(\omega)\,d\omega$

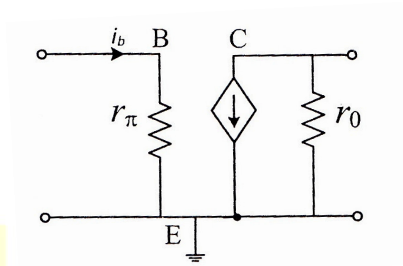
$R_{xx}(\tau) \leftrightarrow S_{xx}(\omega)$

fourier transform pair

$= \frac{1}{2\pi}\left[\frac{1}{2}\times 2\times 10^3\times 6 + \frac{1}{2}\times 2\times 10^3\times 6 + 400 + 400\right] = 6400/\pi$

Since PSD of x(t) does not contain any DC component, the mean value of x(t) is zero.

25. The current i_b through the base of a silicon npn transistor is $1 + 0.1\cos(10000\pi t)$ mA. At 300 K, the r_π in the small signal model of the transistor is



(A) $250\,\Omega$ (B) $27.5\,\Omega$ (C) $25\,\Omega$ (D) $22.5\,\Omega$

Answer:- (C)

Exp:- $r_\pi = \frac{V_T}{I_B} = \frac{25\text{mV}}{1\text{mA}} = 25\Omega$

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26. Given that

$A = \begin{bmatrix} -5 & -3 \\ 2 & 0 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, the value of A^3 is

(A) $15A + 12I$ (B) $19A + 30I$ (C) $17A + 15I$ (D) $17A + 21I$

Answer:- (B)

Exp :- Given : $A = \begin{bmatrix} -5 & -3 \\ 2 & 0 \end{bmatrix}$;

Characteristic equation of A is $|A\text{-}I\lambda| = 0 \Rightarrow \begin{vmatrix} -5-\lambda & -3 \\ 2 & 0-\lambda \end{vmatrix} = 0$

$\Rightarrow (-5-\lambda)(-\lambda) + 6 = 0 \Rightarrow 5\lambda + \lambda^2 + 6 = 0$

$\Rightarrow \lambda^2 = -5\lambda - 6$ and $\lambda^3 = -5\lambda^2 - 6\lambda = -5(-5\lambda - 6) - 6\lambda$

$\lambda^3 = 25\lambda - 6\lambda + 30 = 19\lambda + 30$

Every satisfies its characteristic equation

$\therefore\ A^3 = 19A + 30I$

27. The maximum value of $f(x) = x^3 - 9x^2 + 24x + 5$ in the interval [1, 6] is

(A) 21 (B) 25 (C) 41 (D) 46

Answer:- (C)

EXP:- Given, $f(x) = x^3 - 9x^2 + 24x + 5$

$f'(x) = 0$ for stationary values $\Rightarrow 3x^2 - 18x + 24 = 0 \Rightarrow x = 2, 4$

$f''(x) = 6x - 18;\ f''(2) = 12 - 18 < 0;\ f''(4) = 24 - 18 > 0$

Hence $f(x)$ has maximum value at x=2

$\therefore$ The maximum value is $2^3 - 9\times 2^2 + 24\times 2 + 5 = 25$

But we have to find the maximum value in the interval $[1, 6]$

$\therefore f(6) = 6^3 - 9\times 6^2 + 24\times 6 + 5 = 41$

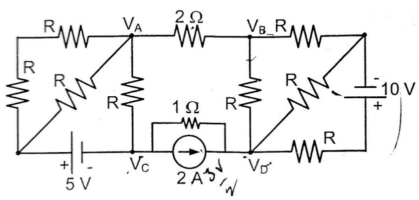
28. If $V_A - V_B = 6$ V, then $V_C - V_D$ is

(A) -5V

(B) 2V

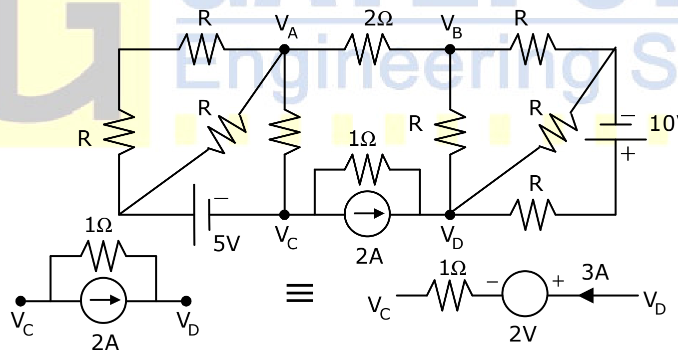
(C) 3V

(D) 6V



Answer:- (A)

Exp:- $I = \frac{V_A - V_B}{2} = \frac{6}{2} = 3A$; Since current entering any network is same as leaving in $V_C - V_D$ branch also it is I = 3A



$V_D = 2 + 3 + V_C = 5 + V_C;\ V_C - V_D = -5V$

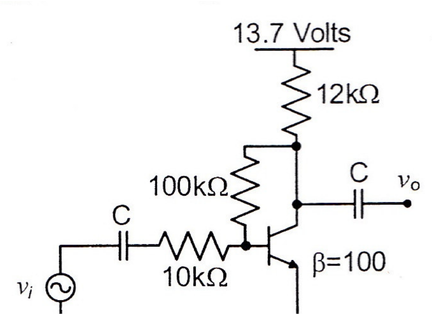
29. The voltage gain A_V of the circuit shown below is

(A) $|A_V| \approx 200$

(B) $|A_V| \approx 100$

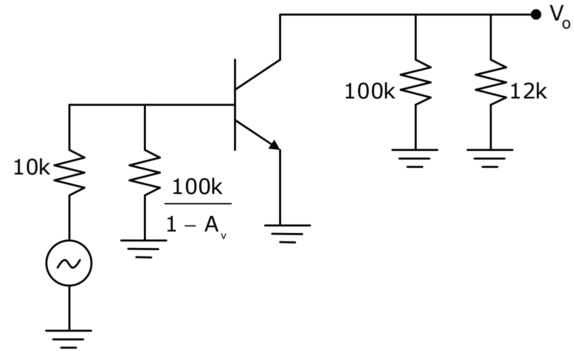
(C) $|A_V| \approx 20$

(D) $|A_V| \approx 10$



Answer:- (D)

Exp:-



KVL in input loop, $13.7 - (I_C + I_B)12k - 100k(I_B) - 0.7 = 0$

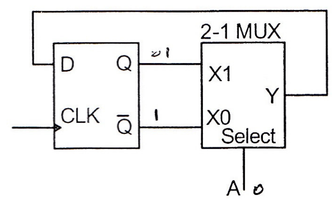
$\Rightarrow I_B = 9.9\mu A;\ I_C = \beta I_B = 0.99mA;\ I_E = 1mA$

$\therefore\ r_e = \frac{26mA}{I_E} = 26\Omega;\ z_i = \beta r_e = 2.6k\Omega;\ \therefore\ A_v = \frac{(100k\,||\,12k)}{26} = 412$

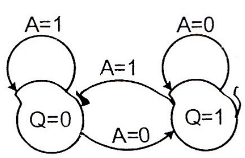
$z_i' = z_i\,||\left(\frac{100k}{1+412}\right) = 221\Omega;\ A_{vs} = A_v\frac{z_i'}{z_i'+R_s} = (412)\left(\frac{221}{221+10k}\right)$

$|A_{vs}| \approx 10$

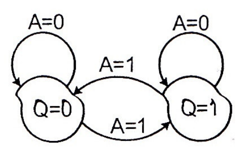
30. The state transition diagram for the logic circuit shown is



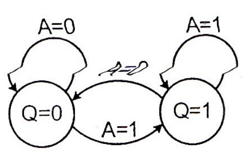
(A)



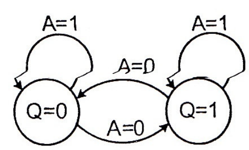
(B)



(C)

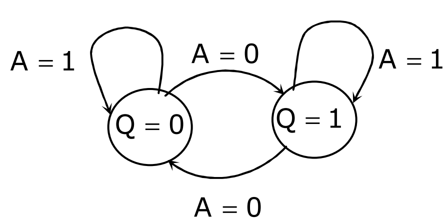


(D)



Answer:- (D)

Exp:- $\left.\begin{array}{l} A = 0,\quad y = Q \\ A = 1,\quad y = \overline{Q} \end{array}\right\}$ when ever $A = 1$, output gets into same state



whenever $A = 0$, output gets toggled

31. Let y[n] denote the convolution of h[n] and g[n], where h[n] = $(1/2)^n$ u[n] and g[n] is a causal sequence. If y[0] = 1 and y[1] = 1/2, then g[1] equals

(A) 0 (B) 1/2 (C) 1 (D) 3/2

Answer:- (A)

Exp:-

$$y[n] = \sum_{k=0}^{\infty} \left(\frac{1}{2}\right)^k g(n-k)$$

$$y[0] = \sum_{k=0}^{\infty} \left(\frac{1}{2}\right)^k g(-k) = 1$$

$$\Rightarrow \left(\frac{1}{2}\right)^O g(0) = 1$$

$$\Rightarrow g(0) = 1$$

Since g(n) is Causal sequence

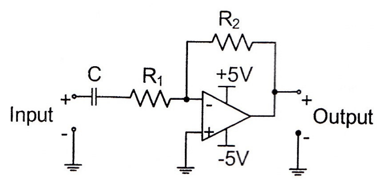
g(−1), g(−2),.................... = 0

$$y[1] = \sum_{k=0}^{\infty} \left(\frac{1}{2}\right)^k g[1-k]$$

$$\Rightarrow \left(\frac{1}{2}\right)^0 g[1] + \left(\frac{1}{2}\right)^1 g(0) = 1/2$$

$$g[1] = 0$$

32. The circuit shown is a



(A) low pass filter with $f_{3dB} = \frac{1}{(R_1 + R_2)C}$ rad/s

(B) high pass filter with $f_{3dB} = \frac{1}{R_1 C}$ rad/s

(C) low pass filter with $f_{3dB} = \frac{1}{R_1 C}$ rad/s

(D) high pass filter with $f_{3dB} = \frac{1}{(R_1 + R_2)C}$ rad/s

Answer:- (B)

Exp:- $$V_0(S) = -\left(\frac{R_2}{R_1 + \frac{1}{CS}}\right) \upsilon_1(s)$$

$$V_O(S) = -\frac{R_2 CS}{(R_1 CS + 1)} V_i(S)$$

Thus cutoff frequency is $\frac{1}{R_1 C}$ and the filter in high pass filter