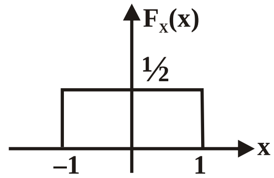
Solution of GATE-2012-Paper in Electronics&Communication-SET-D:

1. (B)



$$P\left(X \le \tfrac{1}{2}\right) = \int_{-1}^{1/2} \tfrac{1}{2}.dx = \frac{1}{2} \times \frac{3}{2} = \frac{3}{4}$$

For other Random Variable:

$$P\left(Y \le \tfrac{1}{2}\right) = \tfrac{3}{4}$$

$$\because P\left(Max\left[XY\right] \le \tfrac{1}{2}\right) = P\left(X \le \tfrac{1}{2}\right).P\left(Y \le \tfrac{1}{2}\right) = \frac{3}{4} \times \frac{3}{4} = \frac{9}{16}$$

2. (A) if $x = \sqrt{-1} = \text{i}$

Then the value of $\text{x}^{\text{x}} = \text{i}^{\text{i}} = \left(\cos\frac{\pi}{2} + i\sin\frac{\pi}{2}\right)^{i} = e^{\left(i\frac{\pi}{2}\right)^{i}} = e^{i^2\frac{\pi}{2}} = e^{-\pi/2}$

3. (C) $f(z) = \frac{1}{z+1} - \frac{2}{z+3} = \frac{z+3-2z-2}{(z+1)(z+3)} = \frac{1-z}{(z+1)(z+3)}$

Poles are $(z+1)(z+3) = 0$

$z = -1, -3$

Put only z = –1 is considered

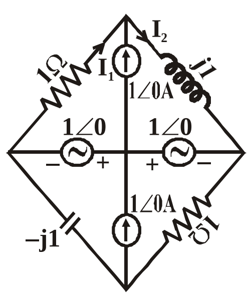
$$\text{Re}\,s(z=-1) = \underset{z\to -1}{Lt}(z+1)\,f(z)$$

$$= \underset{z\to -1}{\text{Lt}} \frac{(z+1)(1-z)}{(z+1)(z+3)} = \frac{2}{2} = 1$$

$$\frac{1}{2\pi j}\int \frac{(1-z)}{(z+1)(z+3)}dz = \frac{1}{2\pi j}\,2\pi j\left(\text{sum of periodic of poles lin within } |(z+1)| = 1\right)$$

$$= \frac{1}{2\pi j}2\pi j(1+0) = \frac{2\pi j}{2\pi j} = 1$$

4. (C)



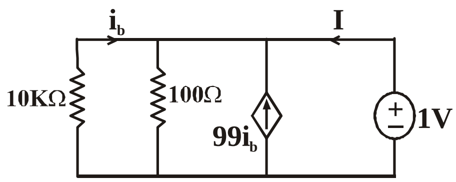
Since it is wheat stone bridge

So $\quad I_1.1 = I_2.j1 \quad \rightarrow (1)$

But $\quad I_1 + I_2 = 1 \quad \rightarrow (2)$

$\therefore \quad I_2.j1 + I_2 = 1 \Rightarrow \quad I_2 = \dfrac{1}{1+j} A$

5. (A)



$$I = \frac{1}{10\times10^3} + \frac{1}{100} - 99i_b \qquad \left\{ i_b = \frac{-1}{10\times10^3} \right.$$

$$= \frac{1}{10\times10^3} + \frac{99}{10\times10^3} + \frac{1}{100} = \frac{100}{100\times10^2} + \frac{1}{100} = \frac{2}{100} = \frac{1}{50}$$

$$R_{th} = \frac{1V}{I_0} = \frac{1}{1/50} = 50\Omega$$

6. (C) $G(s) = \dfrac{(s^2+9)(s+2)}{(s+1)(s+3)(s+4)}$

$x(t) = \sin \omega t$

$X(s) = \dfrac{\omega}{s^2+\omega^2}$

$Y(s) = X(s).G(s) = \dfrac{\omega}{s^2+\omega^2}.\dfrac{(s^2+9)(s+2)}{(s+1)(s+3)(s+4)}$

$e_{SS} = \lim\limits_{s\to0} SY(s) = \dfrac{s\omega}{s^2+\omega^2}.\dfrac{(s^2+9)(s+2)}{(s+1)(s+3)(s+4)}$

$= 0, \text{ if } \omega = 3$

7. (A) Prime implicants are

$\bar{x}\,y \;\&\; x\,\bar{y}$

x \ yz	00	01	11	10
0			1	1
1	1	1		

8. (C) $x[n] = \left(1/3\right)^{|n|} - \left(1/2\right)^n u[n]$

$x[n] = \left(1/3\right)^n u[n] + \left(1/3\right)^{-n} u[-n-1] - \left(1/2\right)^n u[n]$

$|z| > 1/3 \quad | \quad z| < 3 \qquad |z| > 1/2$

So $\quad ROC: \dfrac{1}{2} < |z| < 3$

9. (A) $\quad D = \dfrac{F(\theta)_{\max}}{F_{av}}$

$$F_{av} = \frac{P_{rad}}{4\pi}, \qquad P_{rad} = \int_0^{2\pi}\int_0^{\pi/2} \cos^4\theta \sin\theta d\theta d\phi$$

$$P_{rad} = 2\pi\int -t^4 dt = -2\pi\times\frac{1}{5}\cos^5\theta\Big|_0^{\pi/2} = -2\pi\times\frac{1}{5}(0-1) = \frac{2\pi}{5}$$

$$F_{av} = 1/20\pi, \quad F(\theta)_{\max} = 1$$

$$D = 10$$

$$D(in\,dB) = 10\log(10) = 10.0\,dB$$

10. No Answer is correct.

$$Z_0 = \frac{138}{\sqrt{\varepsilon_r}}\log\left(b/a\right) = \frac{138}{\sqrt{10.89}}\log\left(\frac{2.4}{1}\right) = 41.8\times 0.875 = 15.8\Omega$$

11. (D) *If* $p_1 = p_2 = p$ *then*

$$H_1 = p\log_2 1/p + p\log_2 1/p + p_3\log_2 1/p_3 + ----$$

If $p_1 = p+\varepsilon,\ p_2 = p-\varepsilon$ *then*

$$H_2 = (p+\varepsilon)\log_2\left(1/p+\varepsilon\right) + (p-\varepsilon)\log_2\frac{1}{(p-\varepsilon)} + p_3\log_2 1/p_3 + ---$$

$$= -(p+\varepsilon)\log_2(p+\varepsilon) - I(p-\varepsilon)\log_2(p-\varepsilon) + p_3\log_2 1/p_3 + ---$$

By Comparing H1 & H_2 value it is clear that H_2 value is decreased.

12. (A): It is a clamper circuit. Can be solved by trick also. In positive half output will be zero across diode. And in negative it will have maximum value of -2 Volt .

So $In + ve\,half\ \ Y = 0$

$In\ -ve\,half\ \ Y = -2$

So only option left is

$coswt - 1$

13. (A) N–MOS:

Series $\rightarrow$ AND

Parallel $\rightarrow$ OR

P–MOS:

Series $\rightarrow$ OR

Parallel $\rightarrow$ AND

So Y= $\overline{((A+B).C)} = \bar{A}\bar{B} + \bar{C}$

14. (D) Initial condition $x(1) = 0.5$

$$t\frac{dx}{dt} + x = t \Rightarrow \frac{dx}{dt} + \frac{1}{t}x = 1 \quad \Rightarrow$$ It is of linear form.

$$P = \frac{1}{t} \quad Q = 1$$

$$I.F = e^{\int \frac{1}{t}dt} = e^{\ln t} = t$$

Solution is given by

$$x(I.F) = \int \theta(I.F)dt + C \Rightarrow xt = \int 1.t.dt + C \Rightarrow xt = \frac{t^2}{2} + C$$

$x(t) = 0.5$ when t = 1 x = 0.5

$$1.0.5 = \frac{1^2}{2} + C \Rightarrow 1.\frac{1}{2} = \frac{1}{2} + C \Rightarrow \qquad C = 0$$

The solution is $xt = \frac{t^2}{2} \Rightarrow x = \frac{t}{2}$

15.(D) $f(t) \to F(s)$

$$t\, f(t) \to \frac{-dF(s)}{ds}$$

$$\frac{d}{ds}\left(\frac{1}{s^2+s+1}\right) = \frac{(s^2+s+1).0 - 1(2s+1)}{(s^2+s+1)^2}$$

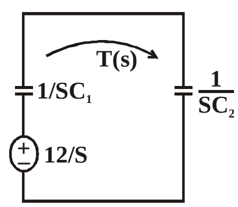
$$\frac{-dF(s)}{ds} = \frac{(2s+1)}{(s^2+s+1)^2}$$

16. (B) $I_{rms} = \frac{5}{\sqrt{2}}$ & R = 4Ω

$$P_{av}: \quad {I_{rms}}^2.R = \left(\frac{5}{\sqrt{2}}\right)^2 \times 4 = \frac{25}{2} \times 4 = 50W$$

17. (D) $V_{C_1}(0^-) = 12V = V_{C_1}(0^+)$

$$V_{C_2}(0^-) = 0V$$



In s-domain

$$\frac{12}{S} = \left(\frac{1}{SC_1} + \frac{1}{SC_2}\right) I(s) \Rightarrow I(s) = \frac{12C_1C_2}{C_1+C_2} \Rightarrow i(t) = \frac{12C_1C_2}{C_1+C_2}\delta(t)$$

18. (D) $i = \begin{cases} \frac{V-0.7}{500} A & ; V \ge 0.7V \\ 0A & ; V < 0.7V \end{cases}$

$$i = \frac{V-0.7}{500} A \Rightarrow V = 500i + 0.7$$

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

$$1000i = 10 - 500i - 0.7 \Rightarrow 1500i = 9.3 \Rightarrow i = \frac{9.3}{1500} = 6.2\,mA.$$

19. (B)

Input A		Input B	
0	0	0	0
0	0	0	1
0	0	1	0
0	0	1	1
0	1	0	0
0	1	0	1
0	1	1	0
0	1	1	1
1	0	0	0
1	0	0	1
1	0	1	0
1	0	1	1
1	1	0	0
1	1	0	1
1	1	1	0
1	1	1	1

These are the 6 cases in which A is greater than B.

20.(A) It is not JK Latch So No chance of Race around condition.

21. (A) $\vec{E} = 10(\hat{a}_y + j\hat{a}_z)e^{-j25x}$

$$|E_1| = |E_2| = 10, \delta = +\frac{\pi}{2}$$

$$\beta = 25 = \frac{2\pi}{\lambda} \Rightarrow \lambda = \frac{2\pi}{25} = \frac{c}{f} \Rightarrow f = \frac{25\times 3\times 10^8}{2\pi} = 1.2GHz$$

22. (C) If wave is incident on a perfect conductor then electric field component will be reversed.

23. (C) $\alpha = 0.75 \rightarrow$ Roll off factor

$$f_s = \frac{2}{1+\alpha}\times f = \frac{2}{1.75}\times 3500 = 2\times 2000 = 4000$$

24. (C) $R_{XX}(\tau) = \frac{1}{2\pi}\int_{-\infty}^{\infty}\delta_{XX}(\omega).e^{j\omega\tau}d\omega$

$$R_{XX}(0) = \frac{1}{2\pi}\underbrace{\int_{-\infty}^{\infty}\delta_{XX}(\omega)d\omega} = E\left[X^2(t)\right]$$

$$\frac{1}{2\pi}\times 2\underbrace{\int_{0}^{\infty}\delta_{XX}(\omega)d\omega}_{\substack{\downarrow\\ area}} = \frac{1}{\pi}\times\underbrace{\int_{0}^{\infty}\delta_{XX}(\omega)d\omega}_{\substack{\downarrow\\ area}}$$

$$R_{XX}(0) = \frac{1}{\pi}\times(Area\ of\ \Delta + Delta\,value)$$

$$R_{XX}(0) = \frac{1}{\pi}\times\left(\frac{1}{2}\times 10^3\times 2\times 6 + 400\right) = \frac{6400}{\pi}$$

25. (C) $r_\pi = \dfrac{h_{fe}}{g_m} = \dfrac{h_{fe}}{I_c} \times V_T \Rightarrow r_\pi = \dfrac{V_T}{i_b} = \dfrac{26mV}{1.1mA} \approx 25\Omega$

26. (B) $Z = \begin{bmatrix} -5 & -3 \\ 2 & 0 \end{bmatrix}$ $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

$$A^2 = \begin{bmatrix} -5 & -3 \\ 2 & 0 \end{bmatrix}\begin{bmatrix} -5 & -3 \\ 2 & 0 \end{bmatrix} = \begin{bmatrix} 25-6 & 15 \\ -10 & -6 \end{bmatrix} = \begin{bmatrix} 19 & 15 \\ -10 & -6 \end{bmatrix}$$

$$A^3 = A^2 - A = \begin{bmatrix} 19 & 15 \\ -10 & -6 \end{bmatrix}\begin{bmatrix} -5 & -3 \\ 2 & 0 \end{bmatrix} = \begin{bmatrix} -95+30 & -57 \\ 50-12 & 30 \end{bmatrix} = \begin{bmatrix} -65 & -57 \\ 38 & 30 \end{bmatrix}$$

$$A^3 = 19\begin{bmatrix} -5 & -3 \\ 2 & 0 \end{bmatrix} + 30\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} -95 & -57 \\ 38 & 0 \end{bmatrix} + \begin{bmatrix} 30 & 0 \\ 0 & 30 \end{bmatrix} = \begin{bmatrix} -65 & -57 \\ 38 & 30 \end{bmatrix}$$

27. (C) $f(x) = x^3 - 9x^2 + 24x + 5$

$f'(x) = 3x^2 - 18x + 24$

$f'(x) = 0 \Rightarrow \quad 3x^2 - 18x + 24 = 0 \Rightarrow \quad x^2 - 6x + 8 = 0 \Rightarrow \qquad x^2 - 2x - 4x + 8 = 0$

$x(x-2) - 4(x-2) = 0$

$(x-2)(x-4) = 0 \Rightarrow \quad x = 2, 4$

But 2, 4 lies inside the interval

$f''(x) = 6x - 18$

$at\ x = 2$

$f''(x) = 12 - 18 = -6 < 0$ max $at\ x = 2$

$But\ \ at\ \ x = 4$

$f''(x) = 24 - 18 = 6 > 0$ min $at\ \ x = 4$

But $\quad f(1) = 1^3 - 9.1^2 + 24.1 + 5 = 1 - 9 + 24 + 5 = 30 - 9 = 21$

$f(2) = 2^3 - 9.2^2 + 24.2 + 5 = 8 - 36 + 48 + 5 = 8 + 12 + 5 = 25$

$f(6) = 6^3 - 9.6^2 + 24.6 + 5 = 216 - 324 + 144 + 5 = 365 - 324 = 41$

So the maximum value is 41.

28. (A) Current in 2 ohm resistor between A&B will be 3 Amp only. Current entering at node D will be also 3 A only. So current in 1 ohm resistor will be 5 Amp only. So V_D-V_c= 5Volt

29. (D) $A_v = \dfrac{-R_f}{R_s} = \dfrac{-100}{10} = -10$

$|A_v| = 10$

30. (D) $y = A \odot Q$

31. (A) $y(n) = g(n) \otimes h(n); h(n) = \left(\dfrac{1}{2}\right)^n u(n);$

By putting values

$y(n) = \left(\dfrac{1}{2}\right)^n u(n)$

$\Rightarrow \quad g(n) = \delta(n) \quad \Rightarrow \quad \boxed{g(1) = 0}$

32. (B) It is a high pass filter with R_1 and C.
33. (D)

$$\frac{m\pi}{a} = \frac{m\pi}{3} = 2.094 \Rightarrow m = 2$$

$$\frac{n\pi}{b} = \frac{n\pi}{1.2} = 2.618 \Rightarrow n = 1$$

So Mode will be TE_{21}

Just Calculate cut-off frequency for TE_{21} mode and

$\omega = 6.28 \times 10^{10}$ *is given*

Here $f < f_c$

So No wave propogation and hence $V_p = 0$

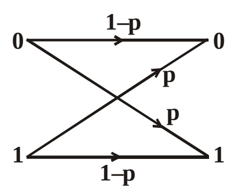
34. (B) $\theta_i = \omega_c t + k_f \int_0^t m(t)dt \Rightarrow \Delta\theta = k_f \int_0^t m(t)dt \rightarrow FM$

$$\theta_i = \omega_c t + k_p m(t) \Rightarrow \Delta\theta = k_p m(t) \rightarrow PM$$

$$so\ k_p m(t) = 2\pi k_f \int_0^t m(t)dt \left(Due\ to\ radian\ unit\right)$$

$$\Rightarrow \frac{k_p}{k_f} = \frac{2\pi\left(\int_0^t m(t)dt\right)_{\max}}{m(t)_{\max}} = \frac{2\pi \times 4}{2} = 4\pi$$

35. (B)



$$p_{10} = \frac{P(y=1)}{P(x=0)} = p$$

$$p_{01} = \frac{P(y=0)}{P(x=1)} = p$$

$P(x=0) = 9/10 \qquad P(y=1) = 1/8 \times 9/10$

$P(x=1) = 1/10 \qquad P(y=0) = 1/10 \times 1/8$

$$P[Y/X] = \begin{Bmatrix} 1-p & p \\ p & 1-p \end{Bmatrix}$$

Here error means o/P Y will have 1 & i/p sent at X is 0

So $P_e = P(X=0).(1-p)$

$$= \frac{9}{10} \times \frac{7}{8} = \frac{63}{80}$$

36. (A) Here M_1 will be in linear region then M_2 will be either in cut-off or saturation

V_{in}	V_{out}	M_1	M_2
$< 1V$	V_{OH}	*Cut off*	*Linear*
V_{IL}	*High (Variable)*	*Satur*	*Linear*

$V_{IL} = \frac{2.V_{out} + V_{Tp} - V_{DD} + V_{Th}}{2}$ (By derivation)

V_{out} will be high but $less\, than V_{DD}$

$V_{TP} = -V_{Th}$ $\quad So\;\; V_{IL} = \frac{2V_{out} - V_{DD}}{2}$

37. (C) The required toss will be odd 1th, 3th, 5th, 7th, --------

Probability of getting heard $= \frac{1}{2}$

Probability of getting toil $= \frac{1}{2}$

Probability of required thus odd

$$\frac{1}{2} + \frac{1}{2}\times\frac{1}{2}\times\frac{1}{2} + \frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2} + \frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2} ------$$

$$= \frac{1}{2} + \frac{1}{2^3} + \frac{1}{2^5} + \frac{1}{2^7} + -----$$

= sum of infinite G.P

$= {}^{a}\!/_{1-r}$ $\quad$ a = first term

r = comon ratio

$$= \frac{\frac{1}{2}}{1 - \frac{1}{2^2}} = \frac{\frac{1}{2}}{1 - \frac{1}{4}} = \frac{1}{2\times 3}\times 4 = {}^{2}\!/_{3}$$

38. (A) $|A| = Kr^n$

Where $r = xi + y\hat{j} + z\hat{k}$

$r^2 = x^2 + y^2 + z^2$

$r = \left(x^2 + y^2 + z^2\right)^{1/2}$

$|A| = K\left(x^2 + y^2 + z^2\right)^{n/2}$

$A = K\left(xi + y\hat{j} + z\hat{k}\right)^n$

$\nabla.A = 0$

$\nabla.\vec{A} = \frac{1}{r^2}\frac{\partial}{\partial r} r^2 A_r$

$= K(n+2)\left(xi + y\hat{j} + zk\right)^{n-1} = 0$

$For\;\; \nabla.\vec{A} = 0$

$n = -2$

39. (D) $s^2 y(s) - sy(0) - y'(0) + 2sy(s) + 2y(0) + y(s) = 1$

$s^2 y(s) + 28 + 0 + 2sy(s) + 4 + y(s) = 1$

$$y(s)\left(s^2+2s+1\right)=-\left(2s+3\right)$$

$$y(s)=\frac{-(2s+3)}{(s+1)^2}=\frac{A}{s+1}+\frac{B}{(s+1)^2}$$

$$B=-(2s+3)\Big|_{s=-1}=-\left(-2+3\right)=-1$$

$$A=-\frac{d}{ds}\left(2s+3\right)\Big|_{s=-1}=-2$$

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

$$\frac{dy(t)}{dt}=2e^{-t}-\left[t.e^{-t}.1+e^{-t}\right]=2e^{-t}+te^{-t}-e^{-t}$$

$$\frac{dy(t)}{dt}\Big|_{t=0^+}=2+0-1=1$$

40. (A)

41. (D) For controllability

Matrix $y(c)=\left[B:AB:A^2B\right]$

Because order of A is 3 × 3

$$y(c)=\begin{bmatrix}0 & : & 0 & : & 0 & 0 & a_1a_2\\ 0 & : & a_2 & : & a_2a_3 & 0 & 0\\ 1 & : & 0 & : & 0 & a_1a_3 & 0\end{bmatrix}_{3\times5}$$

For controllable rank of y(c) matrix should be (3)

(a) $a_1\neq0:a_2=0;a_3\neq0\Rightarrow$ then rank of y(c) = 2

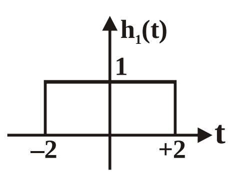
(b) $a_1=0;a_2\neq0;a_3\neq0\Rightarrow$ rank of y(c) = 2

(c) $a_1=0;a_2\neq0;a_3=0\Rightarrow$ Rank of y(c) = 2

(d) $a_1\neq0;\ a_2\neq0;\ a_3=0\Rightarrow$ Rank y(c) = 3

42. (C) $H\left(j\omega\right)=\dfrac{2\cos\omega.\sin2\omega}{\omega}$

$$H_1\left(j\omega\right)=\int_{-2}^{2}2.e^{-j\omega t}dt$$



$$H_1\left(j\omega\right)=\frac{e^{-2j\omega}-e^{+2j\omega}}{-j\omega}=\frac{2\sin2\omega}{\omega}$$

$$h(t)=\frac{h_1\left(t-\frac{1}{2}\right)+h_1\left(t+\frac{1}{2}\right)}{2}$$

$$h(0)=\frac{h_1\left(-\frac{1}{2}\right)+h_1\left(\frac{1}{2}\right)}{2}$$

$$=\frac{1+1}{2}=1$$

43. (A) 1 + G(s) H(s) = 0

$$s^3 + as^2 + (2+K)s + k + 1 = 0$$

$$\left.\begin{array}{lll} s^3 & 1 & 2+K \\ s^2 & a & 1+K \\ s^1 & a(2+K)-(1+K) & 0 \\ s^0 & 1+K & \end{array}\right\}$$

for oscilatory system

s^1 Row = 0

$$a = \frac{1+K}{2+K} \quad \text{—(1)}$$

$$as^2 + 1 + K = 0$$

$$-a\omega^2 + (1+K) = 0$$

$$-4a + (1+K) = 0; \qquad a = \frac{1+K}{4} \quad \text{—(2)}$$

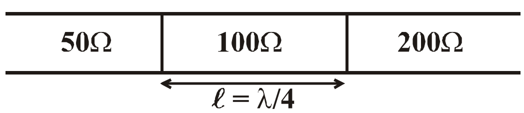
From (1) & (2)

$$\frac{1+K}{4} = \frac{1+K}{2+K} \Rightarrow 2+K = 4; \quad \boxed{K=2}$$

$$a = \frac{2+1}{4} = \frac{3}{4} = 0.75$$

44. (D) It is time variant as well as unstable.

45. (C)



$$Z_i = \frac{Z_0^{\,2}}{Z_R} \qquad \therefore \; Z_0 = \sqrt{Z_i . Z_R}$$

So length of T/m line will be order of λ/4

For 429 MHz $\rightarrow \lambda = \frac{3\times10^8}{4.29\times10^8} = 0.6993\,met$

For $1GHz \rightarrow \lambda = \frac{3\times10^8}{1\times10^9} = 0.3\,met$

Possible lengths for 429 MHz will be:

0.6993/4=0.175 (Basic length)

0.175 ,0.525,0.875,1.225, 1.575…….

Possible lengths for 1MHz will be:

0.3/4=0.075 (Basic length)

0.075 ,0.225,0.375,0.525,0.675,0.825,0.975,1.125,1.275,1.425,1.575…

So length of desired transmission line will be 1.575 m

46. (B)

P_e (min^m) for BPSK

$$= \frac{1}{2} erfc\sqrt{\frac{E_b}{N_o}\cos^2\phi} = Q\sqrt{\frac{2E_b}{N_o}\cos^2\phi}$$

Here $\phi = 45^o$

$$P_e\left(\min^m\right) = Q\sqrt{\frac{2E_b}{N_o}\times\frac{1}{2}} \quad = Q\sqrt{\frac{E_b}{N_o}}$$

47. (D) $n_i = 10^{10}/cm^3$

Dopant density = $10^{19}/cm^3$

So value of n will be greater than 10^{19}

$n.p = n_i^2 = 10^{20}$

$p = \frac{10^{20}}{10^{19}} = 10$

Within this volume vale of holes will be neglected.

48. (A)

Source body capacitance

$C_{sb} = \frac{\varepsilon_{si}.l_s.w}{l_{depletion}} = \frac{11.7\times 8.9\times 10^{-12}\times 0.2\times 10^{-6}\times 1\times 10^{-6}}{10\times 10^{-9}} = 2\times 10^{-15}F = 2\,fF$

$d \rightarrow width\ of\ gate\ drain\ source\ overlap$

$l_s \rightarrow Length\ of\ source$

49. (A)

Gate source overlap capacitance

$C_{ov} = \frac{\varepsilon_{0x}.d.w}{t_{ox}}$

$d \rightarrow width\ of\ gate\ drain\ source\ overlap$

$w \rightarrow width\ of\ transistor$

$t_{ox} \rightarrow oxide\ thikness$

$C_{ov} = \frac{3.9\times 8.9\times 10^{-12}\times 20\times 10^{-9}\times 10^{-6}}{1\times 10^{-9}} = 694.2\times 10^{-18}F$

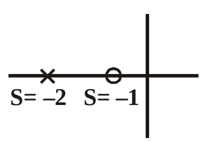
$= 0.694\times 10^{-15}F$

$= 0.7\,fF\,(1\,fF = 10^{-15}F)$

50. (B)

51. (C)

52. (A)



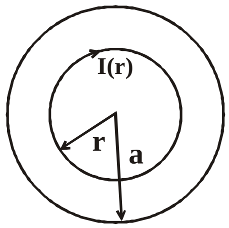
Zero is nearer to origin in case of phase lead compensator

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

53. (A) $\omega_m = \frac{1}{T\sqrt{\alpha}}$; $\alpha = \frac{1}{2}$; $T = 1$ in given Que[n]

$\omega_m = \frac{1}{T\sqrt{1/2}} = \sqrt{2}$ rad/sec.

54. (C) If r < a



$$\oint \bar{H}.\overline{dl} = I(r)$$

Here $I(r) = \dfrac{I \times \pi r^2}{\pi a^2}$

$$H.2\pi r = \frac{I \times \pi r^2}{\pi a^2}$$

$$H = \frac{I \times r}{2\pi a^2}, \ r < a$$

$if \ \ r > a$

$$\oint \bar{H}.\overline{dl} = I$$

$$H \times 2\pi r = I$$

$$H = I/2\pi r, \ r > a$$

55. C

56. (B)

57. (B)

58. (D) $(1.001)^{1259} = 3.52$

$$(1.001)^{2062} = 7.85$$

$$(1.001)^{1259}.(1.001)^{2062} = (1.001)^{3321} = 3.5 \times 7.85 = 27.632$$

59. (C)

60. (D)

61. (D) % of the monthly budget not spent on saving = $\dfrac{10500 - 1500}{10500} \times 100 = 86\%$

62. (C)

63. (A)

64. (A) Let number of

Let 20 note = x

10 note = y

x + y = 14

$20x + 10y = 230$ —(1)

$20x + 20y = 280$ —(2)

$-10y = -50 : \boxed{y = 5}$

65. (A)