Q.P. 27543

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**Questions should be —**
**WRITTEN IN LEGIBLE HANDWRITING IN BLACK INK.**
**SIGNS, SKETCHES OR FIGURES IF ANY BE DRAWN IN NEAT BLACK INK,**
so as to avoid mistakes in the printed question papers.

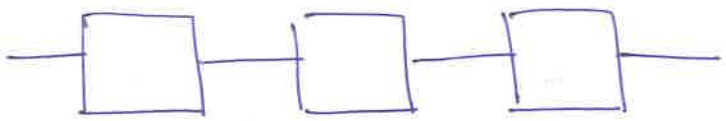
Duration .....03..... Hours. Total Marks assigned to the paper .....80

Q. No.

N.B. :

Solution for (1) Marks
SE | SEM IV | CBSGS
(Elect + Electronics)
(FDC)

(1)
(2)



$(NF)_1 = 10\ dB$ $(NF)_2 = 10\ dB$ $(NF)_3 = 10\ dB$

$A_1 = 20\ dB$ $A_2 = 20\ dB$ $A_3 = 20\ dB$

$(NF_1) = 10 \log (F_1)$

$\therefore 10 = 10 \log (F_1)$

$\therefore F_1 = 10^1 = F_2 = F_3 = 10$

$(A_1)_{dB} = 20 \log (A_1)$

$\therefore 20 = 20 \log A_1$

$\therefore A_1 = A_2 = A_3 = 10$

$\therefore F_T$ = Total Noise Factor

$$= F_1 + \frac{(F_2 - 1)}{A_1} + \frac{(F_3 - 1)}{A_1 A_2}$$

$$= \frac{10}{10} + \frac{9}{(10)(10)} + \frac{9}{(10)(10)(10)}$$

$$= 1 + 0.09 + 0.009$$

$$= 10 + \frac{9}{10} + \frac{9}{100}$$

$$= 10 + 0.9 + 0.09$$

$$= 10.99$$

$\therefore$ **$F_T = 10.99$**

$(NF)_T = 10 \log F_T$

$= 10 \log (10.99)$

$\therefore$ **$(NF)_T = 10.409\ dB$**

Q. No. | Marks

(2)(b) $f_c = 10\,MHz$

$P_c = 60\,KW$

$f_{m_1} = 300\,Hz$ $\quad m_1 = 0.5$

$f_{m_2} = 1\,KHz$ $\quad m_2 = 0.4$

(i)

$$m_T = \sqrt{m_1^2 + m_2^2}$$

$$= \sqrt{0.5^2 + 0.4^2}$$

$$= \sqrt{0.41}$$

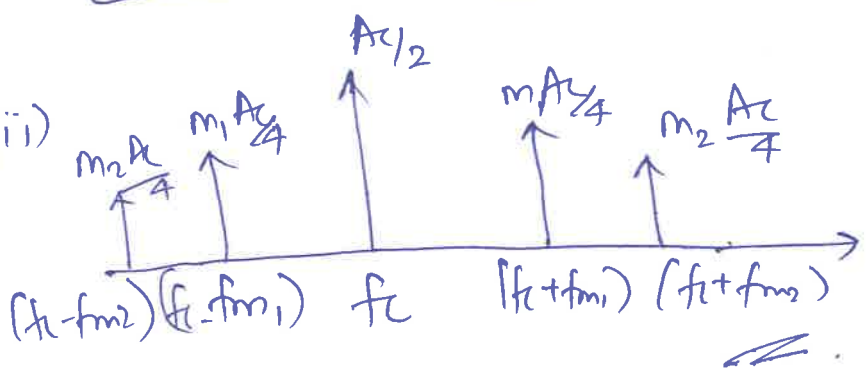
$$\boxed{m_T = 0.64}$$

(ii) $$P_t = P_c\left(1 + \frac{m_T^2}{2}\right)$$

$$= 60\times10^3\left(1 + \frac{0.64^2}{2}\right)$$

$$\boxed{P_t = 72.28\,KW}$$

(iii)



| Q. No. | | Marks |
|---|---|---|

Q. 3.

(a) $x(t) = 20\cos(2\pi 10^4 t) + 5\cos(2\pi @20)t)$

→ Minimum Sampling rate

$f_s = 2f_m$

$= 2 f_{max}$

$= 2 \times 10^4$ Hz

$f_s = 20$ KHz

→ Ideal cut off frequency of Anti-aliasing filter

~~$f_s = 35$ KHz~~ $f_s = 35$ KHz

~~$f_c = 2 f_{max}$~~

~~$f_{max}$~~

~~$= 2 * 35K$~~

~~$f_s = f_c$~~

$f_c = \frac{f_s}{2}$

$= \frac{35}{2}$

$\therefore f_c = 17.5$ KHz

Q. No. | Marks

Q.5.

(a) $f_s = 1100\ KHz$

$f_l = 1550\ KHz$

$Q = 100$

(i) $IF = f_l - f_s$

$= 1550 - 1100$

$= 450$

$IF = 450\ KHz$

$f_{si} = f_s + 2IF$

$= 1100 + 2 \times 450$

$= 1100 + 900$

$f_{si} = 2000\ KHz$

$IRR = \sqrt{1 + \epsilon^2 Q^2}$

$\rho = \frac{f_{si}}{f_s} - \frac{f_s}{f_{si}} = \frac{2000}{1100} - \frac{1100}{2000}$ (5.5)

$= 1.81 - 0.55$

$= 0.26$

$\therefore IRR = \sqrt{1 + (0.26)^2 (100)^2}$

$= \sqrt{676 \times 100 \times 100 \times 10^{-4}}$

$IRR = 26$

5 9113 (letter)

T 2224 / SE SEM IV / CBSGS
T 1098 / FOC

(11) $f_s = 20\ MHz$

~~$If = f_l = f_s$~~

~~$= IF$~~

$IF = 450\ KHz$

$f_{si} = f_s + 2IF$

$= 20 \times 10^6 + 2 \times 450K$

$= 20M + 900K$

$= 20M + 0.9M$

$f_{si} = 20.9\ M$

$\rho = \frac{f_{si} - f_s}{f_s\ f_{si}}$

$= \frac{20.9}{20} - \frac{20}{20.9}$

$= \frac{10.45}{10} - \frac{D.9}{\cancel{200}\ 209}$

$= 1.045 - 0.9$

$\rho = 0.045$

$IRR = \sqrt{1 + t^2 \rho^2}$

$= \sqrt{1 + (0.045)^2 \times (100)^2}$ $= \sqrt{2025 \times 10^{-6} \times 10^4}$

$= \sqrt{2025 \times 10^{-2}}$

$= 45 \times 10^{-1}$

$\therefore IRR = 4.5$