یا غیب

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۹۸۱۴۳۵۰۳

#1 $\begin{cases} S_x = 1 \text{ Watt} \\ \mu_1 = 0.25 \\ S_T = 200 \text{ Watt} \\ N_0 = 2 \times 10^{-5} \\ W = 4 \text{ KHZ} \end{cases}$

$$\left(\frac{S}{N}\right)_{D_1} = \frac{\mu_1^2 S_{x1}}{1+\mu_1^2 S_{x1}} \times \frac{S_{R1}}{N_{01} W_1}$$

$$\left(\frac{S}{N}\right)_{D_2} = \frac{\mu_2^2 S_{x2}}{1+\mu_2^2 S_{x2}} \times \frac{S_{R2}}{N_{02} W_2}$$

$$\left(\frac{S}{N}\right)_{D_1} = \left(\frac{S}{N}\right)_{D_2} \quad \frac{\mu_1^2 S_{x1}}{1+\mu_1^2 S_{x1}} \times \frac{S_{R1}}{N_{01} W_1} = \frac{\mu_2^2 S_{x2}}{1+\mu_2^2 S_{x2}} \times \frac{S_{R2}}{N_{02} W_2}$$

$$\Rightarrow \frac{(0.25)^2 \times 1}{1+(0.25)^2 \times 1} \times \frac{S_{R1}}{N_{01} \times 4} = \frac{\mu_2^2 \times 1}{1+\mu_2^2 \times 1} \times \frac{S_{R2}}{N_{02} \times 5} \Rightarrow \frac{1}{4} \times \frac{0.0625}{1.0625} = \frac{\mu_2^2}{1+\mu_2^2}$$

$$\Rightarrow \mu_2 = 0.12$$

#2 $\begin{cases} S_T = 100 \text{ Watt} \\ S_x = 0.5 \\ W = 5 \text{ KHZ} \\ N_0 = 10^{-5} \\ \mu = 0.5 \end{cases}$

$$\left(\frac{S}{N}\right)_D = \frac{\mu^2 S_x}{1+\mu^2 S_x} \times \frac{S_R}{N_0 W} = \frac{0.25 \times 0.5}{1 \times 0.25 \times 0.5} \times \frac{120}{10^{-5} \times 5 \times 10^3} = 266.66$$

$$\left(\frac{S}{N}\right)_D = \frac{0.5\mu^2}{1+0.5\mu^2} \times \frac{120}{10^{-5} \times W} = 266.66$$

$$\Rightarrow \mu_{max} = 1 \Rightarrow \frac{0.5 \times 1}{1+0.5} \times \frac{120}{10^{-5} \times W} = 266.66$$

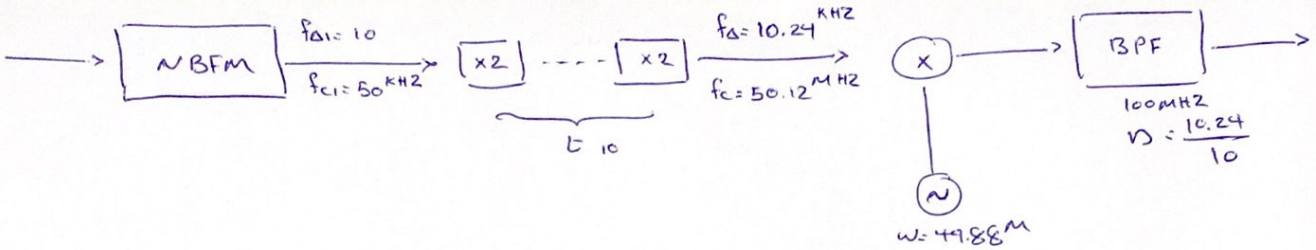
$$\Rightarrow W = 15^{KHZ}$$

#3 $\begin{cases} f_\Delta = 10^{HZ} \\ f_{c1} = 50^{KHZ} \end{cases}$, $L = 10dB \rightarrow S_R = 10$ watt, $\begin{cases} \left(\frac{S}{N}\right)_D = 100 \\ f_c = 100^{M} \end{cases} \rightarrow S_x = \frac{1}{2}$, $N_0 = 10^{-5}$

$$S_T = \frac{A_c^2}{2} = 10 \times 10 = 100 \quad , \quad \left(\frac{S}{N}\right)_D = 3D^2 S_x \gamma \Rightarrow D = \sqrt{\frac{100 \times 10^{-5} \times 10^4}{3 \times 10 \times \frac{1}{2}}}$$

$$\Rightarrow S_R > N_0 W (20(D+1)) = 4$$

$$f_\Delta = D \times W = 10 \text{ KHZ} \Rightarrow n = \frac{f_\Delta}{f_{\Delta_1}} = 10^3 \Rightarrow 2^m > 10^3 \Rightarrow m = 10$$



#4

$S_x = 1$
$W = 10^4$
$N_0 = 10^{-6}$
$L = 100\ dB$
$f_c = 100\ MHZ$
$f_\Delta = 150\ KHZ$

$D = \frac{f_\Delta}{W} = \frac{150}{10} = 15$

$\gamma \geq \gamma_{th} = 2(D+2) \Rightarrow S_R = 20(D+2) N_0 W =$

$S_R = 20(17) \times 10^{-6} \times 10^4 = 3.4\ watt$

$(\frac{S}{N})_D = 60\, D^2 (D+2) S_x = 60 \times 15^2 (15+2) \times 1 = 229500$

#5

$S_T = 1\ W$
$W = 400^{KHZ}$
$S_x = 0.2$
$f_\Delta = 2.4\ MHZ$
$\gamma_n = 20\gamma_0$
$\alpha = 10\ \frac{dB}{km}$
$(\frac{S}{N})_D = 10^4$
$B_{de} = 5^{M}$

$D = \frac{f_\Delta}{W} = 6$

$\gamma \geq 20(D+2) = 160$

$(\frac{S}{N})_D = 10^4 = 3 D S_n \gamma \Rightarrow \gamma = \frac{10^4}{3 D S_n} = 463$

$\frac{S_R}{N \cdot W} = 463 \Rightarrow S_R = 463 \times 8 \times 10^{-20} \times 400 \times 10^3 = 4 \times 10^{-10}$

$S_T = S_R \times L \Rightarrow L = \frac{S_T}{S_R} = \frac{100}{4 \times 10^{-10}} = 25 \times 10^{10} = 114\ dB$

$L = 114\ dB = 10^x \Rightarrow x = 11.4^{km}$

$S_R > 160\, N_0 W = 160 \times 8 \times 10^{-2} \times 400 \times 10^3 = 5.27 \times 10^{-12} \Rightarrow L = \frac{S_T}{S_R} = \frac{100 \times 10^{12}}{5.27} = 2 \times 10^{12}$

$= 133 \Rightarrow L = 133 = 10^x \Rightarrow x = 13.3^{km}$

#6

$f_c = 70$ to 77^{MHZ}
$f_{IF} = 1^{MHZ}$
$f_{IF} = 10^{MHZ}$

if $f_c = 70 - 77^{MHZ}$, $F_{IF} = 1^{MHZ}$ $\rightarrow$
$F_{LO} = f_c + f_{IF} = 71 - 81\ MHZ$
$f_c = f_c + 2F_{IF} = 72 - 79\ MHZ$

if $70 - 77^{MHZ}$, $F_{IF} = 1^{MHZ}$ $\rightarrow$
$f_{LO} = f_c + f_{IF} = 80 - 87\ MHZ$
$f_c = f_c + 2f_{IF} = 90 - 97\ MHZ$