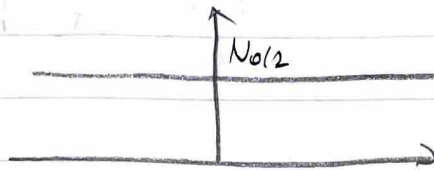


Kemal Yöğür Daskiran  
060210034

2)  $N_0 = 10^{-20} \text{ W/Hz}$

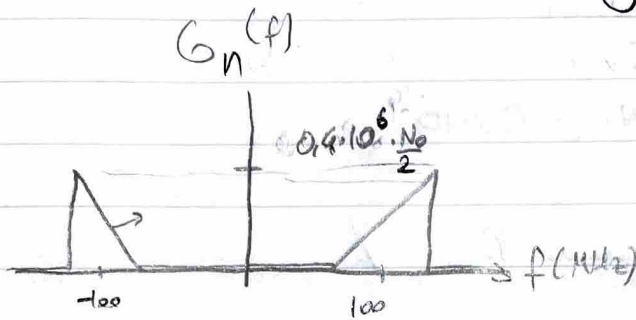
a)



$$|H(f)|^2 = |f| - 99.8 \cdot 10^6$$

$$G_{nw}(f) \cdot |H(f)|^2 = G_n(f)$$

$$P_n = \int_{-\infty}^{\infty} G_n(f) df$$

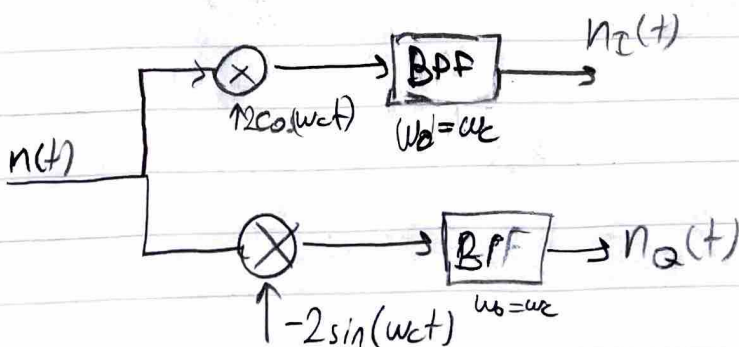


$$P_n = \frac{N_0}{2} \left[ \int_{-100 \cdot 2 \cdot 10^6}^{-99.8 \cdot 10^6} (-f - 99.8 \cdot 10^6) df + \int_{99.8 \cdot 10^6}^{100 \cdot 2 \cdot 10^6} (f - 99.8 \cdot 10^6) df \right]$$

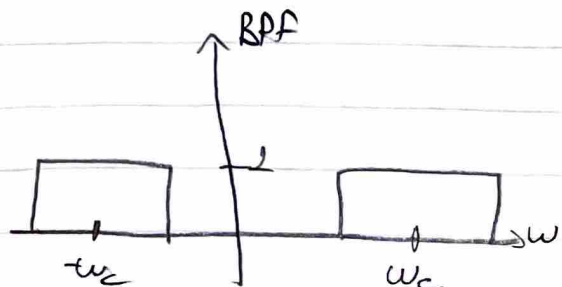
$$P_n = \frac{N_0}{2} \left[ 2 \cdot \frac{(f - 99.8 \cdot 10^6)^2}{2} \right]_{-100 \cdot 2 \cdot 10^6}^{-99.8 \cdot 10^6} = \frac{N_0}{2} \left[ 2 \cdot \frac{(0.4 \cdot 10^6)^2}{2} \right] = \left[ \frac{0.16 \cdot 10^{12}}{2} \right] \cdot 2 \cdot \frac{N_0}{2}$$

$$= 8 \cdot 10^{10} \cdot 2 \cdot \frac{N_0}{2} \rightarrow 8 \cdot 10^{10} \cdot 2 \cdot \frac{1}{2} \cdot 10^{-20} = 8 \cdot 10^{-10} \Rightarrow \boxed{P_{nasy} = 8 \cdot 10^{-10} \text{ [W]}}$$

b)  $n(t) = n_1(t) \cos \omega_c t - n_2(t) \sin \omega_c t$  şeklinde ifade edilebilir

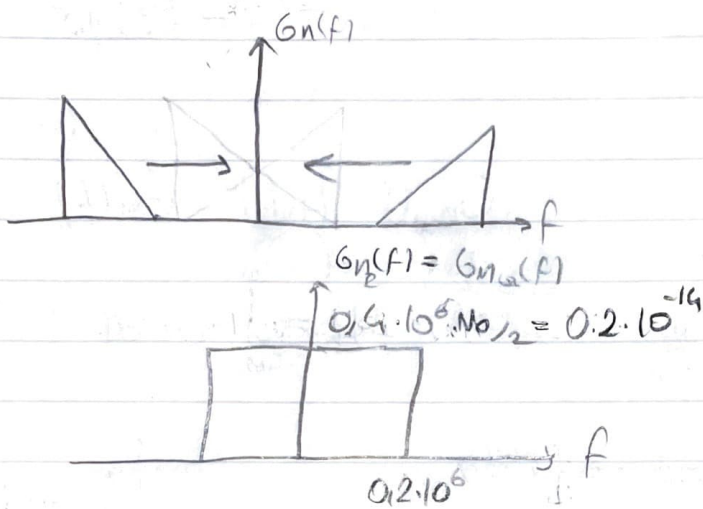


blok diyagramı ile  $n_1(t)$  ve  $n_2(t)$  bu şekilde elde edilebilir.

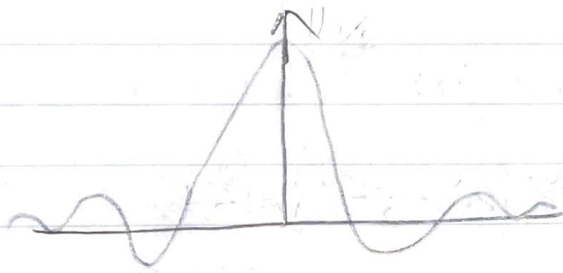


$$99.9 \cdot 10^6 < |f| < 100.2 \cdot 10^6 \text{ ise}$$

$$c) G_{nI}(f) = G_{nQ}(f) = \left\{ \begin{array}{l} G_n(f + 100 \cdot 10^6) + G_n(f - 100 \cdot 10^6) \\ 0 \end{array} \right. \quad \text{Diyim}$$

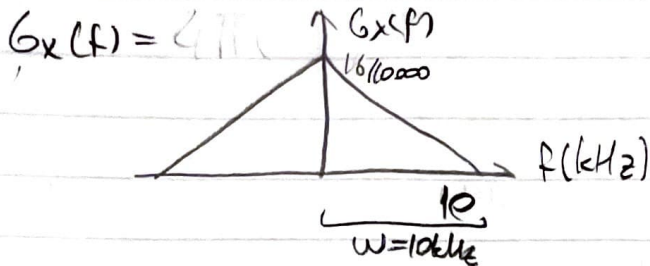


d)



3)  $R_x(\tau) = 16 \sin^2(10000\tau)$  Buradan  $W$  değeri  $10000\text{Hz}$ ,  
yani  $W = 10^4\text{Hz}$  olduğu görülmüştür.

$$R_x(\tau) = 4 \sin(10000\tau) \cdot 4 \sin(10000\tau) \quad G_x(f) = \mathcal{F}\{R_x(\tau)\}$$



a) ÇYB için: Demodülasyon sonucu:  $\left(\frac{S}{N}\right)_D = \frac{P_D}{N_0 W} = 2 \geq 10^5 \leftarrow 5\text{dB}$   
 $P_D \geq 10^5 \cdot N_0 W \Rightarrow P_D \geq 10^5 \cdot 2 \cdot 10^{-12} \cdot 10^4$

$P_D \geq 2 \cdot 10^{-3}$  olmalı.



$P_T$  80 dB fazla olmalı.  $P_T = 2 \cdot 10^{-3} \cdot 10^8 = 2 \cdot 10^5 \text{ [W]} = 200 \text{ kW}$

$P_T \geq 200 \text{ kW}$   $\left(\frac{S}{N}\right)_T = \frac{P_T}{N_0 B_T} \Rightarrow B_T$  ÇYB için 2W.  $B_T = 2 \cdot 10^4 \text{ Hz}$

b) TYB için:

$\left(\frac{S}{N}\right)_D$  ÇYB gibi TYB'de de  $\left(\frac{S}{N}\right)_D = 2 = \left(\frac{P_D}{N_0 W}\right) = \frac{P_D}{N_0 W}$  olduğundan:

$P_D \geq 2 \cdot 10^{-3}$  olmalı.  $P_T = P_D \cdot 10^8$ ,  $P_T \geq 2 \cdot 10^8 \Rightarrow P_T \geq 200 \text{ kW}$

$B_T$  TYB'da  $W$  değeri eşittir.  $\Rightarrow B_T = 10^4 \text{ Hz}$

c) GM  $m=0.4$

$\left(\frac{S}{N}\right)_D$  GM için  $\frac{m^2 \langle x^2(t) \rangle}{1 + m^2 \langle x^2(t) \rangle} \cdot 2 \Rightarrow \frac{(0.4)^2 \cdot 16}{1 + (0.4)^2 \cdot 16} \cdot \frac{P_D}{N_0 W} = \frac{2.56 \cdot P_D}{3.56 \cdot 2 \cdot 10^{-12} \cdot 10^4} \geq 10^5$

$0.72 \cdot \frac{P_D}{2 \cdot 10^{-8}} \geq 10^5 \Rightarrow P_D \geq \frac{2 \cdot 10^{-3}}{0.72}$   $P_D \geq 2.78 \cdot 10^{-3}$

$P_T = P_D \cdot 10^8$  olmalı.  $P_T \geq 2.78 \cdot 10^5 \Rightarrow P_T \geq 278 \text{ kW}$

$B_T$  değeri için 2W olur.  $B_T = 2 \cdot 10^4$