یا لطیف

رضا دینه پور

۹۸۱۴۳۰۳

تمرین سری ۸ مدار مخابراتی

#1

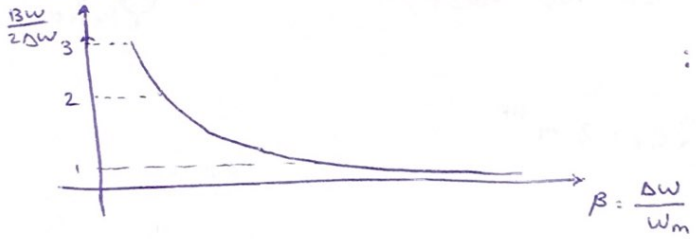
$$\begin{cases} \omega_m = 2\pi(10^{KHz}) \\ \Delta\omega = 2\pi(75^{KHz}) \\ \omega_c = 2\pi(100^{MHz}) \end{cases}$$

$$\beta = \frac{\Delta\omega}{\omega_m} = \frac{2\pi(75^{KHz})}{2\pi(10^{KHz})} = \boxed{7.5}$$

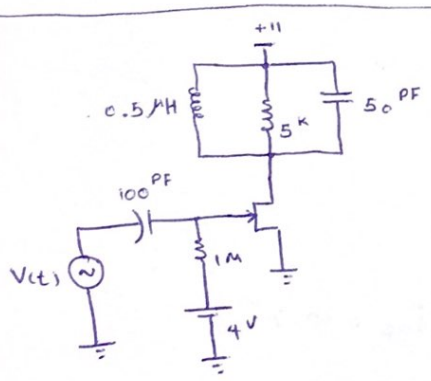
$$\Rightarrow M(7.5) \simeq 10$$

$$B.W = 2M(\beta) \times \omega_m = 2 \times 10 \times 2\pi \times 10^{KHz} = 400\pi$$

با استفاده از روش ترسیم نقطه به نقطه داریم:



#3



$$\omega = \frac{1}{\sqrt{LC}} = \frac{1}{\sqrt{0.5\times10^{-6}\times50\times10^{-12}}} = 2\times10^{8} \ \frac{Rad}{S}$$

$$BW = \frac{1}{RC} = \frac{1}{5\times10^{3}\times50\times10^{-12}} = 4\times10^{6} \ \frac{Rad}{S}$$

$$V_x = V_p - V_{gs} = 4 - 4 = 0 \Rightarrow \frac{V_x}{V_i} = 0$$

به کمک منحنی $\frac{I_1}{I_{dc}}$ برحسب $\frac{V_i}{V_{GQ}}$ داریم:

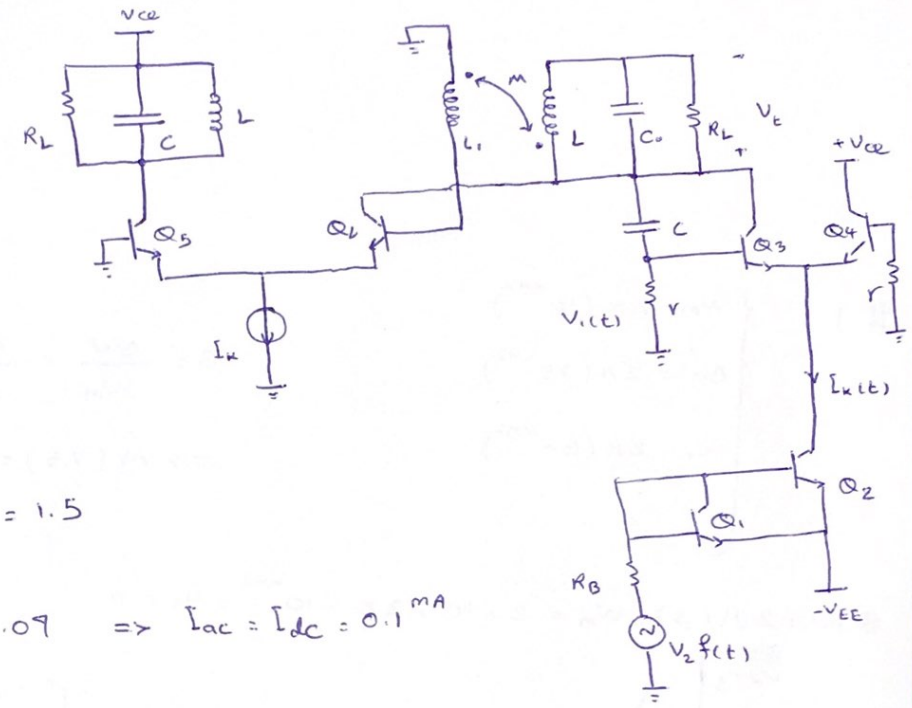
$$\frac{I_{D_2}}{I_{DP}} = 0.25$$

$$\Rightarrow I_{DP} = I_{DSS} = 4^{mA} \Rightarrow I_{D_2} = 1^{mA} \Rightarrow V_o(t) = 11 - 1^{mA}(5^{K})\cos(2\times10^{8}t + 10^{5}\int^{t}\cos 10^{4}\theta\, d\theta)$$

$$= 11 - 5^{V}\cos(2\times10^{8}t + 10^{5}\int^{t}\cos 10^{4}\theta\, d\theta)$$

#4

$$\begin{cases} \omega_o = 2\pi\,(100^{MHz}) \\ \Delta\omega = 2\pi\,(75^{kHz}) \\ \omega_m = 2\pi\,(15^{kHz}) \\ Q_T = 30 \\ V_T = 4 \\ V_{CC} = 10^{V} \\ R_{Ioss} = 20^{K} \end{cases}$$



$$I_{dc} = I_{ac} \quad , \quad \beta = \frac{2\Delta\omega}{\omega_o} = 1.5$$

$$\frac{\beta V_i Q_t}{I_{ac} R_L} < 0.1 \Rightarrow I_{dc} > 0.09 \Rightarrow I_{ac} = I_{dc} = 0.1^{mA}$$

$$Q_t = \omega_o (C + C_o) R_L = 30 \Rightarrow C + C_o = 2.4^{pF}$$

$$\begin{cases} L_1 C \omega_o^2 = 1 \Rightarrow L_1 = 1^{\mu H} \\ C = C_o = 2.4^{pF} \end{cases}$$

$$V_i r C \omega_c \leq 10^{mV} \Rightarrow r > 1.5^{\Omega} \Rightarrow \boxed{r = 1.67^{K}}$$

$$I_{dc} = \frac{V_{EE} - 0.7}{R_1} = 0.1^{mA} \Rightarrow R_1 = 107^{K} \quad , \quad \omega_m = R_1 I_{ac} = 10.7^{V}$$