

تمرين 5 التردد 3

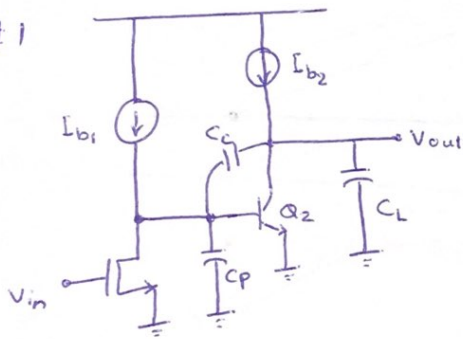
اعضار لرون:

مع علاقي

عليه منا قريان

منا ادينه

#1



$$V_{eff} = 0.2$$

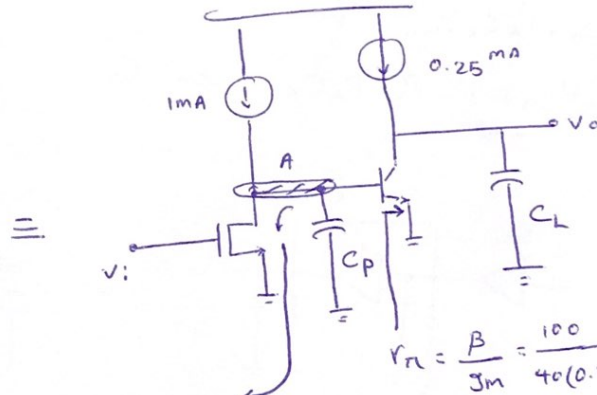
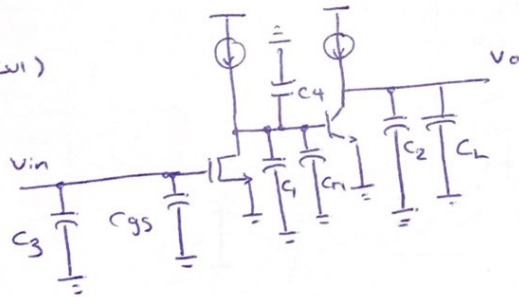
$$\lambda = 0.1 \text{ V}^{-1}$$

$$I_{b1} = 1 \text{ mA}, I_{b2} = 0.25 \text{ mA}$$

$$C_L = 1 \text{ pF}, C_P = 0.5 \text{ pF}$$

$$\beta = 100, V_T = 25 \text{ mV}, V_A = 10 \text{ V}$$

الف)

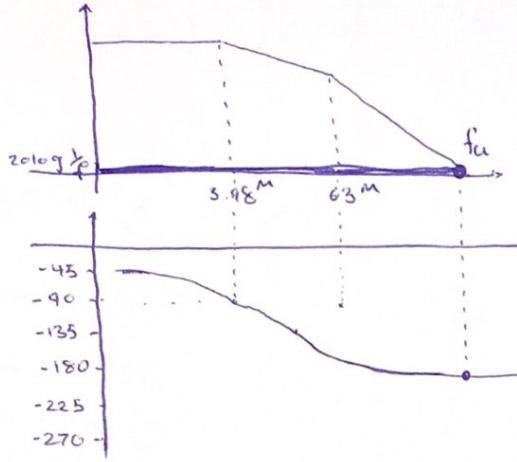


$$r_o = \frac{1}{\lambda I_D} = \frac{1}{0.1} = 10^k$$

$$r_{\pi} = \frac{\beta}{g_m} = \frac{100}{40(0.25)} = 10^k$$

$$P_A = \frac{1}{R_A C_A} = \frac{1}{C_P (10^k \parallel 10^k)} = \frac{1}{0.5 \text{ pF} (5^k)} = \frac{1}{2.5} = 0.4 \frac{\text{Grad}}{\text{s}} = 63 \text{ MHz}$$

$$P_o = \frac{1}{R_o C_o} = \frac{1}{C_L (r_o)} = \frac{1}{1 \text{ pF} \left(\frac{10}{0.25} \right)} = \frac{1}{40} \frac{\text{Grad}}{\text{s}} = 3.98 \text{ MHz}$$



$$f_u = \beta \omega_\beta = \beta \left(\frac{1}{r_n(C_n + C_M)} \right)$$

ج) $\text{ph.m} > 63^\circ \Rightarrow C_c = ?$

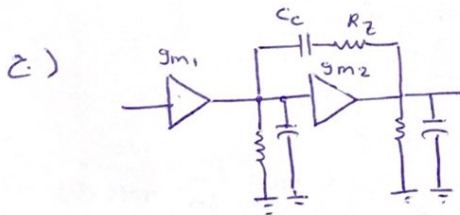
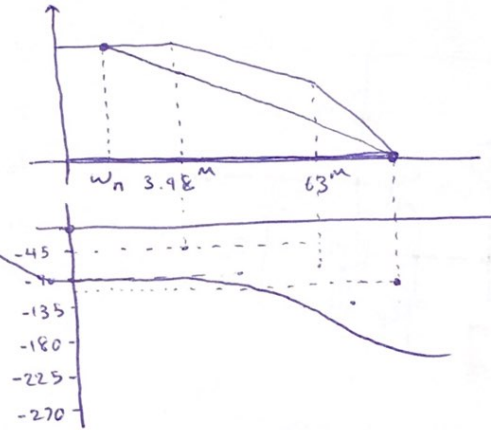
بسیار
اضاف
نشان
خارج

$$P_A = \frac{1}{R_A(C_A + C_c)} = P_{wn}$$

$$P_A(C_A + C_c) P_{wn} = 1$$

$$P_{wn} P_A C_A + P_A C_c P_{wn} = 1$$

$$P_A C_c P_{wn} = 1 - P_{wn} P_A C_A \Rightarrow C_c = \frac{1 - P_{wn} P_A C_A}{P_A P_{wn}}$$

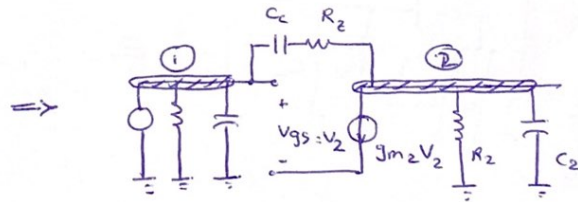


$$\frac{V_o}{I_{in}} = \frac{-g_{m2} R_1 R_2 \left[\left(R_2 - \frac{1}{g_{m2}} \right) C_2 S + 1 \right]}{\alpha S^3 + \beta S^2 + \gamma S + 1}$$

$$\alpha = R_1 R_2 R_2 C_1 C_2 C_c$$

$$\beta = R_1 R_2 (C_1 C_2 + C_1 C_c + C_2 C_c) + R_1 R_2 C_1 C_c + R_2 R_2 C_2 C_c$$

$$\gamma = R_1 C_1 + R_2 C_2 + C_c (R_1 + R_2 + R_2 + g_{m2} R_1 R_2)$$



$$\text{KCL ①: } I_{in} = \frac{V_2}{R_1} + V_2 C_1 S + (V_2 - V_o) \frac{1}{R_2 + \frac{1}{C_2 S}}$$

$$\text{KCL ②: } g_{m2} V_2 + \frac{V_o}{R_o} + V_o C_2 S + (V_o - V_1) \frac{1}{R_2 + \frac{1}{C_c S}} = 0$$

محل جریه صفر : $(R_2 - \frac{1}{g_{m2}}) C_2 S + 1 = 0$

$$\Rightarrow S = \frac{1}{(\frac{1}{g_{m2}} - R_2) C_2}$$

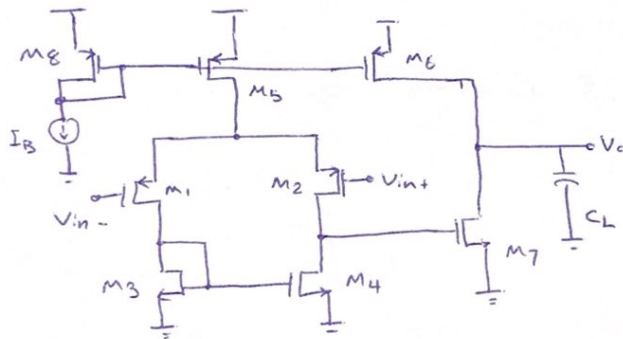
بعد از اضافه
نشان مقادیر
R_2

2) If $C_c = 2^{PF} \Rightarrow R_c = ? \Rightarrow \text{Ph.m} = 63^\circ$

$$\Rightarrow C_c = \frac{1 - P_{wn} P_A C_A}{P_A P_{wn}} \xrightarrow{P_A = \frac{1}{R_A C_A}} C_c = \frac{1 - P_{wn} (\frac{1}{R_A})}{\frac{1}{R_A C_A} P_{wn}}$$

$$\Rightarrow \frac{C_c P_{wn}}{R_A C_A} = 1 - \frac{P_{wn}}{R_A} \longrightarrow \underbrace{\omega_H R}_{\text{نصف دائرة}} \approx 1$$

#2



$$\omega_{P1} = 10^4 \frac{\text{rad}}{\text{sec}}$$

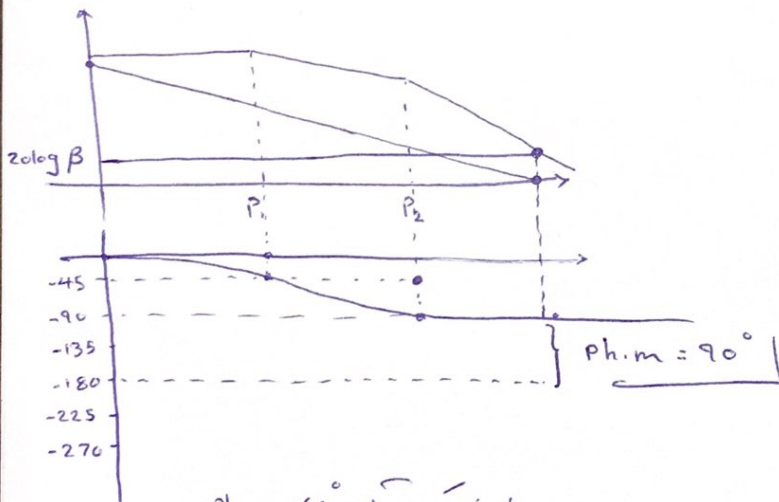
$$\omega_{P2} = 10^5 \frac{\text{rad}}{\text{S}}$$

$$I_B = 1 \text{ mA} \quad r_O = 45 \text{ k}$$

$$V_{ov} = 0.2 \text{ V}$$

$$\left(\frac{\omega}{L}\right)_5 = 2 \left(\frac{\omega}{L}\right)_6 = 2 \left(\frac{\omega}{L}\right)_8$$

$$\left(\frac{\omega}{L}\right)_7 = \left(\frac{\omega}{L}\right)_{3,4}$$

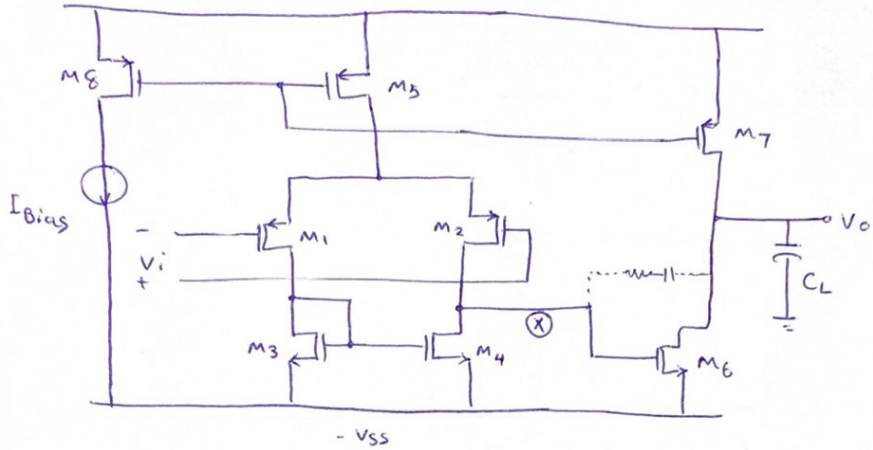


$$\text{Ph.m} = 60^\circ \quad \underbrace{\text{نصف دائرة}}_{\text{نصف دائرة}}$$

$$\omega_{P1} = \frac{1}{R_1 (C_1 + C_c)} = P_{wn} \Rightarrow \omega_{P1} (R_1 (C_1 + C_c)) = P_{wn}$$

$$C_c = \frac{1 - P_{wn} P_A C_A}{P_A P_{wn}}$$

#3



$$g_{m_1} = 1 \text{ mmho}$$

$$g_{m6} = 4 \text{ mmho}$$

$$R_1 = 250^{\circ}\text{K}$$

$$R_2 = 100^{\text{K}}$$

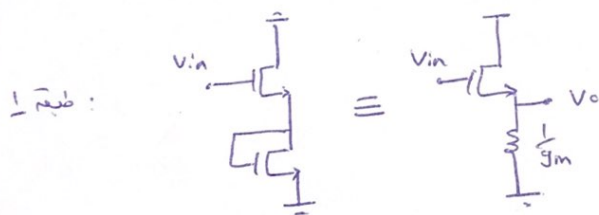
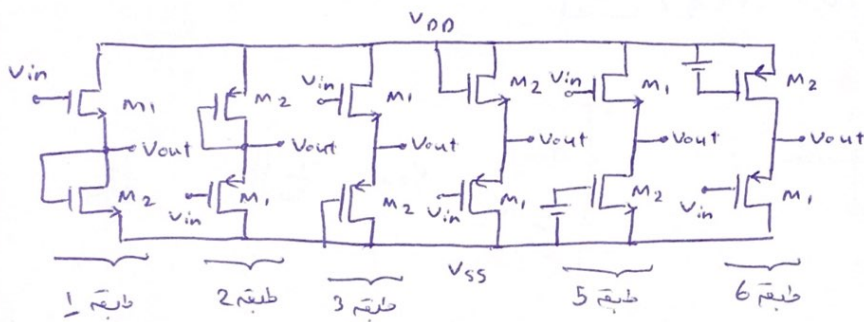
$$C_1 = 0.8 \text{ PF}$$

$$C_2 = 10 \text{ PF}$$

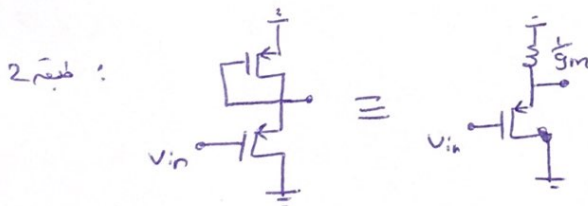
الف) إذا $p.h.m = 45^\circ \Rightarrow C = ?$

تميز طاس ①

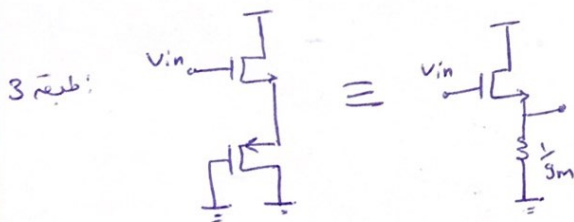
مما قلنا
على صفة بيان
من ادوية يوم



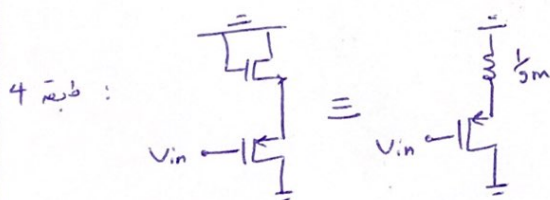
$$A_{v1} = \left(\frac{V_o}{V_{in}} \right)_1 = \frac{\frac{1}{g_m}}{\frac{1}{g_m} + \frac{1}{g_m}} = \frac{\frac{1}{g_m}}{\frac{2}{g_m}} = \frac{1}{2}$$



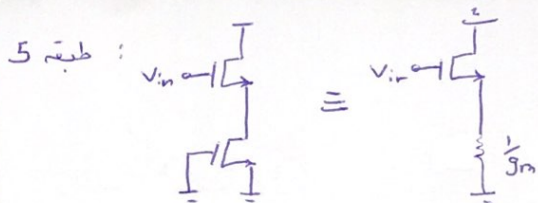
$$A_{v2} = \left(\frac{V_o}{V_{in}} \right)_2 = \frac{\frac{1}{g_m}}{\frac{2}{g_m}} = \frac{1}{2}$$



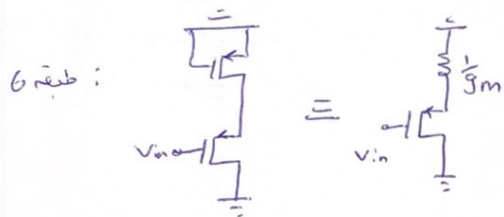
$$A_{v3} = \left(\frac{V_o}{V_{in}} \right)_3 = \frac{\frac{1}{g_m}}{\frac{2}{g_m}} = \frac{1}{2}$$



$$A_{v4} = \left(\frac{V_o}{V_{in}} \right)_4 = \frac{1}{2}$$



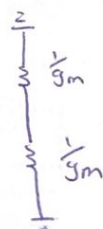
$$A_{V5} = \left(\frac{V_o}{V_{in}} \right)_5 = \frac{1}{2}$$



$$A_{V6} = \left(\frac{V_o}{V_{in}} \right)_6 = \frac{1}{2}$$

$$A_{V_{Total}} = A_{V1} A_{V2} A_{V3} A_{V4} A_{V5} A_{V6} = 6 \left(\frac{1}{2} \right) = 3$$

مقاومت خروجی : $\frac{1}{g_m}$ به امپدانس



$$R_{out} = \frac{1}{g_m} \parallel \frac{1}{g_m} = \frac{1}{2g_m}$$

مقاومت ورودی : ∞ به امپدانس



$$A_{V5} = \left(\frac{V_o}{V_{in}} \right)_5 = \frac{1}{2}$$

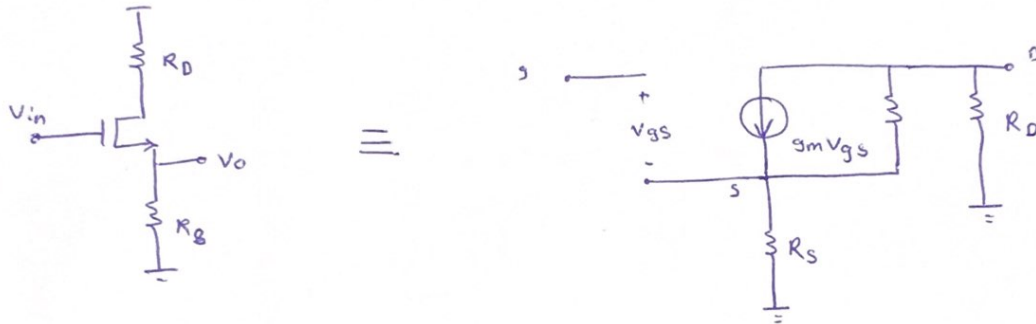
الطيف

تمرین ۲

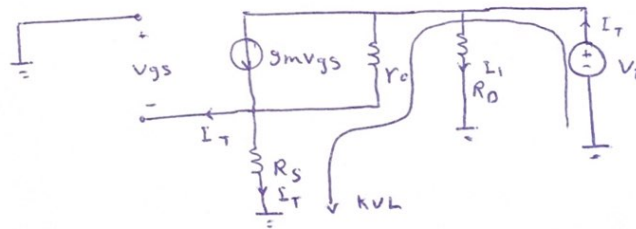
مقاومتی

علیه مناعه پانی

مساکنه در



مقاومت
 R_{out}



$$I_1 = [I_T - g_m V_{gs}] = [I_T - g_m (0 - R_S I_T)] = I_T (1 + g_m R_S)$$

$$KVL: -V_T + r_{ds} I_T (1 + g_m R_S) + R_S I_T = 0$$

$$\Rightarrow V_T = I_T (R_S + r_{ds} + r_{ds} g_m R_S) \Rightarrow R_{out} = R_S \parallel r_{ds} (1 + g_m R_S)$$