

$\eta_1 = \eta_2 = 1$ $I_x = ?$

KVL: $V_T - V_{D_1} + V_{D_2} = 0 \rightarrow V_{D_1} = V_{D_2} + V_T$

$I_D: I_s (e^{\frac{V_D}{\eta V_T}} - 1) \rightarrow \begin{cases} D_1: I_x = I_{s1} (e^{\frac{V_{D_1}}{\eta V_T}} - 1) \\ D_2: -I_x = I_{s2} (e^{\frac{V_{D_2}}{\eta V_T}} - 1) \end{cases} \rightarrow -1 = \frac{1}{10} \left[\frac{e^{\frac{V_{D_1}}{\eta V_T}} - 1}{e^{\frac{V_{D_2}}{\eta V_T}} - 1} \right]$

$\rightarrow -10 = \left[\frac{e^{\frac{V_{D_2} + V_T}{\eta V_T}} - 1}{e^{\frac{V_{D_2}}{\eta V_T}} - 1} \right] \rightarrow -10 = \frac{X \cdot e - 1}{X - 1} \rightarrow -10X + 10 = X \cdot e - 1$

$\rightarrow X = \frac{11}{e + 10} \xrightarrow{D_2} -I_x = I_{s2} \left[\frac{11}{e + 10} - 1 \right] \rightarrow I_x = I_{s2} \left[\frac{1 - e}{e + 10} \right]$

$\frac{I_x}{I_{s2}} = \frac{e - 1}{e + 10}$

مجموعه حسابی ابزار دقیق ۸۸ و ارسد ۹۳

@KONKORTEC/Mani

$$V_{GS} = 0.5V \rightarrow I_D = 1\mu A \xrightarrow{\text{اسباع}} \mu_n C_{ox} \frac{W}{L} = 1$$

$$V_{GS} = 0.6V \rightarrow I_D = 4\mu A$$

$$V_{TH} = ?$$

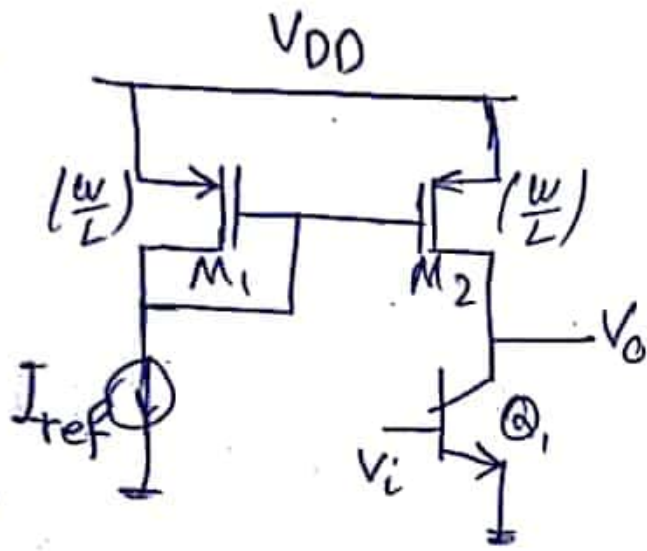
$$I_D = \frac{1}{2} \mu_n C_{ox} \frac{W}{L} (V_{GS} - V_{TH})^2 \rightarrow \frac{I_{D1}}{I_{D2}} = \frac{k'_1 (V_{GS1} - V_{TH})^2}{k'_2 (V_{GS2} - V_{TH})^2}$$

$$\rightarrow \frac{1}{4} = \left[\frac{0.5 - V_{TH}}{0.6 - V_{TH}} \right]^2 \rightarrow \frac{0.5 - V_{TH}}{0.6 - V_{TH}} = \frac{1}{2} \rightarrow 1 - 2V_{TH} = 0.6 - V_{TH}$$

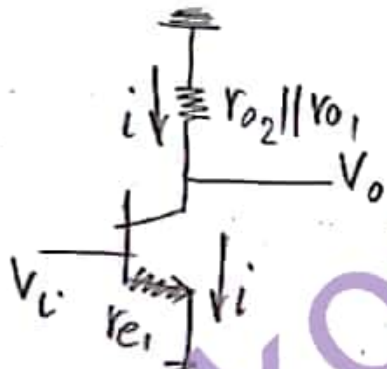
$$\rightarrow \boxed{V_{TH} = 0.4V} \rightarrow \mu_n C_{ox} \frac{W}{L} = \frac{2 \times 1\mu A}{(0.5 - 0.4)^2} = \frac{200\mu A}{V^2}$$

ساره دپرون شرح

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ac.



$$A_V = \frac{V_o}{V_i} = - \frac{(r_{o1} || r_{o2})}{r_{e1}}$$

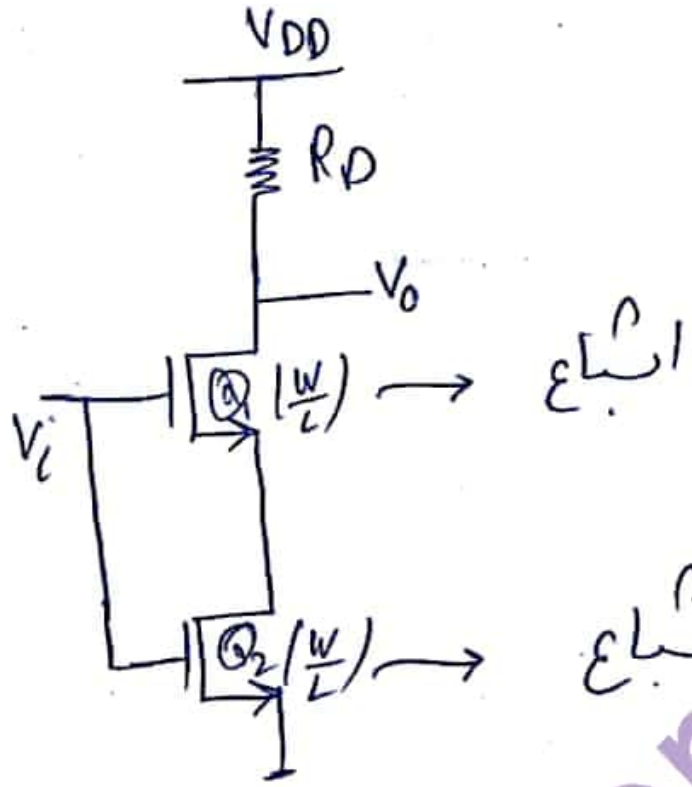
$$A_V \propto \frac{1}{r_{e1}} = \frac{I_c}{V_T} = \frac{I_c}{\frac{kT}{q}}$$

$$\rightarrow A_V = \frac{I_c \times q}{kT} = \frac{I_{ref} \times q}{kT}$$

$$\rightarrow A_V \propto \frac{1}{T} \rightarrow$$

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ساره جدير



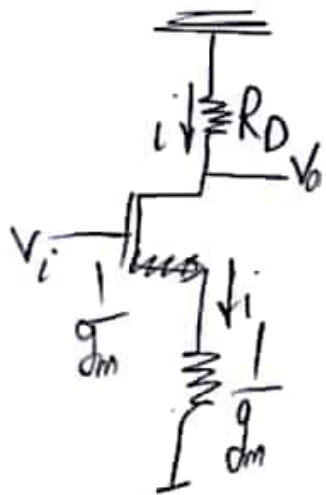
Q₂: نبع → $V_{DS2} \ll V_{th}$ → $V_{DS2} = V_{GS1}$ $V_{GS1} \ll V_{th}$ → تروايست

$$I_{D} \approx \frac{1}{2} \mu_n C_{ox} \frac{W}{L} [2(V_{GS} - V_{th})V_{DS} - V_{DS}^2] \approx \mu_n C_{ox} \frac{W}{L} (V_{GS} - V_{th})V_{DS}$$

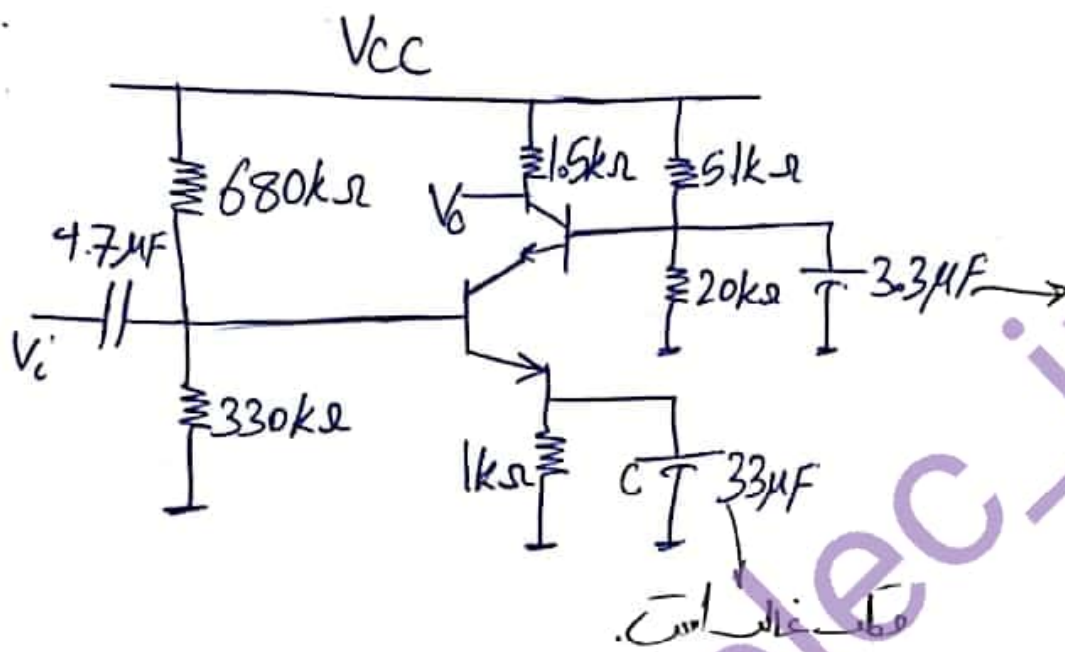
$$g_m = \frac{\partial I_D}{\partial V_{GS}} = \mu_n C_{ox} \frac{W}{L}$$

«جدید»

$$r_{ds2} = \frac{dV_{DS2}}{dI_{D2}} = \frac{1}{\mu_n C_{ox} (V_{GS2} - V_{th})} = \frac{1}{g_m}$$



$$\begin{cases} v_o = R_D i_i \\ v_i = \frac{2}{g_m} i_i \end{cases} \rightarrow A_v = -\frac{1}{2} g_m R_D$$



این مدار یک کلاسیک است
مدار یک رانسی می کند

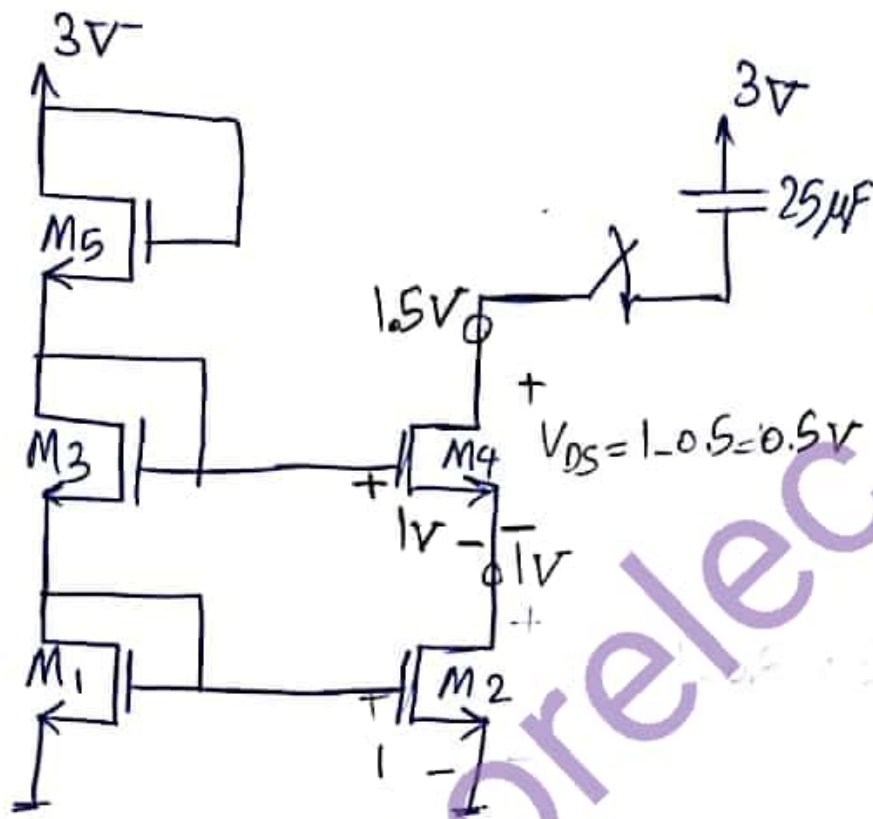
مطابق غالب است.

$$C: \begin{cases} Z_L = \frac{1}{33 \times 10^{-6} \times 10^3} \frac{\text{rad}}{\text{s}} = \frac{10^3}{33} \frac{\text{rad}}{\text{s}} \\ P_L = \frac{1}{33 \times 10^{-6} \times 25 \Omega} = \frac{10^6}{33 \times 25 \Omega} \frac{\text{rad}}{\text{s}} \end{cases} \rightarrow P_L \gg Z_L$$

$$\omega_L = \frac{10^6}{33 \times 25} \frac{\text{rad}}{\text{s}} \rightarrow \boxed{f = \frac{10^6}{33 \times 25 \times 2\pi} \approx 200 \text{ Hz}}$$

موسسه دانشگاه اردبیل ۹۴ و ...

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$M_{1,3,5}$ } سری
 مانه
 اشیاع
 $V_{GS1} = V_{GS2} = V_{GS3}$, $V_{GS1} + V_{GS2} + V_{GS3} = 3V$
 $V_{GS} = 1V \rightarrow V_{GS1} = V_{GS2} = 1V$

$M_{2,4}$ } سری
 مانه
 هنزانشیاع
 $V_{GS2} = V_{GS4} = 1V \rightarrow I_D = \frac{1}{2} \times \frac{2}{10} \times (1 - 0.5)^2 = \frac{4}{10} mA$

$Cv = It \rightarrow 25 \times 10^{-6} \times (3 - 1.5) = \frac{4}{10} \times 10^{-3} \times t$

$t = 1.5 (s)$

منویس و حساب ارسره 4

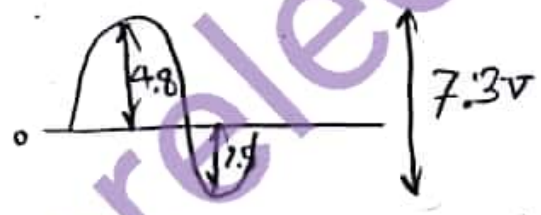
① $V_o(DC) = 0V$

② $V_o(\text{قطع}) = 1k\Omega \times 2.5mA = 2.5V$

③ $V_o(\text{الابيع}) = \frac{5 - 0.2}{2k\Omega} \times 2k\Omega = 4.8V$

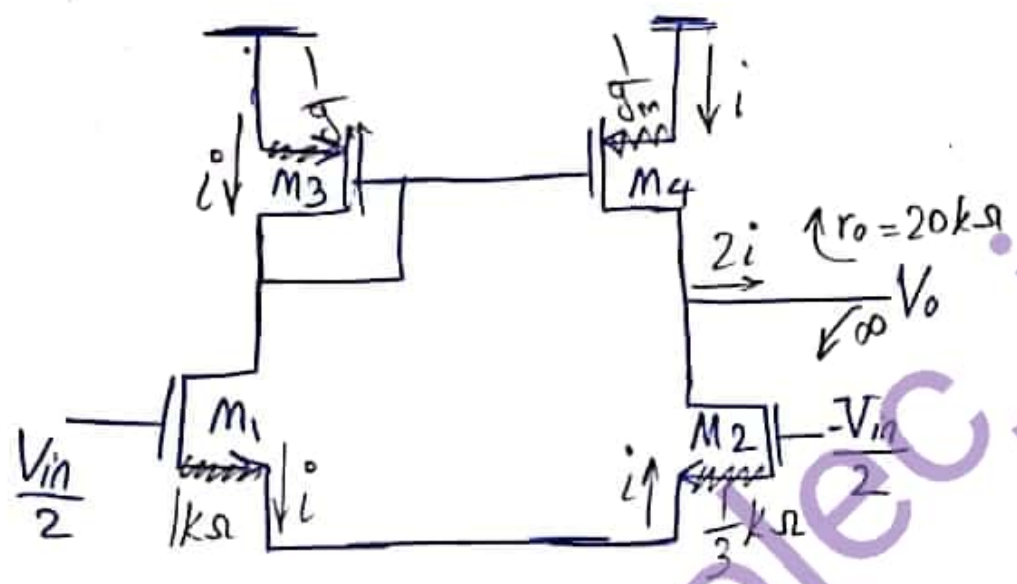
④ $V_o(\text{اسير}) = \text{---}$

⑤ $V_{P.P} = 7.3V$



ساره و حساب ارسره ۷۹

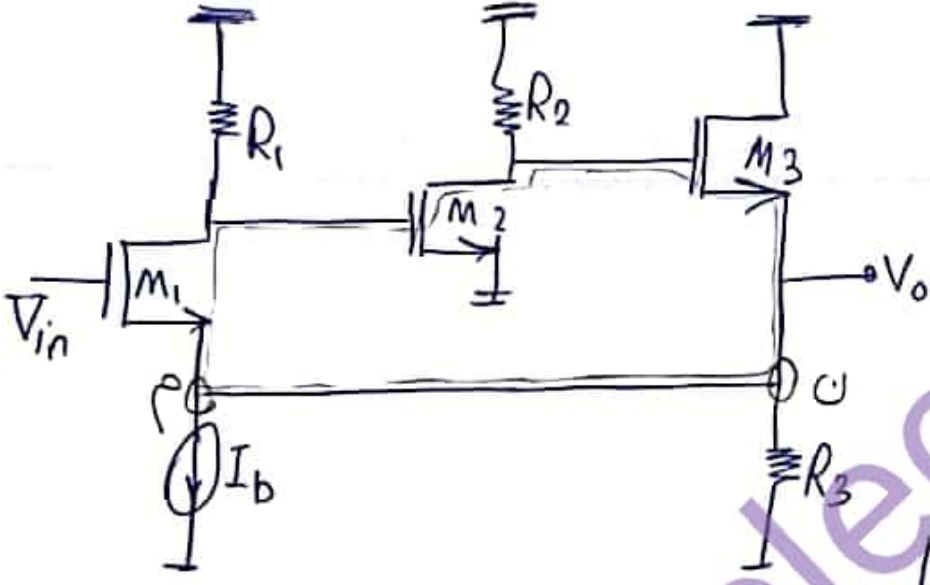
@Konkooelec_iman



$$\begin{cases}
 V_o = (20k\Omega \parallel \infty) \times 2i \\
 v_i = \frac{4}{3} k\Omega \times i \rightarrow A_v = 30
 \end{cases}$$

در این مثال زمین مجازی نداریم چون مدار در هیچ بالسی متوازن نمی باشد
 بسیار ساده و به ابزاری رسیده

@Korikoorelec_Iman

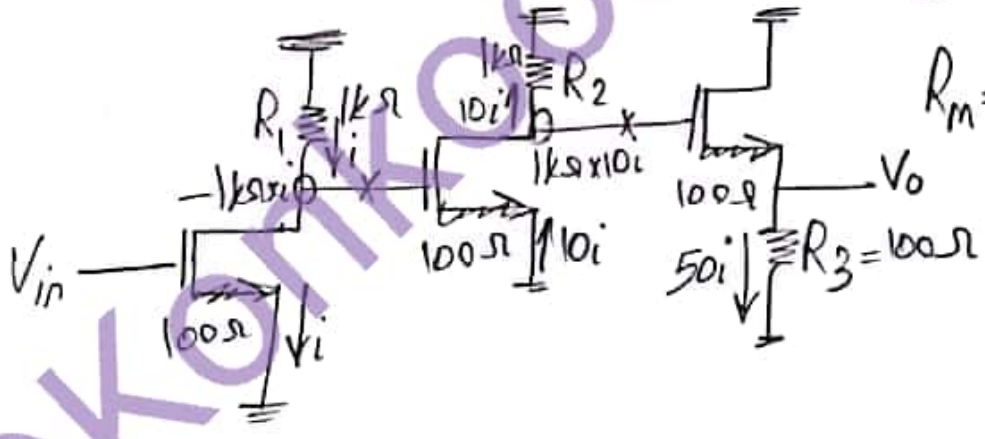


$g_{m_{1,2,3}} = 10 \text{ mS}$
 $R_{1,2} = 1 \text{ k}\Omega$
 $R_3 = 100 \Omega$
 $V_A = \infty$

$|BA| = |AF| = 1$

نوع فریب: وکسار - سری

$R_m = 0, R_N = R_3$



$A = \frac{V_o}{V_{in}} = \frac{100 \Omega \times 50i}{100 \Omega \times i} = 50$

$|AF| = |A \times \beta| = 50$

$f = \frac{V_o}{V_f} = 1$

متوسط حساب از دست ۹۳

3 ✓