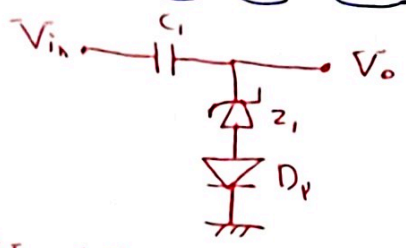
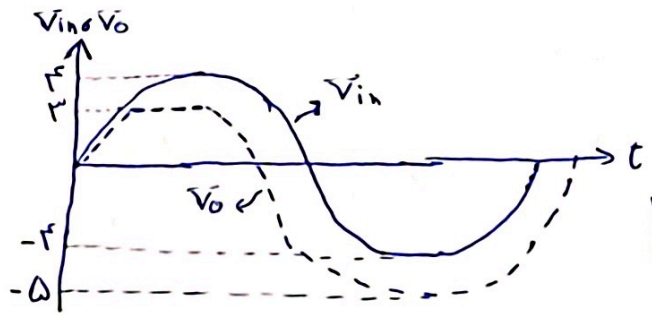


(۵۶)

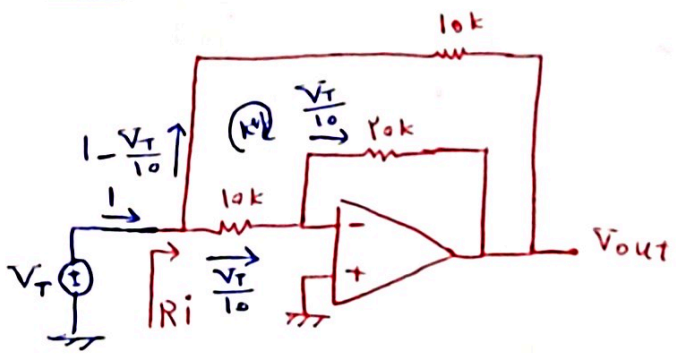


$V_{Z1} = 2.3V$  و  $V_{D1, on} = 0.7V$   
 $-4 < V_{in} < 4$



$|V_{out, max}| = 2.3V$   
 گزینه ۴

(۵۷)

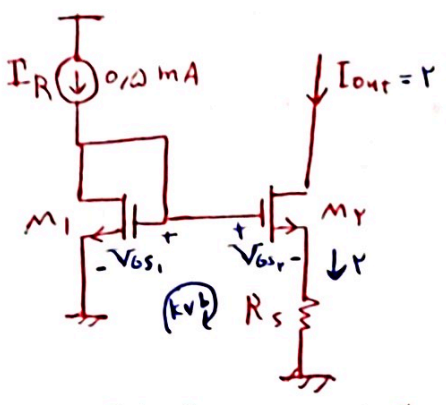


kvl:  $(1 - \frac{V_T}{10}) \times 10 - \frac{V_T}{10} \times 10 - \frac{V_T}{10} \times 10 = 0$   
 $\Rightarrow V_T = 2.5$

$R_i = V_T = 2.5 k\Omega$

گزینه ۲

(۵۸)

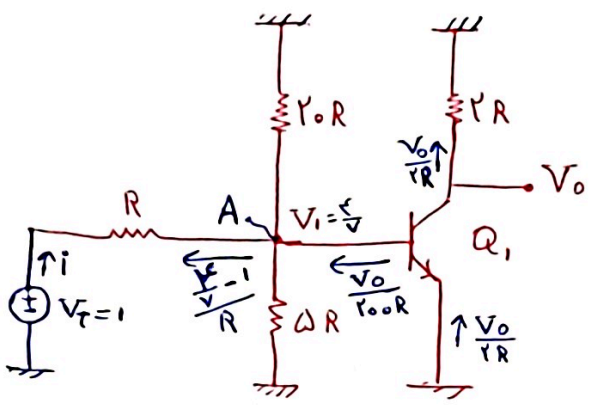


kvl:  $-V_{GS1} + V_{GS2} + I R_S = 0$   
 $V_{GS1} = \sqrt{\frac{\mu_n I R}{\mu_n C_{ox} (W/L)_1}} + V_{th}$   
 $V_{GS2} = \sqrt{\frac{\mu_p I_{out}}{\mu_p C_{ox} (W/L)_p}} + V_{th}$

$\Rightarrow -\sqrt{\frac{2 \times 0.1}{14}} - V_{th} + \sqrt{\frac{2 \times 2}{100}} + V_{th} + I R_S = 0$   
 $\Rightarrow I R_S = \frac{5}{100} \Rightarrow R_S = 0.1025 k\Omega = 25 \Omega$

گزینه ۱

$\mu_n C_{ox} (W/L)_1 = 14 \text{ mA/V}^2$   
 $\mu_p C_{ox} (W/L)_p = 100 \text{ mA/V}^2$   
 $\lambda = 0$   
 $I_{out} = 2 \text{ mA}$   
 $R_S = ?$



kCL (A):  $\frac{V_o}{Y_o R} = \frac{\frac{\epsilon}{V}}{(Y_o R || \Delta R)} + \frac{\frac{\epsilon}{V} - 1}{R}$

$\Rightarrow \frac{V_o}{Y_o} = \frac{\frac{\epsilon}{V}}{\frac{Y_o \times \Delta}{Y_o + \Delta}} + \frac{\frac{\epsilon}{V} - 1}{R}$

$\Rightarrow V_o \approx -\Delta V$

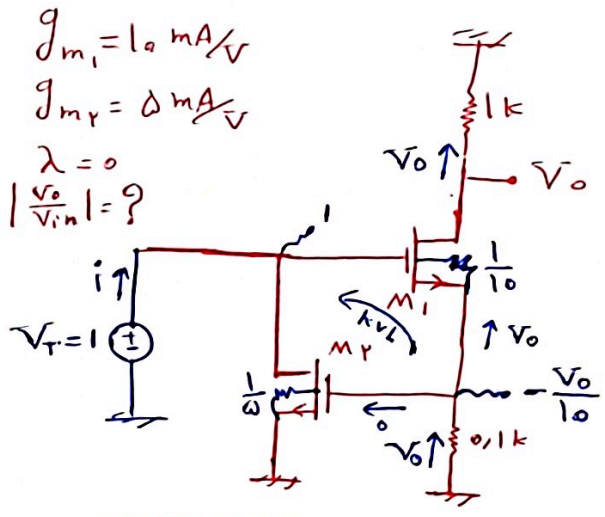
$\Rightarrow \frac{V_o}{V_s} = \underline{-\Delta V}$

گزینه ۱

$\beta = 100$  و  $V_A = \infty$

$\frac{V_i}{V_s} = \frac{\epsilon}{V} \xrightarrow{V_s = V_T = 1} V_i = \frac{\epsilon}{V}$

$\frac{V_o}{V_s} = ?$

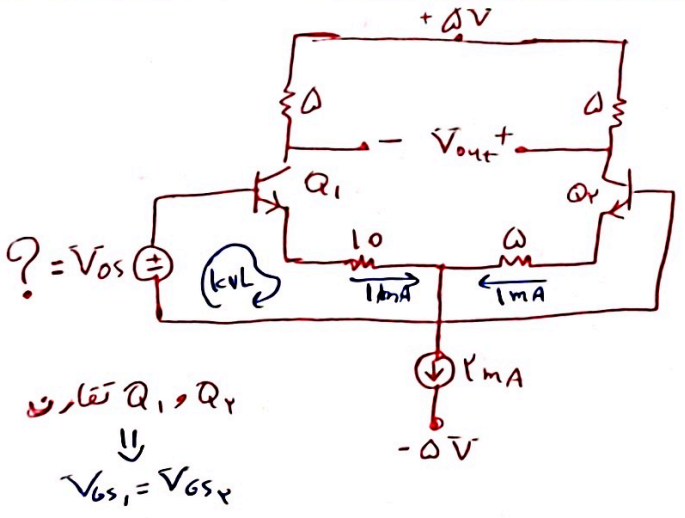


kVL:  $\frac{V_o}{10} + V_o \times \frac{1}{10} + 1 = 0$

$\Rightarrow V_o = -\Delta \Rightarrow \left| \frac{V_o}{V_{in}} \right| = \Delta$

گزینه ۴

$g_{m1} = 10 \text{ mA/V}$   
 $g_{m2} = \Delta \text{ mA/V}$   
 $\lambda = 0$   
 $\left| \frac{V_o}{V_{in}} \right| = ?$

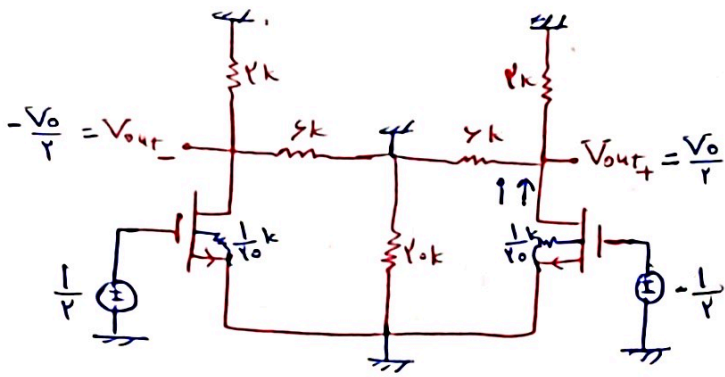


kVL:  $-\bar{V}_{os} + \bar{V}_{GS1} + 10 - \Delta - \bar{V}_{GS2} = 0$

$\Rightarrow \bar{V}_{os} = \underline{\Delta V}$

گزینه ۳

$Q_1$  و  $Q_2$  تقارن  
 $\Downarrow$   
 $V_{GS1} = V_{GS2}$



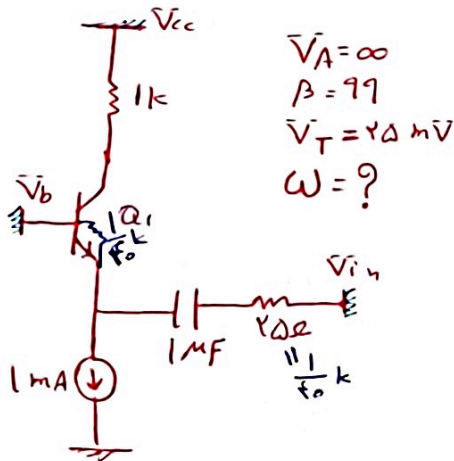
$$i = \frac{0 - (-\frac{1}{V})}{\frac{1}{V_0}} = 1_0$$

$$\frac{V_0}{V} = 1_0 \times (2 \parallel 2) \Rightarrow V_0 = 2_0$$

$$\Rightarrow A_d = V_0 = 2_0$$

گزینه ۲

$g_{m1,2} = 2_0 \frac{mA}{V}$   
 $\lambda = 0$   
 $|A_d| = ?$

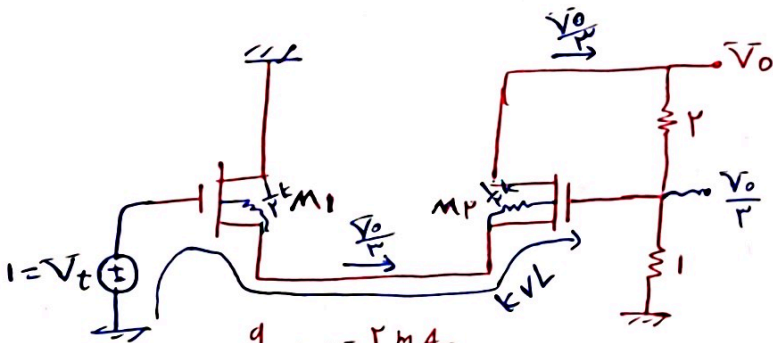


$$I_{C1} = 1mA \Rightarrow g_m = 40 \frac{mA}{V} \Rightarrow r_e = \frac{1}{40} k\Omega$$

$$R_T = \frac{1}{f_0} + \frac{1}{f_0} = \frac{1}{f_0} k$$

$$\omega = \frac{1}{C R_T} = \frac{1}{10^{-6} \times \frac{1}{f_0} \times 10^3} = 2_0 \frac{k rad}{s}$$

گزینه ۲



$$KVL: -1 + (\frac{1}{V} + \frac{1}{V}) \times \frac{V_0}{V} + \frac{V_0}{V} = 0$$

$$\Rightarrow V_0 = 1,5$$

$$\Rightarrow \left| \frac{V_0}{V_{in}} \right| = 1,5$$

گزینه ۲

$g_{m1,2} = 2 \frac{mA}{V}$   
 $V_A = \infty$   
 $\left| \frac{V_0}{V_{in}} \right| = ?$