یاالعلیب

رضا دینپرور

۹۸۱۴۳۰۳

امتحان پایانترم الکترونیک ۱

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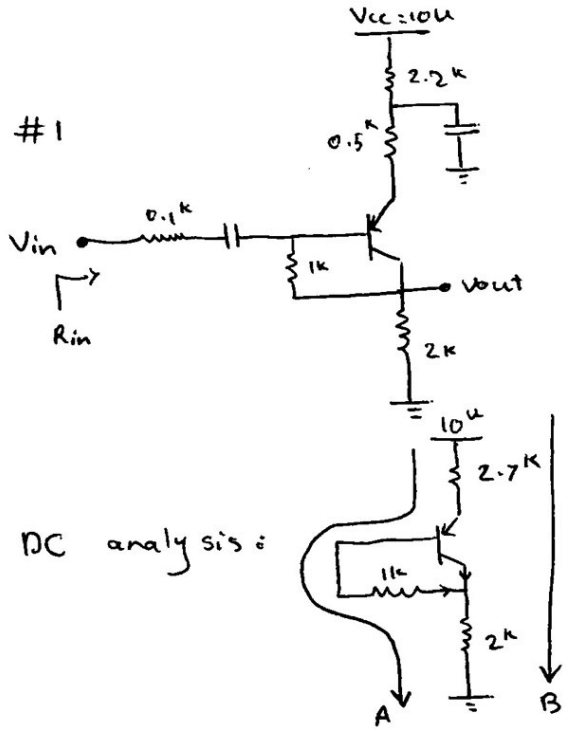


$\begin{cases} V_{BE} = 0.6 \\ V_{CE,sat} = 0.2 \\ V_T = 25\ mV \\ \beta = 100 \\ V_A = \infty \end{cases}$

چون $4.7^K \gg \frac{1^K}{100}$

DC analysis :

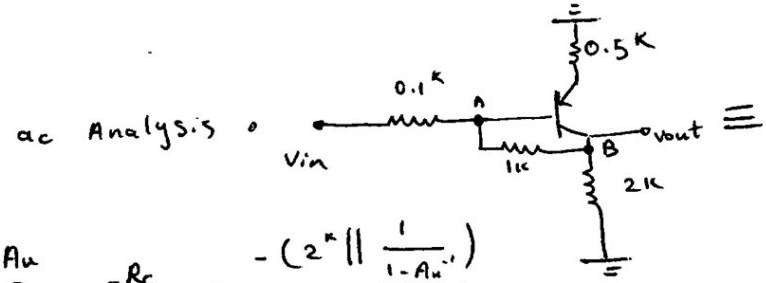
KVL in A : $-10 + 2.7^K \times I_C + 0.6 + 1^K \times I_B + 2^K (I_C + I_B) = 0$

$\Rightarrow 4.7^K I_C = 9.4 \Rightarrow I_C = I_E = 2\ mA$

$\begin{cases} g_m = 40 \times 2 = 80\ \frac{mA}{V} \\ r_\pi = \frac{\beta}{g_m} = \frac{100}{80} = 1.25^K \\ r_o = \infty \end{cases}$

KVL in B : $-10 + 2.7^K \times 2^m + V_{CE} + 2^K \times 2^m = 0 \Rightarrow V_{CE} = 0.6^V > V_{CE,sat}$

ac Analysis :



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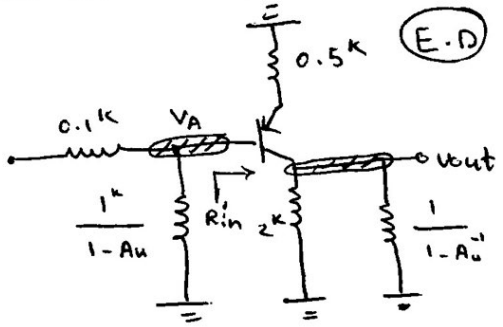


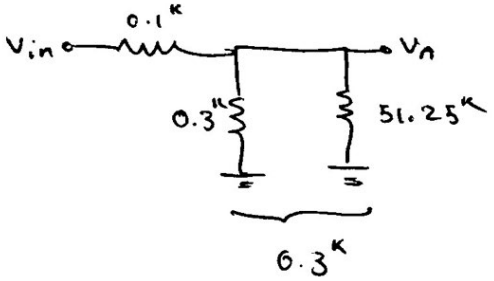
$A_u = \frac{-R_C}{\frac{1}{g_m} + R_E} = \frac{-(2^K \| \frac{1}{1-A_u^{-1}})}{\frac{1}{80} + 0.5^K}$

$\Rightarrow A_u = -\frac{\frac{2 \times \frac{1}{1-A_u^{-1}}}{2 + \frac{1}{1-A_u^{-1}}}}{0.5} = -\frac{\frac{2}{\frac{2A_u^{-1}+1}{1-A_u^{-1}}}}{0.5} \Rightarrow A_u \cong -2 = \frac{V_{out}}{V_A}$

$R_{in} = 0.1^K + (\frac{1^K}{3} \| R'_{in})$

$A_u = \frac{V_{out}}{V_A} \times \frac{V_A}{V_{in}} \Rightarrow$

$$R'_{in} = r_\pi + (\beta+1) R_E = 1.25 + (101) \times 0.5^{k} = 51.25$$



$$\frac{V_A}{V_{in}} = \frac{0.3^{k}}{0.3+0.1} = 0.75$$

$$A_v = -2 \times 0.75 = -1.5$$

$$R_{in} = 0.1^{k} + 0.3^{k} = 0.4^{k}$$