یا لطیف

رضا ادیب زاده

۹۸۱۴۳۰۳

تمرین سری ۲ - مالس

#13-4

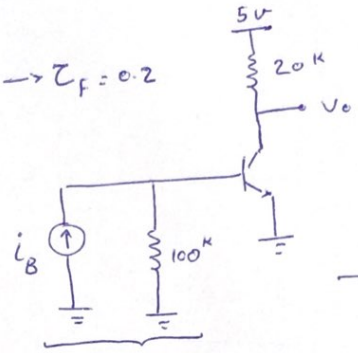
$\beta = 50 \longrightarrow \frac{\tau_{BF}}{\tau_F} = 50 \longrightarrow \tau_F = 0.2$

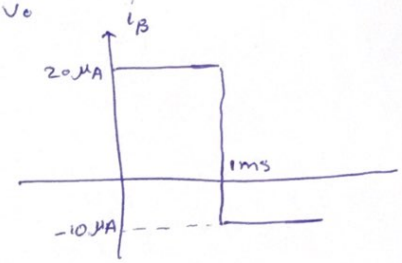
$V_{BE,on} = 0.7\ V$

$V_{CE,sat} = 0.1\ V$

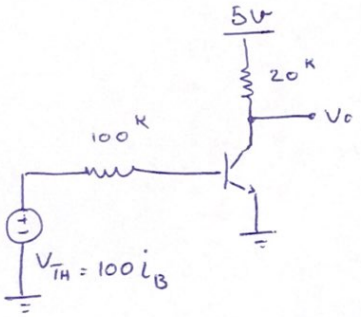
$\tau_{BF} = 10\ ns$

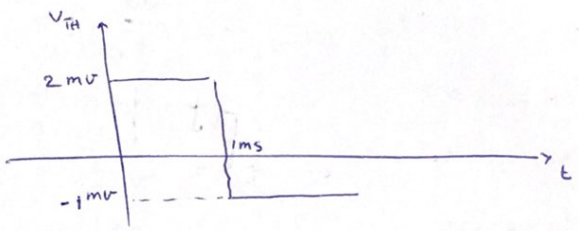
$\tau_s = 20\ ns$

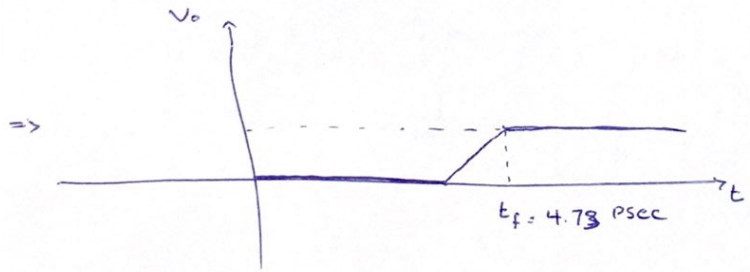




معادل تونن این قسمت را می نویسیم







$$I_B = \frac{2^{mV} - 0.7}{100^{K}} = 0.013\ ^{\mu A}$$

$$Q_F(t) = Q_F(\infty) + \left[Q_F(0) - Q_F(\infty)\right] e^{-\frac{t}{\tau_{BF}}}$$

$$= \tau_{BF} I_B + \left(0 - \tau_{BF} I_B\right) e^{-\frac{t}{\tau_{BF}}}$$

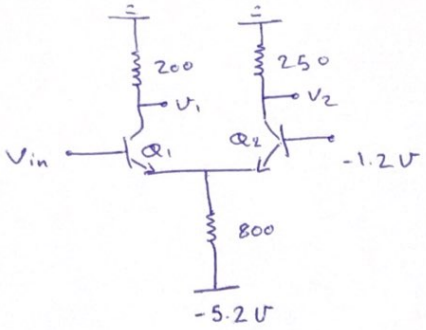
$$= 0.13\left(1 - e^{-\frac{t}{10\,ns}}\right)\ nC$$

$$I_{C(sat)} = \frac{V_{CC} - V_{CE,sat}}{R_C} = \frac{5 - 0.1}{20^{K}} = 0.245\ ^{mA}$$

$$Q_A = \tau_F I_{C(sat)} = 0.2^{ns} \times 0.245 = 0.049 \quad \Rightarrow \quad 0.049^{PC} = (0.13)\cdot\left[1 - e^{-\frac{t_f}{\tau_{BF}}}\right]$$

$$\Rightarrow \quad t_f = -\tau_{BF} \ln \frac{0.049 - 0.13}{-0.13} = 4.73\ ^{PS}$$

17-4



if $V_{in} = -1.6$ V → a) V_E = ? b) I_E = ? c) V_2 = ?

$V_{in} = -1.6\ V < -1.2 \longrightarrow \begin{cases} Q_1 : off \\ Q_2 : ON \end{cases}$ $\Rightarrow 1.2 + 0.7 + V_E = 0 \Rightarrow V_E = -1.9\ V$

b) $I_E = \dfrac{-1.9 + 5.2}{0.8\ K} = 4.125\ mA$

c) $V_2 = 0 - 0.25\ K \times 4.125\ mA = -1.03\ V$

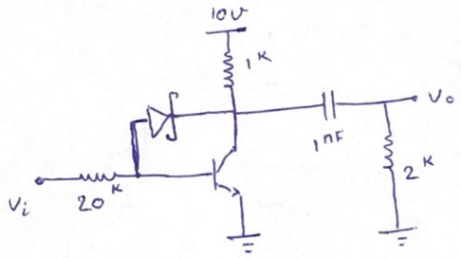
#23-4

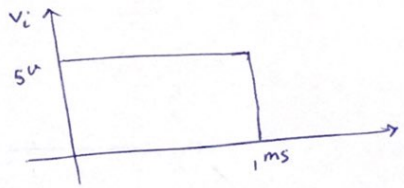
$\beta = 30$

$V_{BE,ON} = 0.7$

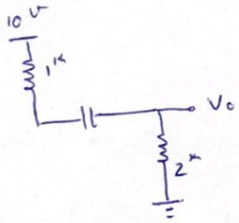
$V_{CE,sat} = 0.1$

$V_D = 0.3\ V$



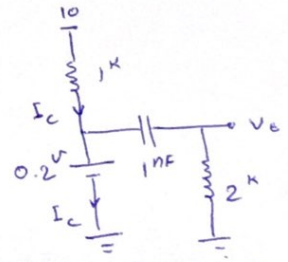


بدلیل اعمال پالس ورودی :



$V_o(0^-) = 10\ V$

بعد از ورود پالس : $I_B = \dfrac{V_i - V_{BE}}{R_B} = \dfrac{5 - 0.7}{20\ K} = 0.215\ mA$



$V_o(0^+) = 9.8\ V \Rightarrow V_o(t) = 0.2 + (10 - 0.2)\, e^{-\frac{t}{\tau_1}}$

$V_o(\infty) = 0.2$

$V_o(t) = 0.2 + 9.8\, e^{-\frac{t}{2\ \mu s}}$

$\tau_1 = 1\ nF \times 2\ K = 2\ \mu s$