تمرین سری 6

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سوال 3 : 8-29

$I_C = 100 \times I_L = 100 \times 50 = 5 \qquad R_C = \dfrac{V_{CC} - V_{CE}}{I_C} = \dfrac{10}{5} = 2$

$I_B \geq \dfrac{I_C}{\beta_{min}} = \dfrac{5}{100} = 50 \Longrightarrow \dfrac{10 - 0.7}{R_B} \geq 50 \longrightarrow R_B \leq 286$

$t_1 = t_2 = 0.5T = \dfrac{0.5}{f} = \dfrac{0.5}{5} = 100$

$C = \dfrac{t_1}{0.69 R_B} = \dfrac{100}{0.69 \times 270} = 537$

سوال 8-34 :

$I_C = 100 I_L = 100 \times 50 = 5$

$Q_1(sat)$: $V_{CC} = R_{C_1} I_{C_1} + V_{CE(on)} + R_{E_1} I_{E_1} \longrightarrow V_B = V_{BE(on)} + R_{E_1} I_{E_1}$

$Q_2(sat)$: $V_{CC} = R_{C_1} I_{B_1} + V_{BE(on)} + R_{E_2} I_{E_2} \rightarrow$ ~~[illegible]~~

$\Longrightarrow \begin{cases} R_{C_1} + R_E = 1.76 \\ V_B - 5R_E = 0.7 \\ 100 R_E + R_{C_1} = 166 \end{cases}$

$R_E = 1.6 \;,\; R_{C_1} = R_{C_2} = 150 \;,\; V_B = 8.7$

$T_2 = R_{E_2} C \ln\left(\dfrac{V_{CC} - 2V_{BE}}{(V_B - V_{BE}) + V_{CE(sat)}}\right) \longrightarrow 100 = 1.6 \times C \ln\left(\dfrac{9 - 2\times 0.7}{8.7 - 0.7 + 0.2}\right) \longrightarrow C = 822$

سوال 8-37 : الف) شارژ خازن :

$V(0^+) = -\frac{7}{3} \;,\; V(\infty) = 4 \;,\; \tau = RC$

$V(t) = 4 + \left(-\frac{7}{3} - 4\right) e^{-\frac{t}{RC}} = 4 - \frac{19}{3} e^{-\frac{t}{RC}}$

$\frac{4}{3} = 4 - \frac{19}{3} e^{-\frac{t}{RC}} \longrightarrow T_1 = 0.865 RC$

دشارژ خازن :

$-\frac{7}{3} = -7 + \frac{25}{3} e^{-\frac{T_2}{RC}} \rightarrow T_2 = 0.58 RC$

$T = T_1 + T_2 = 0.865 RC + 0.58 RC = 1.445 RC$

$f = \frac{1}{T} = \frac{1}{1.445} = 1\,kHz \longrightarrow RC = 692 \longrightarrow \begin{cases} R = 10k \\ C = 69200p \end{cases}$

ب)

$\text{duty cycle} : \dfrac{T_1}{T_1 + T_2} \times 100 = \dfrac{0.865}{1.445} \times 100 = 60\%$

سوال 8-140

$$v_o(t) = v_{OH} + (v_{tl} + v_{OH})e^{-\frac{t}{RC}}$$

$$v_{tu} = v_{OH} + (v_{tl} - v_{OH})e^{-\frac{T_1}{RC}} \rightarrow T_1 = RC\ln\left(\frac{v_{tl} - v_{OH}}{v_{tu} - v_{OH}}\right) = RC\ln\frac{v_{OH} - v_{tl}}{v_{OH} - v_{tu}}$$

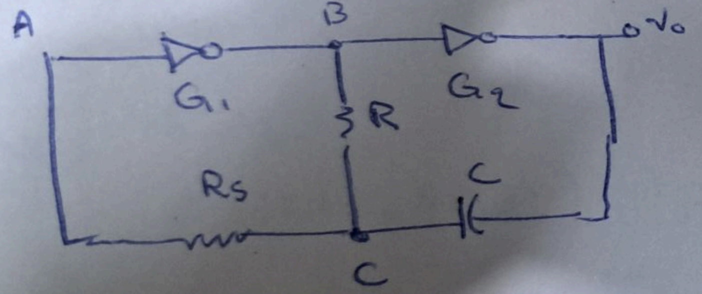
$$v_o(0^+) = v_{tu}, \quad v_o(\infty) = v_{OL}, \quad \tau = RC$$

$$v_o(t) = v_{OL} + (v_{tu} - v_{OL})e^{-\frac{t}{RC}}$$

$$v_{tL} = v_{OH} + (v_{tu} - v_{OL})e^{-\frac{T_2}{RC}} \rightarrow T_2 = RC\ln\left(\frac{v_{tu} - v_{OL}}{v_{tl} - v_{OL}}\right)$$

$$T = T_1 + T_2 = RC\left(\ln\frac{v_{tu} - v_{OL}}{v_{tL} - v_{OL}} + \ln\frac{v_{OH} - v_{tL}}{v_{OH} - v_{tu}}\right)$$

سوال 8-42 :



$$v_o = 0 \rightarrow v_B = 1, \quad v_A = 0$$

$$v_C = v_A + R_S I_{G_1}$$

C: شارژ می‌شود $\rightarrow v_A = v_T \Rightarrow v_C = v_T + R_S I_{G_1}$

$$v_o = 1 \rightarrow v_C(0^+) = v_T + R_S I_{G_1} + v_{CC}$$