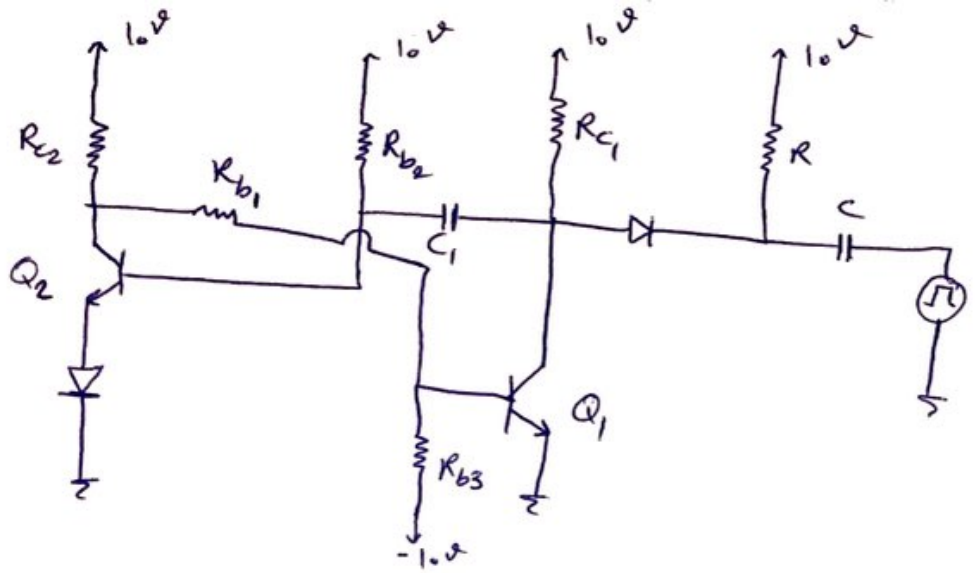
بخش ۱)



باید باشد: Q_2 اشباع، Q_1 قطع

$$\vartheta_{B_1} = \frac{-0.7-(-10)}{R_{b1}+R_{b3}} \times R_b - 10 = -1.5$$

$$\Rightarrow R_{b1} = \text{فرض } 0.68\,K\Omega \longrightarrow R_{b3} \simeq 2.2\,K\Omega$$

برای $t=0^-$

$$\vartheta_{B2} = 0.7 + 1.4 - 0.7$$

$$\vartheta_{CQ_1} = 10 \longrightarrow \vartheta_{C_1}(0^-) = 10 - 1.4 = 8.6\,\vartheta$$

$$\vartheta_{CQ_1} = 0.2 \rightarrow \vartheta_{B2} = -\vartheta_{C1} + \vartheta_{CQ_1} = 0.2 - 8.6 \Rightarrow \vartheta_{B_2} = -8.4\,\vartheta$$

Q_1 → اشباع $\quad \vartheta_{B_2}(t) = \vartheta_{B_2}(\infty) + (\vartheta_{B_2}(0^+) - \vartheta_{B_2}(\infty))\,e^{-t/\tau}$

Q_2 → قطع $\quad \vartheta_{B_2}(t) = 10 + (-8.4-10)\,e^{-t/R_{b2}C_1}$

$$\Rightarrow 1.2 = 10 + (-18.4)e^{-10^5/\tau} \longrightarrow \tau \simeq 1.35\,ms$$

$$R_{b_2} = 160\,K\Omega$$

$$C_1 = 1\,nF$$

$$i_{B2} = \frac{\vartheta_{cc} - \vartheta_{BE} - \vartheta_D}{R_{b2}} = \frac{10-1.4}{150} \simeq 0.057\,mA$$

$$i_{c2} = \frac{\vartheta_{cc} - \vartheta_{CE_2} - \vartheta_D}{R_{c2}} - \frac{\vartheta_{CE_2} + \vartheta_D + \vartheta_{EE}}{R_{b1}+R_{b3}} = \frac{9.1}{R_{c2}} - \frac{10.9}{2.88}$$

$$\Rightarrow 0.057 > \frac{0.091}{R_{c_1}} - 0.038$$

ادامه بخش ۱)

غیر پایداری

$$I_{B1} = \frac{10-.7}{R_{C2}-R_{b1}} - \frac{0.7-(-10)}{R_{b_2}} \simeq 0.67mA$$

$R_{C2} = 1K\Omega$

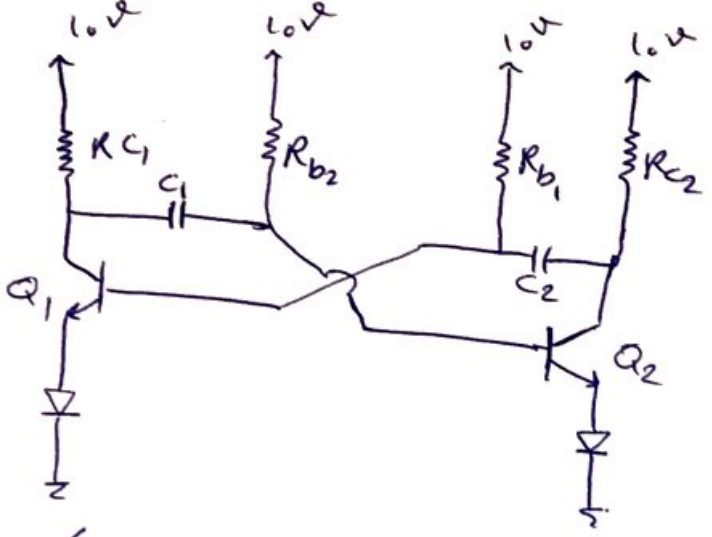
$$\frac{10-0.2}{R_{C_1}} = \frac{10-8.6-0.2}{R_{b_2}} \longrightarrow R_{C_1} = 10K\Omega$$

$$\omega = \frac{1}{R_C} = \frac{2\pi}{T} \longrightarrow R_C = \frac{1m}{2\pi} = 159\mu s$$

$R \simeq 16K$

$C = 10nF$

بخش 2)



دیوتی سایکل $= \frac{25}{100} = 25\% \longrightarrow f = 5KHz$

if $\rightarrow R_{C2} = R_{C1} = 1K\Omega$

$$V_{B1}(T_1) = 1.2 = V_B(\infty) + (V_B(0) - V_B(\infty))\, e^{-t/\tau}$$

$$1.2 = 10 + (-7.7 - 10)\, e^{-t/\tau}$$

$$V_{B1}(0^+) = 1.4(V_{CC} - 0.9) = 1.4 - 9.1 = -7.7$$

$$\tau_1 = C_2 R_{b1}$$

$$V_{B2}(T_2) = 1.2 = V_A(\infty) + (V_B(0) - V_B(\infty))\, e^{-t/\tau_2}$$

$$\tau_2 = R_{b2} C_1$$

$$25\% = \frac{T_2}{T_1 + T_2} \Rightarrow \begin{cases} T_1 = 50\mu s \\ T_2 = 150\mu s \end{cases}$$

$$f_1 = \frac{1}{T_1 + T_2} = 5KHz \Rightarrow T_1 + T_2 = 0.2ms$$

$R_b C_1 = 214.65\mu$

$R_{b2} C_1 = 71.63\mu \Rightarrow C_1 = C_2 = 6.8nF \longrightarrow R_{b1} = 10.53K\Omega$

$R_{b2} = 31.6K\Omega$