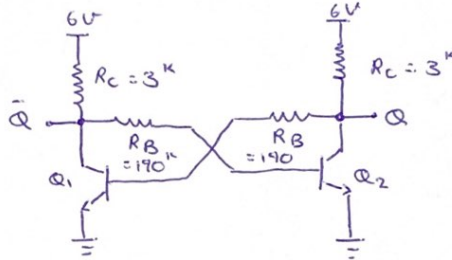رضا دینی پور
9814303
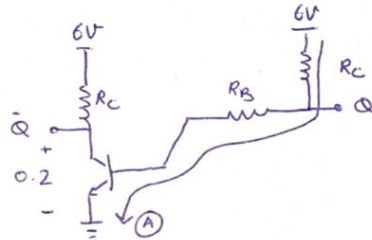تمرین سری 5 پالس

5
$\begin{cases} V_{cc} = 6\,V \\ I_c = 2\,mA \\ \beta > 70 \end{cases}$

1) $\begin{cases} Q_1 : ON \ (sat) \\ Q_2 : off \end{cases}$

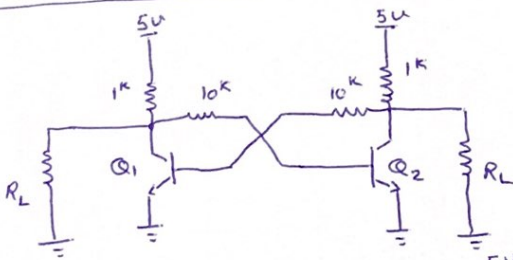
$R_c = \dfrac{V_{cc} - V_{CE,sat}}{I_c} = \dfrac{6 - 0.2}{2} = 2.9^k \xrightarrow{\text{انتخاب}} \boxed{R_c = 3^k} \Rightarrow I_c = \dfrac{6-0.2}{3} \simeq 1.9^{mA}$

$I_B = \dfrac{I_c}{\beta} = \dfrac{1.9}{70} = 0.027^{mA} = 27.1\,\mu A$
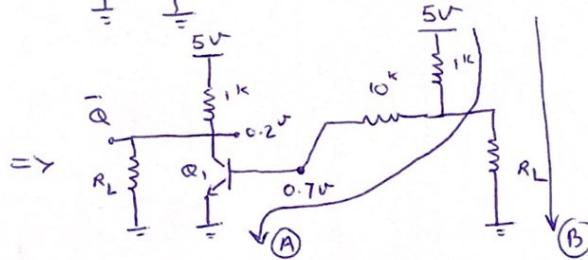
KVL in A: $-6 + (3^k + R_B) I_B + 0.7 = 0 \Rightarrow -6 + 3^k(0.027) + 0.027 R_B + 0.7 = 0$

$R_B = \dfrac{6 - 0.081 - 0.7}{0.027} = 193.2^k \longrightarrow \boxed{R_B = 200^k}$

8

$\begin{cases} Q_1 : ON \ (sat) \\ Q_2 : off \end{cases}$ (فرض) $\Rightarrow$
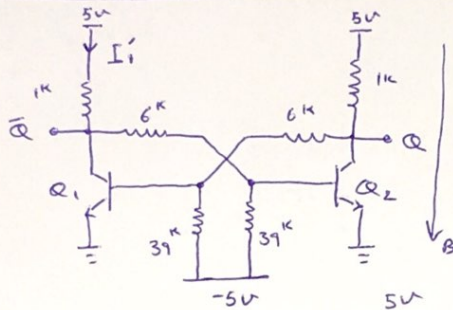

$R_L \gg 1$ (فرض) : $\dfrac{V_{cc} - 0.2}{1^k} = I_{c_1} = \dfrac{5 - 0.2}{1^k} = 4.8^{mA}$

KVL in Ⓐ : $-5 + (1^k + 10^k) I_{B_1} + 0.7 = 0 \Rightarrow \boxed{I_{B_1} = I_{c_2} = 390\,\mu A}$
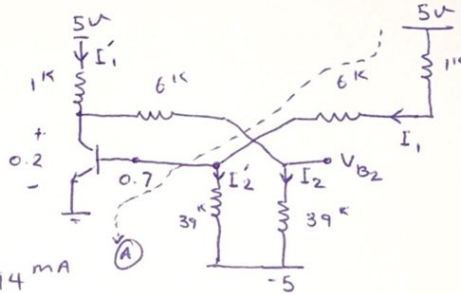
$$\beta_{min} = \frac{I_{c_1}}{I_{B_1}} = \frac{4.8^{mA}}{391 \mu A} = 12.28$$

KVL in B: $-5 + 1^k (0.39) + V_{CE2} = 0$ => $\boxed{V_{CE2} = 4.61}$

#10

فرض : $\begin{cases} Q_1 : ON \ (sat) \\ Q_2 : off \end{cases}$ =>

$$I_2' = \frac{V_{B_1} + V_{EE}}{39^k} = \frac{0.7 + 5}{39^k} = 0.14^{mA}$$

KVL in (A): $-5 + 7^k I_1 + 0.7 = 0$ => $I_1 = \frac{5 - 0.7}{7^k} = 0.6^{mA}$

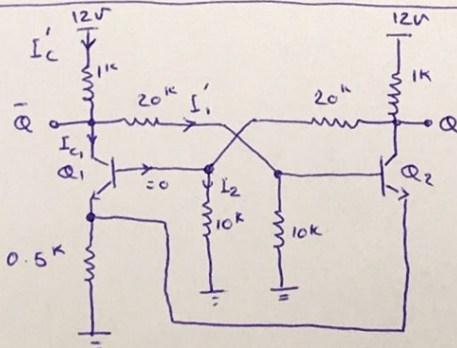KVL in (B): $-5 + 1^k (0.6^{mA}) + V_{CE2} = 0$ => $\boxed{V_{CE2} = 4.4^v}$

$$\boxed{I_1' = \frac{5 - 0.2}{1^k} = 4.8^{mA}}$$

$$I_2 = \frac{V_{CE1} + V_{EE}}{6 + 39} = \frac{0.2 + 5}{45} = 0.115^{mA}$$

$$V_{B2} = \frac{V_{B2} + V_{EE}}{39^k} + \frac{V_{B2} - V_{CE1}}{6^k} = 0 \quad => \quad V_{B2} \left(\frac{1}{39^k} + \frac{1}{6^k} \right) = \frac{-5}{39^k} + \frac{0.2}{6^k}$$
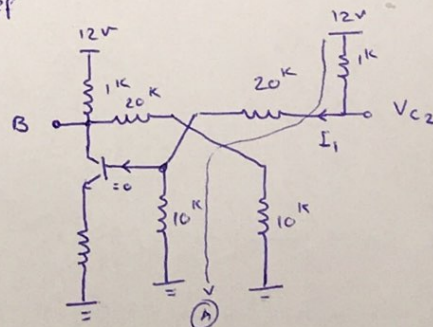
$$=> V_{B2} = \frac{\frac{-5}{39^k} + \frac{0.2}{6^k}}{\frac{1}{39^k} + \frac{1}{6^k}} = \boxed{-0.49 \ v}$$

#14

$\begin{cases} Q_1 : ON \ (sat) \\ Q_2 : off \end{cases}$ =>

$\beta \gg 1$ بنابراین فرض می‌کنیم $\rightarrow I_B \approx 0$ $\Rightarrow$ KVL in Ⓐ : $-12 + (1 + 20^k) I_1 + 10^k I_1 = 0$

$\Rightarrow I_1 = \dfrac{12}{31} = \underline{0.38^{mA}}$

$V_{B_1} = 0.38 \times 10^k = \underline{3.8\,v}$

$V_{C_2} = \dfrac{(R_1 + R_2) V_{cc}}{R_1 + R_2 + R_c} = \dfrac{(20^k + 10^k) \times 12^v}{20^k + 10^k + 1^k} = 11.61\,v$

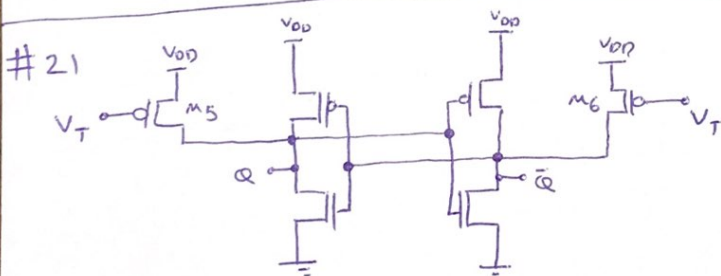$V_{E_1} = V_{E_2} = V_{B_1} - 0.7 = 3.87 - 0.7 = \underline{3.17\,v}$

$I_{E_1} = I_{c_1} = \dfrac{V_{E_1}}{R_E} = \dfrac{3.17}{0.5^k} = 6.34^{mA}$

KCL in Ⓑ : $+ I_c' - I_{c1} - I_1' = 0$ $\Rightarrow I_c' = I_{c1} + I_1'$ $\Rightarrow \dfrac{V_{cc} - V_{c1}}{R_c} = I_{c1} + \dfrac{V_c}{R_1 + R_2}$

$\Rightarrow \dfrac{12 - V_{c1}}{1^k} = 6.34^{mA} + \dfrac{V_{c1}}{20^k + 10^k}$ $\Rightarrow \underline{V_{c1} = 5.46}$

$V_{B_2} = \dfrac{R_2 V_{c1}}{R_1 + R_2} = \dfrac{10(5.46)}{10^k + 20^k} = \underline{1.82^v}$ $\Rightarrow$ $\begin{cases} I_1' = \dfrac{V_{c1}}{R_1 + R_2} = \dfrac{5.4}{20^k + 10^k} = 0.182^{mA} \\[4mm] I_c' = \dfrac{V_{cc} - V_{c1}}{R_c} = \dfrac{12 - 5.46}{1} = 6.54^{mA} \end{cases}$
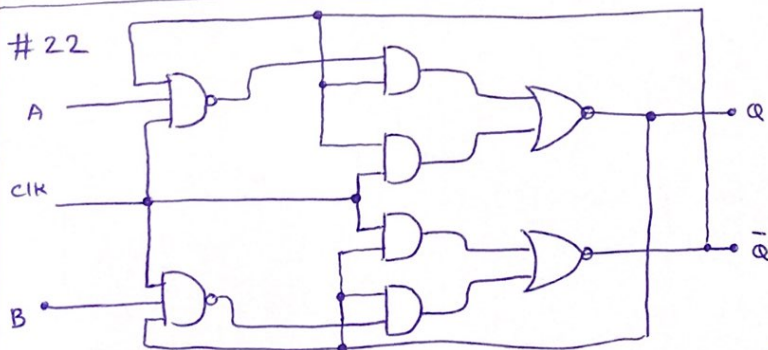

#21

.اگر $V_T = $ logic $\underline{1} \longrightarrow M_5, M_6 :$ off

.اگر $V_T = $ logic $\underline{0} \longrightarrow M_5, M_6 :$ oN

$\Big\Downarrow$ Active Low Triger

.اگر $M_5 :$ oN $\Rightarrow Q = $ logic $\underline{1}$ $\longrightarrow$ $\begin{vmatrix} A : \text{Set} \\ B : \overline{\text{Reset}} \end{vmatrix}$

#22

.اگر CIK $= 1$ $\Rightarrow$

A	B	Q^+
0	0	Q
0	1	Q
1	0	Q
1	1	Q

$Q^+ = Q$ با تغییر حالت‌ها بی‌اثر است

23

A	Q^+
0	0
1	1

D فلیپ فلاپ حساس به لبه مثبت کلاک