

تقریر میری کاپی بالیں

بسم الله الرحمن الرحيم

جانبہ غلام زادہ ۹۸۲۲۳۲۲۲

(۷)

$$V_{CC} = R_C I_{C_r} + V_{CE(sat)} + R_E I_E \quad , \quad I_{C_r} + I_{B_r} = I_E$$

$$V_{CC} = R_B I_{B_r} + V_{BE(on)} + R_E I_E$$

$$\begin{aligned} V_o &= I_{C_r} \times 0.1 + I_E \\ V_o &= 1V I_{B_r} + 0.1V + I_E \end{aligned} \quad \left. \begin{aligned} I_E &= 10 \text{ mA} \\ I_C &= 9.1 \text{ mA} \\ I_B &= 0.9 \text{ mA} \end{aligned} \right\}$$

$$V_E = R_E I_E = 1 \times 10 = 10 \text{ V} \quad V_i < V_E + V_{BE(on)} = 10.1 \text{ V}$$

$$\begin{aligned} V_o &= 0.1 I_1 + 0.1 I_2 + I_E \\ V_o &= 1V I_1 - 9.1V + 0.1 I_2 + I_E \end{aligned} \quad \left. \begin{aligned} I_E &= I_C = I_1 + I_2 \end{aligned} \right\} \begin{aligned} I_1 &= 9.04 \text{ mA} \\ I_2 &= 0.06 \text{ mA} \\ I_E &= 9.1 \text{ mA} \end{aligned}$$

$$V_E = R_E I_E = 1 \times 9.1 = 9.1 \text{ V} \quad V_i > V_{BE(on)} + V_E = 0.1V + 9.1V = 9.2 \text{ V}$$

$$V_{BE} < V_i < 10.1 \text{ V}$$

$$V_{B_r} = V_o - 1V I_1 = V_o - 1V \times 0.06 = -2.14 \text{ V}$$

$$V_E = 9.1 \text{ V} \Rightarrow V_{B_r} - V_E = -2.14 - 9.1 = -11.24$$

$$I_{C_1} = \frac{V_{CC} - V_{CE(sat)}}{R_C} = \frac{10 - 0.1}{1k} = 1.9 \text{ mA} \quad , \quad I_{B_1} > \frac{I_{C_1}}{\beta} = \frac{1.9}{100} = 19.9 \mu\text{A} \quad (1.)$$

$$V_{B_r} = V_{i1} + (-V_{i1} - V_{i1}) e^{-\frac{t}{\tau}} \rightarrow \tau = R_{th} \times C$$

$$0.1V = V_{i1} - 1.99 e^{-\frac{t}{\tau}} \rightarrow \tau = R_{th} C \approx 2V \mu s$$

$$V_{B_r} = V_{i1} + (-V_{i1} - V_{i1}) e^{-\frac{t}{\tau}} \quad \tau = (R_B + R_{a1} \parallel R_{b1}) C$$

$$0.1V = V_{i1} - 1.99 e^{-\frac{t}{\tau}} \quad t = 0.1V \times 10^3 (R_B + R_{a1} \parallel R_{b1}) C \geq 5 \mu s$$

$$\rightarrow (R_B + R_a \parallel R_b) C \geq \Delta t_{\text{mus}} \quad , \quad I_B = \frac{V_{ab} - V_{BE(on)}}{R_B + (R_a \parallel R_b)} > 19,1 \mu\text{A}$$

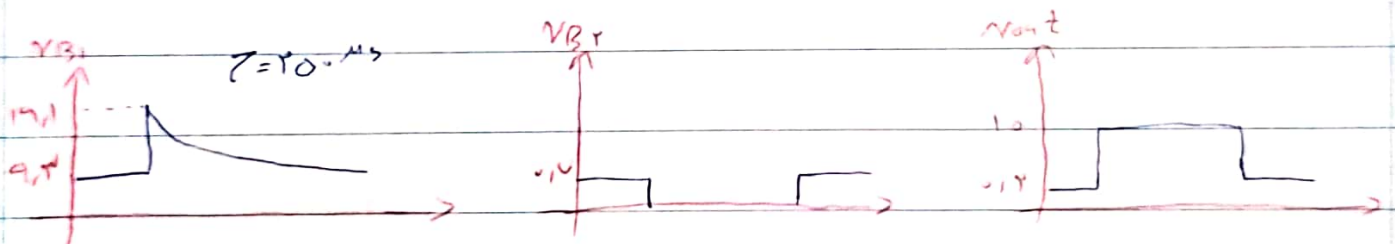
$$V_{ab} = \frac{\Delta \times R_b}{R_a + R_b} \rightarrow \frac{\Delta \times R_b}{R_b(R_a + R_b) + R_a R_b} > 10 \mu\text{V} \rightarrow R_B = 10 \text{ k} \quad , \quad R_a = R_b = 10 \text{ k} \quad (C = 10 \text{ nF})$$

$$I_{B_1} = \frac{9,1 \text{ V}}{10 \text{ k}} = 910 \mu\text{A} \rightarrow I_{C_1} = I_{E_1} = \beta I_{B_1} = 64,1 \text{ mA} \quad (\text{نقطة } 15)$$

$$I_{\text{sat}} = \frac{0,1 \text{ V}}{10} = 1 \mu\text{A} \quad , \quad I_{B_2} = I_{C_1} - I_{\text{sat}} = 64,1 \text{ mA} - 1 \mu\text{A} = 64,1 \text{ mA}$$

$$I_{C_2} = \frac{10 - 0,1 \text{ V}}{10 \text{ k}} = 1,99 \mu\text{A} \quad I_{B_2} \geq \beta I_{C_2}$$

$$V_{B_1} = 17,1 \text{ V} \quad , \quad \tau = (10 + 10) \times 0,01 \mu\text{F} = 20 \mu\text{s}$$



$$9,1 = 17,1 e^{-\frac{t}{20 \mu\text{s}}} \rightarrow t = -20 \mu\text{s} \ln\left(\frac{9,1}{17,1}\right) = 11 \mu\text{s} \quad (نقطة 17)$$

$$I_{B(max)} = 100 \mu\text{A} \quad , \quad I_{R_1} = 100 I_{B(max)} = 100 \times 100 \mu\text{A} = 10 \text{ mA} \quad (19)$$

$$R_2 = \frac{V_{B_2}}{I_{B_2}} = \frac{0,1 \text{ V}}{10 \text{ mA}} = 1 \text{ k}\Omega \quad , \quad 0,1 \text{ V} = \frac{17,1 \text{ V}}{R_1 + 1 \text{ k}\Omega} \times 9 \rightarrow R_1 = 144,5 \text{ k}\Omega \rightarrow 150 \text{ k}\Omega$$

$$V = \frac{R_2}{R_1 + R_2} V_{cc} = \frac{1 \text{ k}\Omega}{150 \text{ k}\Omega + 1 \text{ k}\Omega} \times 9 = 0,006 \text{ V} \quad , \quad R_W = R_1 \parallel R_2 = 150 \text{ k}\Omega \parallel 1 \text{ k}\Omega = 997,3 \text{ }\Omega \approx 1 \text{ k}\Omega$$

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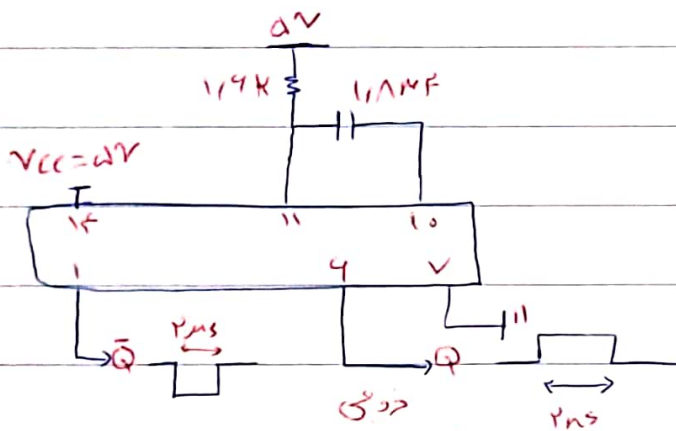
$$V = 0.1V_0 + (-1\omega) \cdot 41 - 0.1V_0 e^{-t/\tau}$$

$$\tau = (R_1 \parallel R_2)C = 1\mu s \times C$$

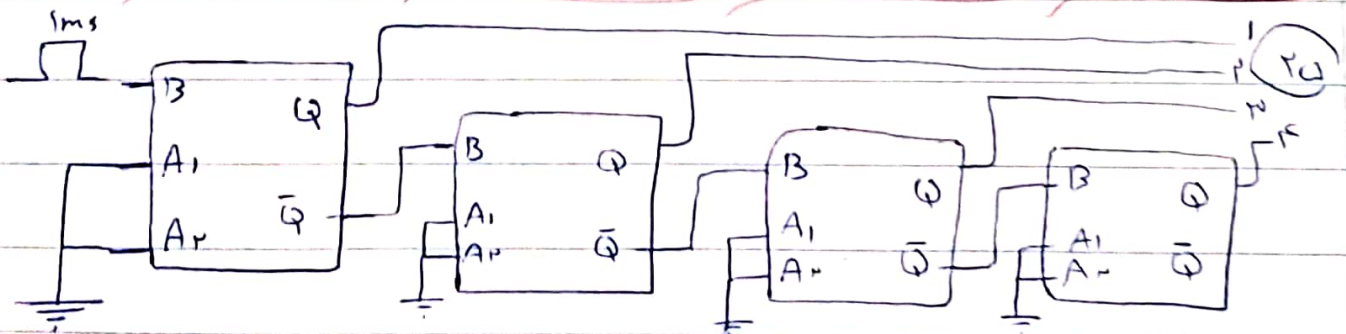
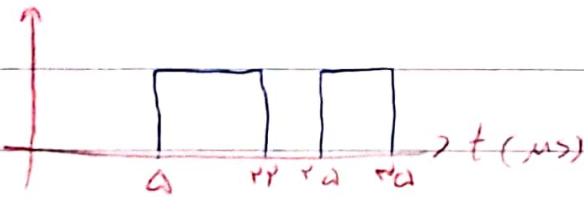
$$T = -1\mu s \ln\left(\frac{0.1V_0}{V_0}\right) = 1\mu s \rightarrow C_1 = 1.01 \mu F$$

$$T = -1\mu s \times 1.01 \ln\left(\frac{0.1V_0}{V_0}\right) = 2.9\mu s$$

$$0.49 R_{ex} C_{ex} = 2\mu s \rightarrow R_{ex} C_{ex} = 4.1\mu s \rightarrow C_{ex} = 1.1\mu F, R_{ex} = 1.4k\Omega \quad (18)$$



$$pw = 0.12A C_{ex} R_{ex} \left(1 + \frac{4.1V}{R_{ex}}\right) = 0.12A \times 0.00012 \times 1.1\mu s \times \left(1 + \frac{4.1V}{1.4k\Omega}\right) = 1.0\mu s \quad (22)$$





$$P_w = 0.149 \text{ C en Ren} = 1 \text{ ms}$$



$$\text{C en Ren} = 1, \text{ ms}$$



$$P_w = 0.149 \times 1, \mu\text{s} \times 1 \text{ K} = 1, \mu\text{s} \text{ ms}$$

