

①

(i)

②

$$V_{out} = 0.5 V_{in}$$

3

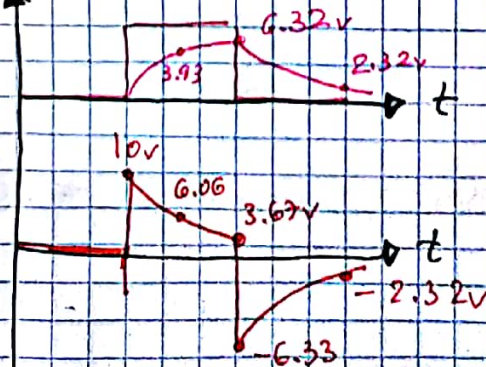
$$I_{02} = I_6 + I_8 = 1.5 \text{ mA}$$

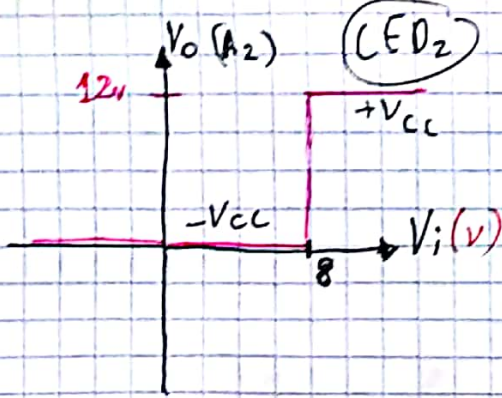
(1c)

②

(2)

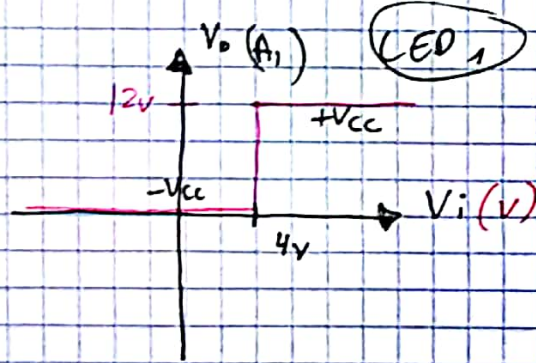
$$V_c/V_{in}$$





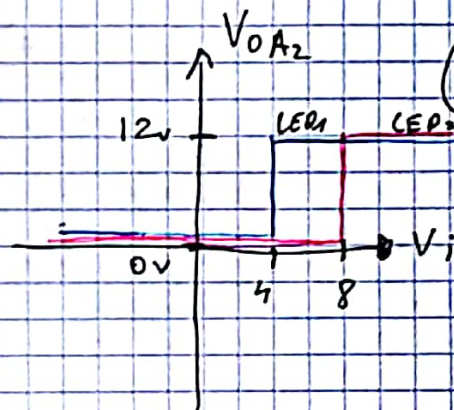
$$V_y = 10 \text{ V}$$

$$V_x = 4 \text{ V}$$



$$I_R = \frac{12 - 2.4}{2k} = 4.8 \text{ mA}$$

LED ₁	LED ₂	0 < V _i < 12V
off	off	0 < V _i < 4V
off	on	4V < V _i < 8V
on	off	8V < V _i < 12V
on	on	



Equ

$$\begin{cases} 20 = 30I_A - 10I_B \\ 60 = -10I_A + 20I_B \end{cases} \quad \begin{matrix} \cdot 2 \\ + \end{matrix}$$

$$40 = 60I_A - 20I_B$$

$$100 = 50I_A \quad 0$$

$$I_A = 2 \text{ A} \rightarrow I_B = 4 \text{ A}$$

$$R_1, R_2 \xrightarrow{2A} I_A$$

$$R_4, R_5 \xrightarrow{4A} I_B$$

$$\downarrow / R_3 \rightarrow I_B - I_A = 2A$$

$$V_A = V_B + 60 \rightarrow V_4 - V_2 = 0V + 60 - 4 \cdot 7 - 2 \cdot 5 = 22V$$

100k 100k : 100k 100k

(5)

$$V_{out1} = \left(\frac{V_2}{R_2} + \frac{V_1}{R_1} \right) (-R_3) = \left(\frac{0.2}{20k} + \frac{0.1}{10k} \right) 50k$$

$$V_{out1} = 1V \rightarrow I_4 = \frac{1V - 0}{10k} = 0.1mA$$

$$V_{out2} = ? \rightarrow 100k 100k$$

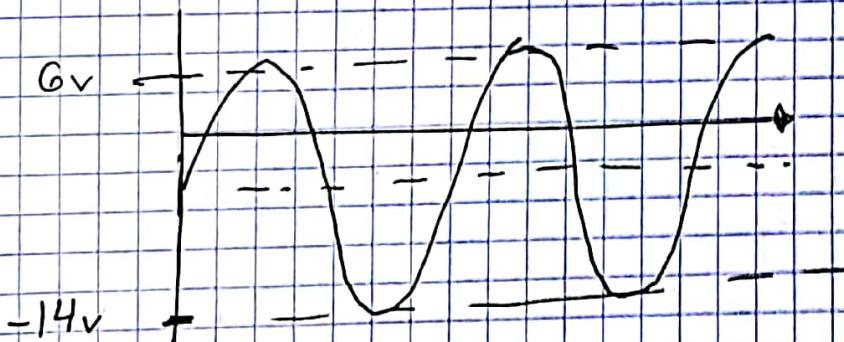
$$\frac{V_{out2} - V_A}{100k} = \frac{V_A - V_{out1}}{25k}$$

$$V_{out2} - V_A = 4V_A - 4 \cdot 1V$$

$$V_{out2} = 5V_A - 4V$$

$$V_A = 2V \quad 6V \text{ max}$$

$$V_A = -2V \quad -14V \text{ min}$$



$$\tau = 1 \text{ ms}$$

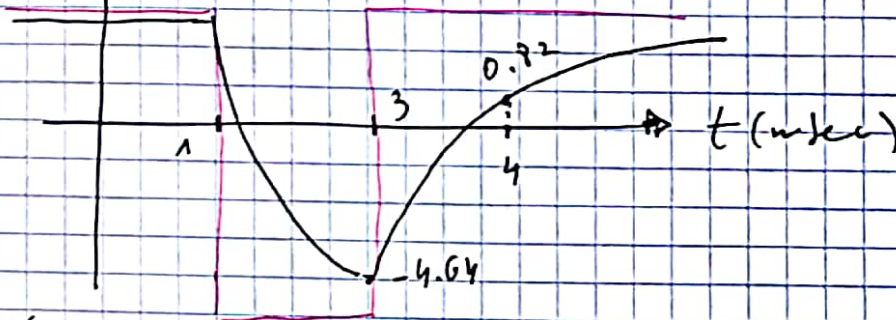
(1c) (6)

$$(3 \text{ ms}) V_C = -6 - (-6-4) \cdot e^{-2} = -4.64 \text{ V}$$

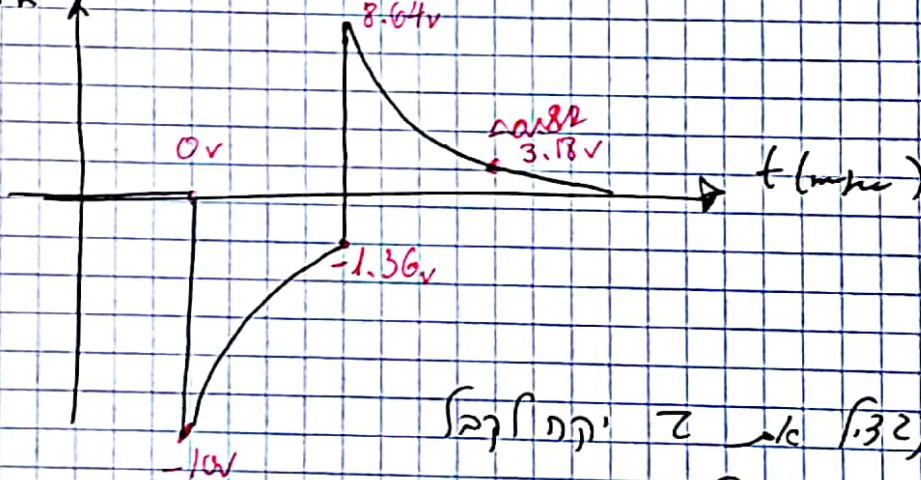
(2+) (1c)

$$(4 \text{ ms}) V_B = 4 - (4 + 4.64) e^{-1} = 0.82 \text{ V}$$

$V_{in}/V_C \text{ (V)}$

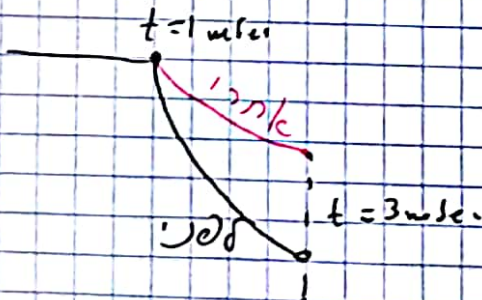


$(V) V_B$



אם τ יקח קצת יותר זמן להטען.

לכן המתח ביציאה יהיה גבוה יותר.



$$V_B = 2V$$

(10) (7)

$$V_A > V_B \quad \text{and} \quad V_0 = 6V$$

(7)

$$V_A = 2V \quad \leftarrow \text{is}$$

$$R_{LOR} < 50K \quad \text{and}$$

$$R_{LOR} > 3LUX \quad \text{and}$$

$$R_3 = \frac{U_3}{I_3} = \frac{6 - 1.5}{10m} = 450\Omega$$

(5)

$$I = \frac{E_1 + E_2}{R_1 + R_2} = \frac{22}{7} = 3.14A$$

(6)

(8)

$$U_2 = I \cdot R_2 = 9.42V$$

$$V_B + 12V - U_2 = V_A$$

$$V_B - V_A = U_2 - 12 = 9.42V - 12 = -2.57V$$

$$|V_{BA}| = 2.57V$$

$$\begin{cases} 22 = 7I_A + 3I_B \\ 12 = 3I_A + 15I_B \end{cases}$$

(1A)

(1B)

(1)

$$I_A \neq I_B : 83N$$

$$110 = 35I_A + 15I_B$$

$$-98 = -32I_A$$

$$\begin{cases} I_A = 3.0625A \\ I_B = 0.1875A \end{cases}$$

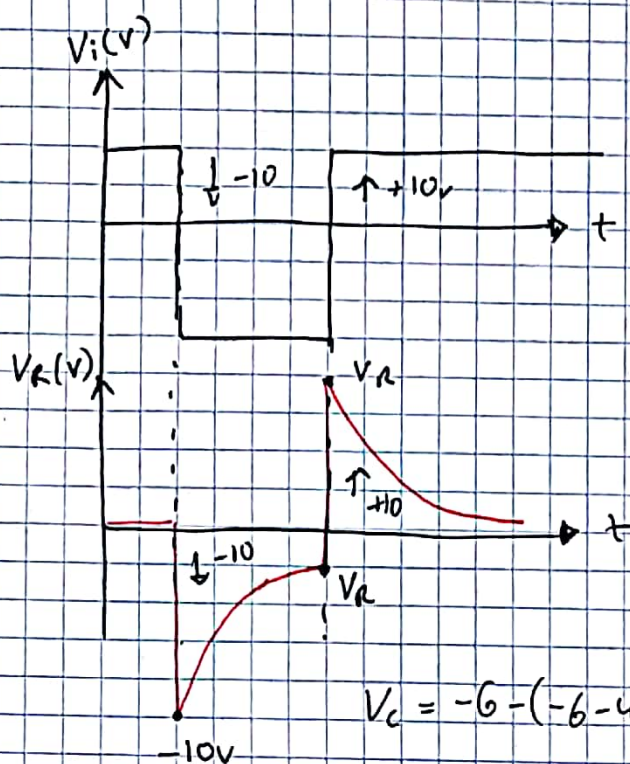
$$I_3 = 3.25A$$

$$V_B + 12 - 9.75 = V_A$$

$$V_B - V_A = -2.25V$$

$$U_3 = 9.75V$$

$$|V_{BA}| = 2.25V$$



$$\tau = 1 \text{ ms}$$

(9)

לנתן הנצטרך תמיד 10 א"מ

אם 0-8 וולט ומהם 83 א"מ

שינוי לנתן הנכנסה

לנתן ה' 3.1 א"מ = לנתן 3.2

$$V_c = -6 - (-6 - 4)e^{-2} = -2.32 \text{ V} \rightarrow V_R = -3.67 \text{ V}$$

$$3 \text{ ms} \quad V_c = -6 - (-6 - 4)e^{-2} = -4.64 \text{ V} \rightarrow V_R = -1.35 \text{ V}$$

$$4 \text{ ms} \quad V_c = 4 - (4 - (-4.64))e^{-1} = 0.82 \text{ V} \rightarrow V_R = 3.17 \text{ V}$$

לנתן 10 א"מ $1 \text{ ms} < t < 3 \text{ ms}$ (3) נה קורה ה'ן

$$V_\infty = -6, \quad V_0 = 4 \quad V_c = V_\infty - V_R = -6 - (-7) = 1 \text{ V}$$

$$t = -\tau \cdot \ln \left(\frac{V_\infty - V_c}{V_\infty - V_0} \right) = -1 \text{ ms} \cdot \ln \left[\frac{-6 - 1}{-6 - 4} \right] = 0.356 \text{ ms}$$

$$t = 1 \text{ ms} + 0.356 \text{ ms} = 1.356 \text{ ms}$$

$$\begin{cases} 50I_A - 45I_B = 40 & /:10 \\ -45I_A + 50.5I_B = 64 & /:9 \end{cases}$$

$$\begin{matrix} I_A & I_B & (10) \end{matrix}$$

נכנס

$$\vec{I}_4 = 10 \text{ A} \quad \uparrow \quad \vec{I}_3 = 0.2 \text{ A}$$

$$0 - V_A = U_3 = -0.2 \cdot 45 = -9 \text{ V}$$

$$\begin{aligned} 5I_A - 4.5I_B &= 4 \\ -5I_A + 5\frac{11}{18}I_B &= 7\frac{1}{9} \end{aligned}$$

$$1\frac{1}{9}I_B = 11\frac{1}{9}$$

$$\boxed{I_B = 10 \text{ A}} \rightarrow \boxed{I_A = 9.8 \text{ A}}$$