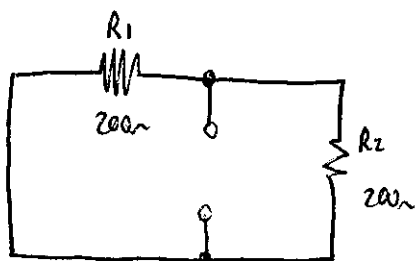


1. לאסון

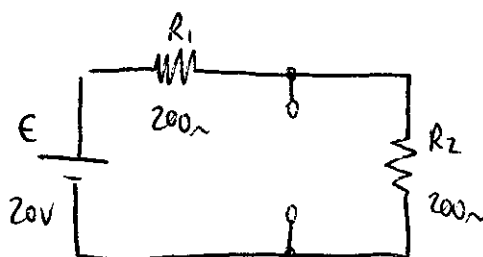
(סכום) ממוצע תכנון כללי (הסכום):

תאריך: R_{TH}



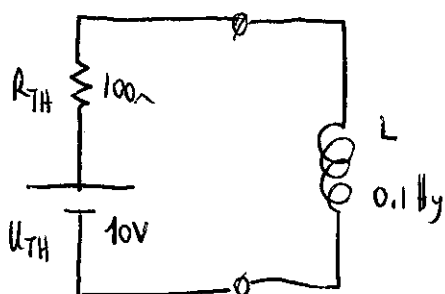
$$R_{TH} = R_1 \parallel R_2 = 200 \parallel 200 = 100 \Omega$$

תאריך: U_{TH}



$$U_{TH} = U_{R_2} = \frac{E}{2} = 10V$$

(סכום) כלל תכנון כללי (הסכום):



$$\tau = \frac{L}{R_{TH}} = \frac{0.1}{100} = 1msec$$

(K)

$$i_L(t=2msec) = ?$$

(?)

$$I_L(t) = I_L(\infty) - (I_L(\infty) - I_L(0^+))e^{-t/\tau}$$

$$I_L(\infty) = \frac{U_{TH}}{R_{TH}} = \frac{10}{100} = 0.1 \text{ A}$$

$$I_L(0) = 0$$

$$I_L(2\text{msec}) = 0.1 - (0.1 - 0)e^{-\frac{2}{1}} = 0.1 - 0.1e^{-2} = 86.466 \text{ (mA)}$$

$$V_L(2\text{msec}) = ?$$

(1)

$$V_L(t) = V_L(\infty) - (V_L(\infty) - V_L(0^+))e^{-\frac{t}{\tau}}$$

$$V_L(\infty) = 0$$

$$V_L(0^+) = U_{TH} = 10 \text{ V}$$

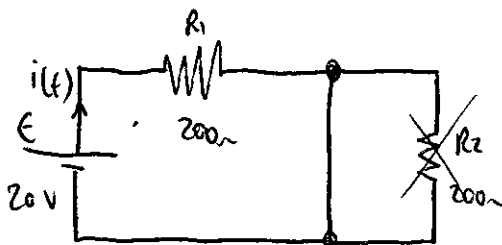
$$V_L(2\text{msec}) = 0 - (0 - 10)e^{-\frac{2}{1}} = 10e^{-2} = 1.353 \text{ (V)}$$

8" חוק הוולט'ים של קירכוף:

$$V_{R_1}(t) = \epsilon - V_L(t)$$

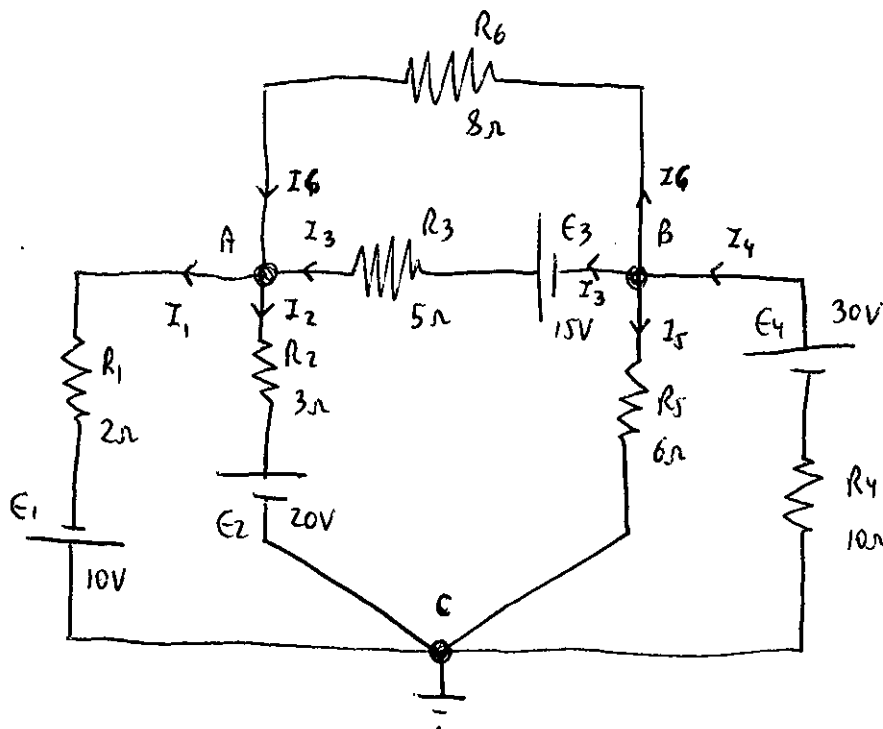
$$U_{R_1}(2\text{msec}) = 20 - 1.353 = 18.646 \text{ (V)}$$

9) כעקרו במתמטיקה (הסידור מונוטו קצר ולסוף המעגל נראה) כן:



$$i(t=5\tau) = \frac{\epsilon}{R_1} = \frac{20}{200} = 0.1 \text{ (A)}$$

"משך זמן"



(K)

A) $I_6 + I_3 = I_1 + I_2$

$$\frac{U_B - U_A}{R_6} + \frac{U_B - U_A + E_3}{R_3} = \frac{U_A - U_C + E_1}{R_1} + \frac{U_A - U_C - E_2}{R_2}$$

B) $I_4 = I_3 + I_5 + I_6$

$$\frac{U_C - U_B + E_4}{R_4} = \frac{U_B - U_A + E_3}{R_3} + \frac{U_B - U_C}{R_5} + \frac{U_B - U_A}{R_6}$$

$$\begin{cases} \frac{U_B - U_A}{8} + \frac{U_B - U_A + 15}{5} = \frac{U_A + 10}{2} + \frac{U_A - 20}{3} & | \cdot 120 \\ \frac{-U_B + 30}{10} = \frac{U_B - U_A + 15}{5} + \frac{U_B}{6} + \frac{U_B - U_A}{8} & | \cdot 120 \end{cases}$$

(P)

$$\begin{cases} 15(U_B - U_A) + 24(U_B - U_A + 15) = 60(U_A + 10) + 40(U_A - 20) \\ 12(-U_B + 30) = 24(U_B - U_A + 15) + 20U_B + 15(U_B - U_A) \end{cases}$$

$$\begin{cases} 15U_B - 15U_A + 24U_B - 24U_A + 360 = 60U_A + 600 + 40U_A - 800 \\ -12U_B + 360 = 24U_B - 24U_A + 360 + 20U_B + 15U_B - 15U_A \\ -139U_A + 39U_B = -560 \\ -39U_A + 71U_B = 0 \end{cases}$$

$$U_A = 4.762(V) ; U_B = 2.616(V)$$

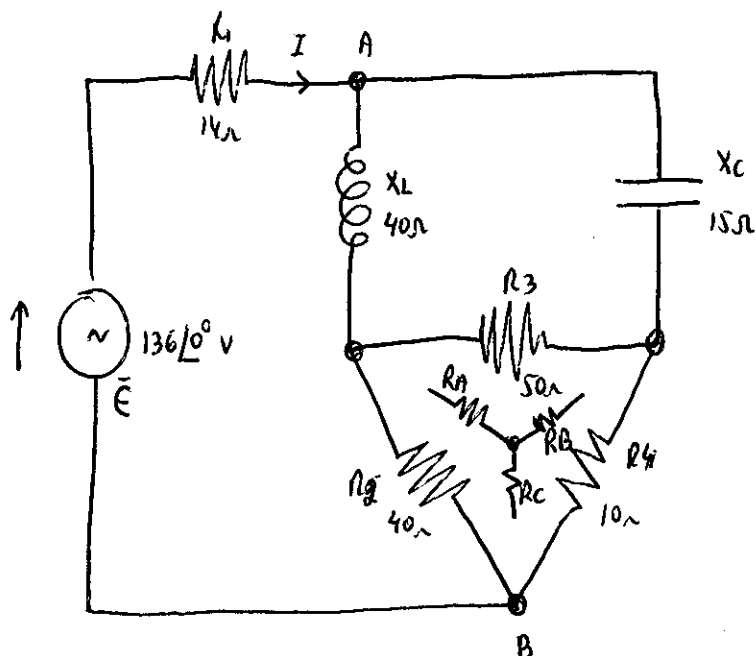
$$I_{R_3} = \frac{U_B - U_A + E_3}{R_3} = \frac{2.616 - 4.762 + 15}{5} = 2.57(A) \quad B \rightarrow A \quad (2)$$

$$P_{R_6} = \frac{U_{R_6}^2}{R_6} \quad (3)$$

$$U_{R_6} = U_A - U_B = 4.762 - 2.616 = 2.146 V$$

$$P_{R_6} = \frac{2.146^2}{8} = 0.575(W)$$

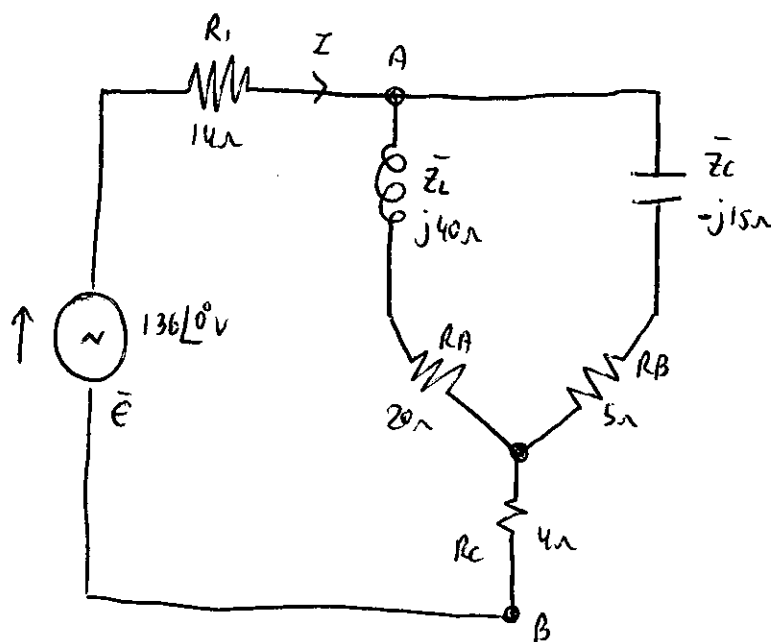
שים לב: השוליים יחתכו לפני הסריקה. לכן, חל איסור מוחלט לכתוב כאן.



$$R_A = \frac{R_3 \cdot R_2}{R_2 + R_3 + R_4} = \frac{50 \cdot 40}{100} = 20\Omega$$

$$R_B = \frac{R_3 \cdot R_4}{R_2 + R_3 + R_4} = \frac{50 \cdot 10}{100} = 5\Omega$$

$$R_C = \frac{R_2 \cdot R_4}{R_2 + R_3 + R_4} = \frac{40 \cdot 10}{100} = 4\Omega$$



$$\bar{Z}_T = [(\bar{Z}_L + R_A) \parallel (\bar{Z}_C + R_B)] + R_1 + R_C$$

$$\bar{Z}_T = \left(\frac{1}{20 + j40} + \frac{1}{5 - j15} \right)^{-1} + 14 + 4 = \left(\underset{\substack{\uparrow \\ R_T}}{30} - \underset{\substack{\uparrow \\ X_T}}{j16} \right) \Omega = \underset{\substack{\uparrow \\ |\bar{Z}_T|}}{34} \angle \underset{\substack{\uparrow \\ \theta}}{-28.012^\circ} \Omega$$

$$\bar{I}_T = \frac{\bar{E}}{\bar{Z}_T} = \frac{136 \angle 0^\circ}{34 \angle -28.07^\circ} = 4 \angle 28.07^\circ \text{ [A]} \quad (K)$$

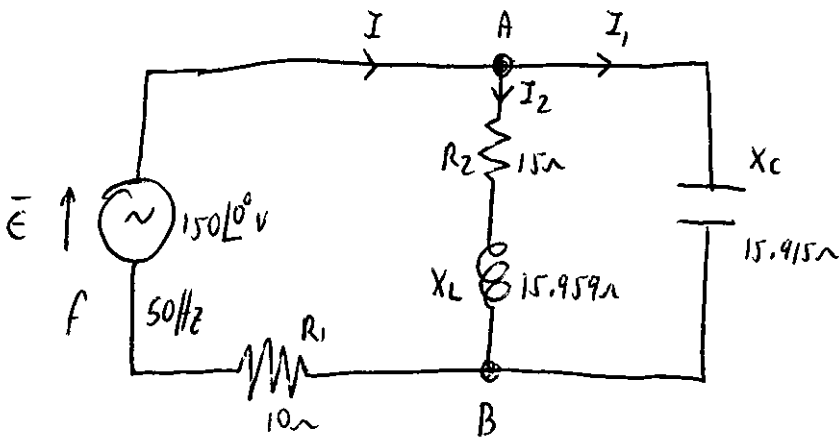
$$P_T = |I_T|^2 \cdot R_T = 4^2 \cdot 30 = 480 \text{ [W]} \quad (L)$$

$$\bar{U}_{AB} = -\bar{U}_{R_1} + \bar{E} \quad (I)$$

$$\bar{U}_{AB} = -(R_1 \cdot \bar{I}_T) + \bar{E}$$

$$\bar{U}_{AB} = -(14 \cdot 4 \angle 28.07^\circ) + 136 = 90.509 \angle -16.92^\circ \text{ (V)} .$$

שם לבו השוליים יחתכו לפני הסריקה. לכן, חל איסור מוחלט לכתוב כאן.



4, dxe

$$X_L = 2\pi fL = 2\pi \cdot 50 \cdot 50.8 \cdot 10^{-3} = 15.959 \Omega$$

$$X_C = \frac{1}{2\pi fC} = \frac{1}{2\pi \cdot 50 \cdot 200 \cdot 10^{-6}} = 15.915 \Omega$$

$$\bar{Z}_T = [(R_2 + \bar{Z}_L) \parallel \bar{Z}_C] + R_1$$

$$\bar{Z}_T = \left(\frac{1}{15 + j15.959} + \frac{1}{-j15.915} \right)^{-1} + 10$$

$$\bar{Z}_T = (26.885 - j15.964) \Omega = 31.268 \angle -30.301^\circ \Omega$$

$$\bar{I} = \frac{\bar{E}}{\bar{Z}_T} = \frac{150 \angle 0^\circ}{31.268 \angle -30.301^\circ} = 4.797 \angle 30.301^\circ \text{ (A)}$$

(K)

$$\bar{I}_1 = \frac{\bar{I} \cdot (R_2 + \bar{Z}_L)}{R_2 + \bar{Z}_L + \bar{Z}_C}$$

$$\bar{I}_1 = \frac{4.797 \angle 30.301^\circ \cdot (15 + j15.959)}{15 + j15.959 - j15.915} = 7.004 \angle -16.241^\circ \text{ (A)}$$

$$\bar{I}_2 = \bar{I} - \bar{I}_1 = 4.797 \angle 30.301^\circ - 7.004 \angle -16.241^\circ$$

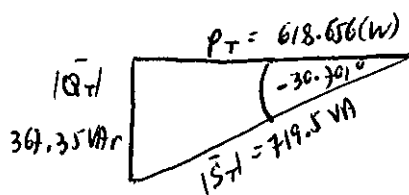
$$\bar{I}_2 = 5.117 \angle 120.532^\circ \text{ (A)}$$

$$P_T = |\bar{I}_T|^2 \cdot R_T = 4.797^2 \cdot 26.885 = 618.656 \text{ (W)}$$

(P)

$$|Q_T| = |\bar{I}_T|^2 \cdot X_T = 4.797^2 \cdot 15.964 = 367.35 \text{ (VAR)}$$

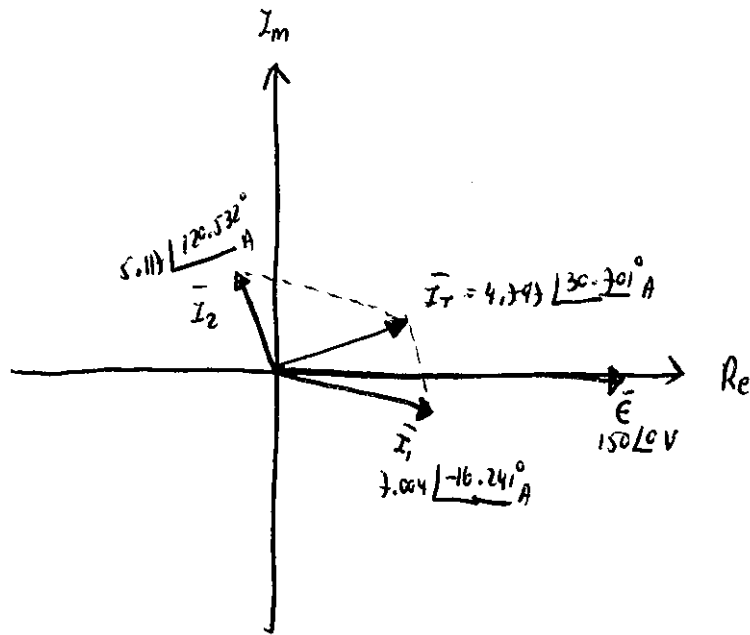
$$S_T = P_T + jQ_T = (618.656 + j367.35) \text{ VA} = 719.5 \angle -30.301^\circ \text{ (VA)}$$



(S_T)

- (ז) אופי התעלה הוא קיבולי, כי
 - כוונת העברת השקילות שלילית
 - האופי קיבולי והכרחי מנקיטת אר האמת

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שים לב! השוליים יחתכו לפני הסריקה. לכן, חל איסור מוחלט לכתוב כאן.