ASSIGNMENT 02 [MID-TERM]

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The variables value according to ID:

m_1	m_2	m_3	m_4	m_5
4	4	7	9	3

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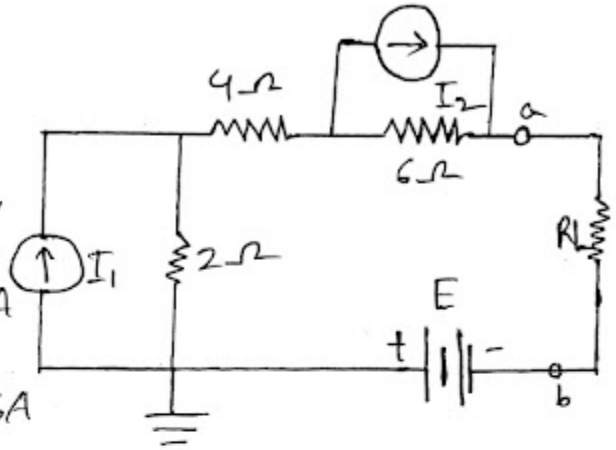
Problem-01

$m_5 = 3$

$\therefore E = 20(1+0.25\times3) = 35V$

$I_1 = 4(1+0.25\times3) = 7A$

$I_2 = 2(1+0.25\times3) = 3.5A$



a)

$R_{TH} = (2+4+6)\Omega$

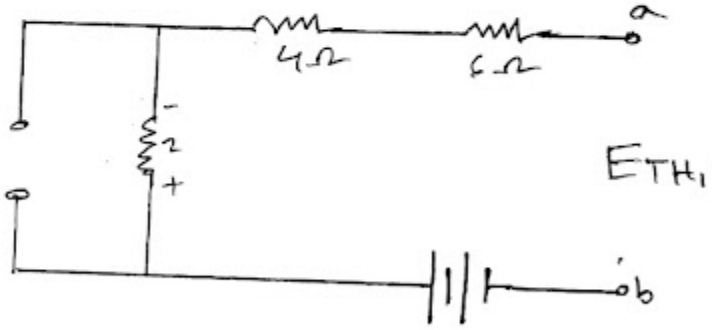
$= 12\Omega$

To find E_{TH},

Consider E,

$\therefore E_{TH_1} = \frac{2}{12} \times 35$

$= 5.83V$

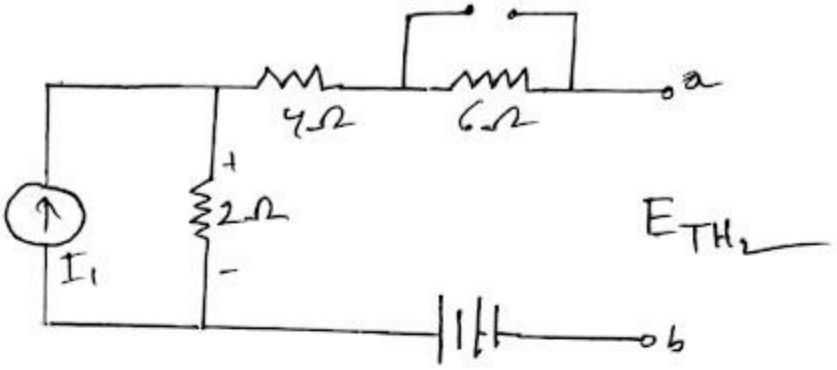


Consider I_1,

$E_{TH_2} = I_1 \times R_{TH}$

$= 7 \times 12$

$= 84\,V$

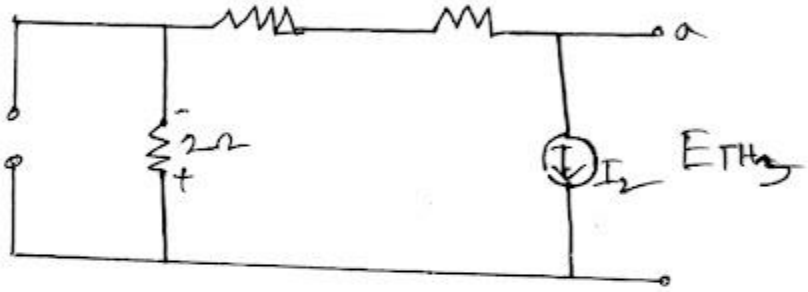


Consider I_2,

$E_{TH_3} = I_2 \times R_{TH}$

$= 3.5 \times 12$

$= 42\,V$



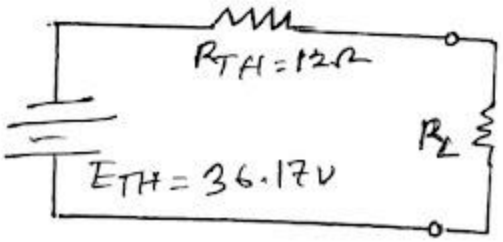
Finally,

$E_{TH} = E_{TH_1} - E_{TH_2} + E_{TH_3}$

$= (5.83 - 84 + 42)\,V$

$= -36.17\,V$

So The Thevenin equivalent circuit,



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b)

$$R_L = R_{TH} = 12\,\Omega$$

c)

$$P_{max} = \frac{(E_{TH})^2}{4R_{TH}}$$

$$= \frac{(-36.17)^2}{4 \times 12}$$

$$= 27.26\ W.$$

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Problem-02:

a) $m_4 = 9$

$\therefore E = 40(1 + 0.5 \times 9) = 220V$

Time constant,

$\tau = RC$

$= 2 \times 100$

$= 200ms$

$v_c = E(1 - e^{-t/\tau})$

$= 220(1 - e^{-t/200})V$

$i_c = \frac{E}{R} e^{-t/\tau}$

$= \frac{220}{2} e^{-t/200}$

$= 110 e^{-t/200}$

$= 110mA\, e^{-t/200}$

b) $\tau = 200ms$

$v_c = E e^{-t/\tau}$

$= 220V e^{-t/200}$

$i_c = -\frac{E}{R} e^{-t/\tau}$

$= -\frac{220}{2} e^{-t/200}$

$= -110mA e^{-t/200}$

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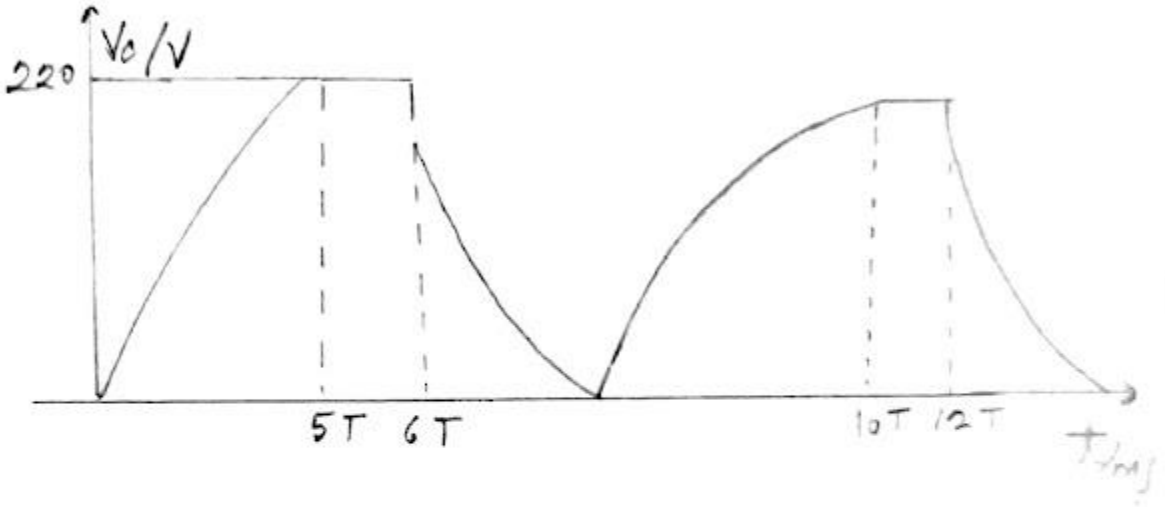
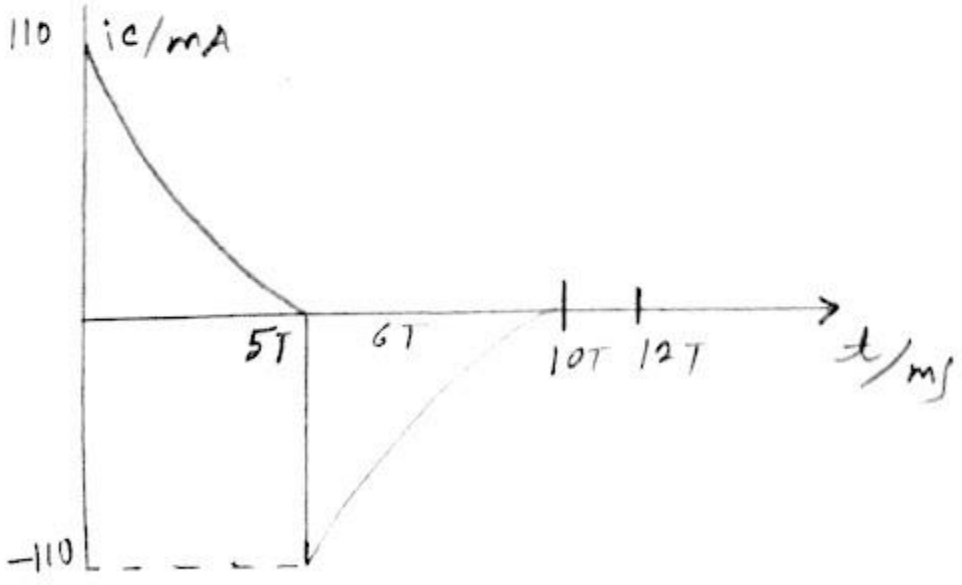
c)





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Problem - 3

a) $\tau = \frac{L}{R_1}$

$= \frac{10}{10}\mu s = 1\mu s$

$i_L = \frac{E}{R_1}(1 - e^{-t/\tau})$

$= \frac{20}{10}(1 - e^{-t})$

$= 2mA(1 - e^{-t})$

$V_L = Ee^{-t/\tau}$

$= 20e^{-t}$

$= 20Ve^{-t}$

b) $\tau' = \frac{L}{R_1 + R_2}$

$= \frac{10}{10 + 10}$

$= 0.5\mu s$

$I_m = \frac{E}{R_1}$

$= \frac{20}{10}$

$= 2mA$

$i_L = I_m e^{-t/\tau}$

$= 2mAe^{-t/0.5}$

$V_i = \left(1 + \frac{R_2}{R_1}\right)E$

$= \left(1 + \frac{10}{10}\right)20$

$= 40V$

$V_L = V_i e^{-t/\tau}$

$= -40V \cdot e^{-t/0.5}$

c,

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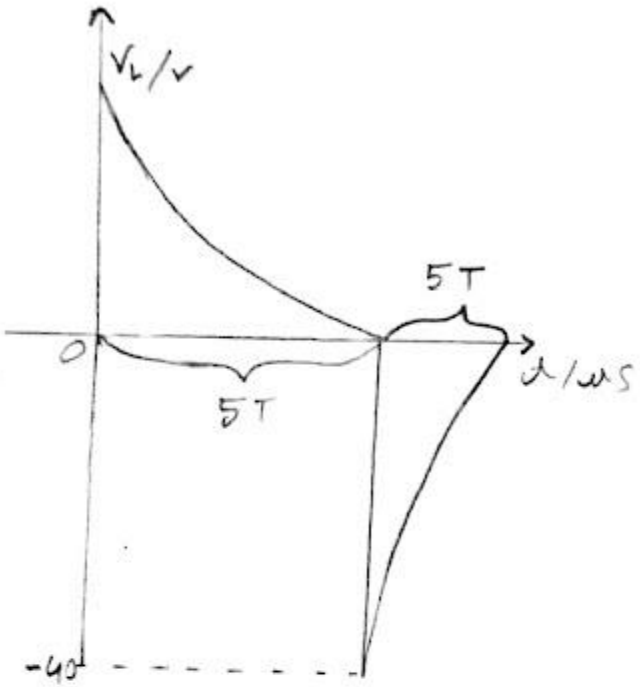

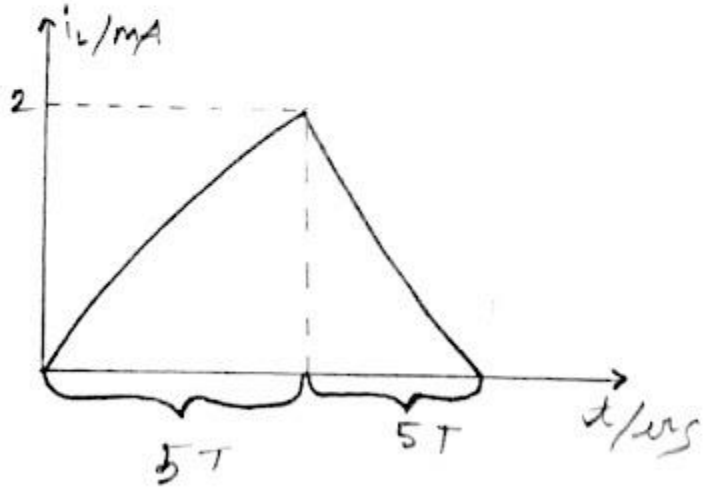

$5T = 5 \times 1 = 5\mu s$

$5T = 5 \times 0.5 = 2.5\mu s$

THE END