University of engineering & technology Peshawar

Circuit & system-1

Final-term paper

Spring 2020

Submitted by: Ashfaq Ahmad

Section: B

Reg No: 19PWCSE1795

Semester: 2nd

"On my honor, as a student of University of Engineering and Technology Peshawar, I have neither given nor received unauthorized assistance on this academic work"

Student signature: _____

Submitted to:
prof: salman ahmad

Department Of Computer System Engineering

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Answer No 1:

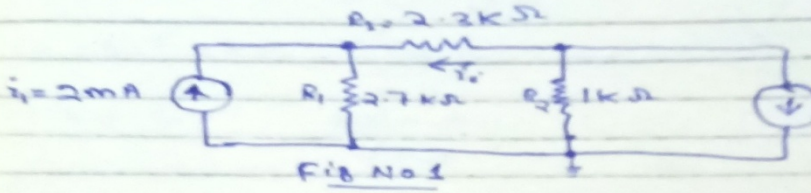

Fig No 1

Now According to Source - Transformation

$V_{s_1} = i_1 R_1$ put values

$V_{s_1} = 2 \times 10^{-3} \times 2.7 \times 10^{3}$

$V_{s_1} = 5.4\,V$

So figure No 1 became

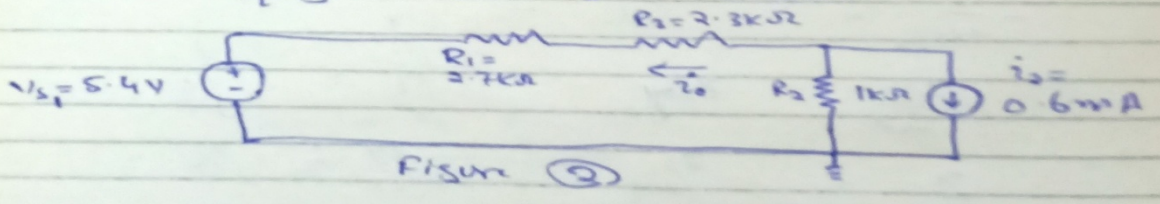

Figure (2)

Now we can further Simplify Figure (2) by using Source transformation

$V_{s_2} = i_2 \times R_2$ put value

$V_{s_2} = 1 \times 10^{3} \times 0.6 \times 10^{-3}$

$V_{s_2} = 1 \times 0.6$

$V_{s_2} = 0.6\,V$

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Now figure (2) became.

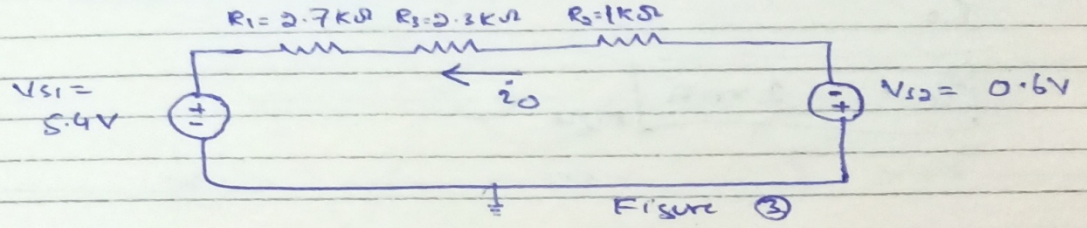


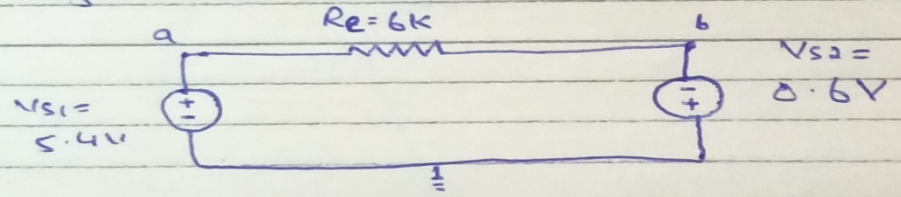
Figure (3)

Now equivalent Resistance of R_1, R_2, R_3 is

$R_e = (2.7K + 2.3K + 1K)\,\Omega$

$R_e = 6K\,\Omega$

Figure (3) became,



Now i_o is given by

$$i_o = \frac{V_{s1} - V_{s2}}{R_e}$$

$V_{s1} = 5.4V$

$V_{s2} = -0.6V$ (opposite in direction)

So $$i_o = \frac{5.4 - (-0.6)}{6\times10^3} = \frac{6.0V}{6\times10^3\,\Omega}$$

$$i_o = 1\,mA$$

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Since it is opposite in direction
So

$$\boxed{\vec{i}_o = -1\,mA}$$ Ans

xxx xxx xxx

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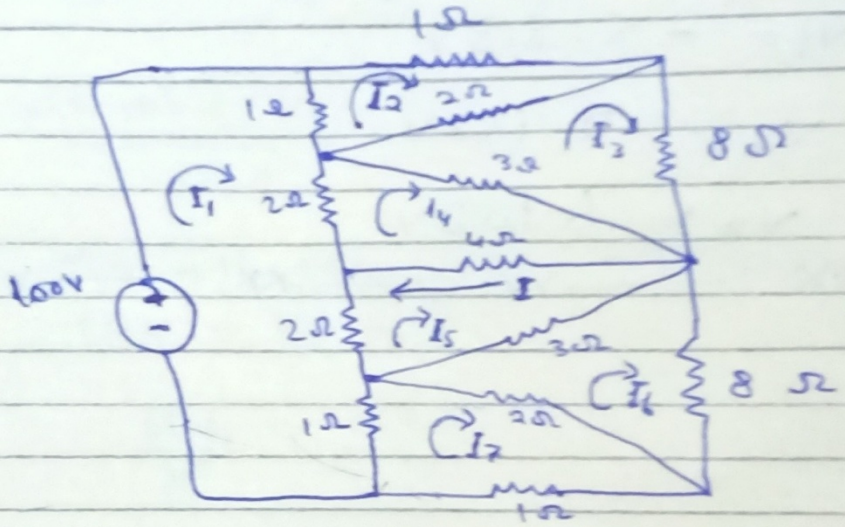
Answer NO 2:



All mesh current are labeled and we are going clockwise in each mesh

Mesh 1: (containg voltage source)

$$-100V + 1(I_1 - I_2) + 2(I_1 - I_4) + 2(I_1 - I_5) + 1(I_1 - I_7) = 0$$

$$I_1 + I_2 + 2I_1 - 2I_4 + 2I_1 - 2I_5 + 1I_1 - 1I_4 = 100$$

$$6I_1 - I_2 - 2I_4 - 2I_5 - 1I_7 = 100 \quad (1)$$

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Mesh 2:

$1(I_2 - I_1) + I_2 + 2(I_2 - I_3) = 0$

$I_2 - I_1 + I_2 + 2I_2 - 2I_3 = 0$

$-I_1 + 4I_2 - 2I_3 = 0 \rightarrow$ eq (3)

Mesh 3:

$3(I_3 - I_4) + 2(I_3 - I_2) + 8I_3 = 0$

$3I_3 - 3I_4 + 2I_3 - 2I_2 + 8I_3 = 0$

$-2I_2 + 13I_3 - 3I_4 = 0 \rightarrow$ eq (3)

Mesh 4:

$2(I_4 - I_1) + 3(I_4 - I_3) + 4(I_4 - I_5) = 0$

$2I_4 - 2I_1 + 3I_4 - 3I_3 + 4I_4 - 4I_5 = 0$

$-2I_1 - 3I_3 + 9I_4 - 4I_5 = 0$

eq (4)

Mesh 5:

$2(I_5 - I_1) + 4(I_5 - I_4) + 3(I_5 - I_4) = 0$

$2I_5 - 2I_1 + 4I_5 - 4I_4 + 3I_5 - 3I_4 = 0$

$-2I_1 - 4I_4 + 9I_5 - 3I_6 = 0$

eq (5)

Mesh 6:

$2(I_6 - I_7) + 3(I_6 - I_5) + 8I_6 = 0$

$2I_6 - 2I_7 + 3I_6 - 3I_5 + 8I_6 = 0$

$-3I_5 + 13I_6 - 2I_7 = 0$ → eq (6)

Mesh 7:

$I_7 + 2(I_7 - I_1) + 2(I_7 - I_6) = 0$

$I_7 + 2I_7 - 2I_1 + 2I_7 - 2I_6 = 0$

$-I_1 - 2I_6 + 4I_7 = 0$ — eq (7)

Now we have (7) eq

$P \neq TF$ o

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$6I_1 - I_2 + 0I_3 - 2I_4 - 2I_5 + 0I_6 - 1I_7 = 100$

$-1I_1 + 4I_2 - 2I_3 + 0I_4 + 0I_5 + 0I_6 + 0I_7 = 0$

$0I_1 - 2I_2 + 13I_3 - 3I_4 + 0I_5 + 0I_6 + 0I_7 = 0$

$-2I_1 + 0I_2 + 6I_3 - 4I_4 - 3I_6 = 0$

$-3I_5 + 13I_6 - 2I_7 = 0$

$-1I_1 - 2I_6 + 4I_7 = 0$

I have used MATLAB To solve above equation, the code is pasted on next Page

$I_4 = -3.092784$

$I_5 = -3.092784$

Current Through 4Ω Resistor is,

$I = I_4 - I_5$

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$$I = -3.092784 + 039784$$

$$\boxed{I = 0\ A}$$ Ans

xx — xx — xx — xx

the END

```
clc;
clear all;
abc = [6 -1 0 -2 -2 0 -1;
       -1 4 -2 0  0 0   0;
       0 -2 13 -3 0 0  0;
       -2 0 -3  9 -4 0 0;
       -2 0  0  -4 9 -3 0;
       0  0  0   0 -3 13 -2;
       -1 0  0   0  0 -2  4];
n = [100 0 0 0 0 0 0]';
I = inv(abc) * n;
fprintf('Current I4 = %f\n', I(4));
fprintf('Current I5 = %f\n', I(5));
fprintf('Current trough 4 ohm resistor
is %f\n', I(4) - I(5));
```

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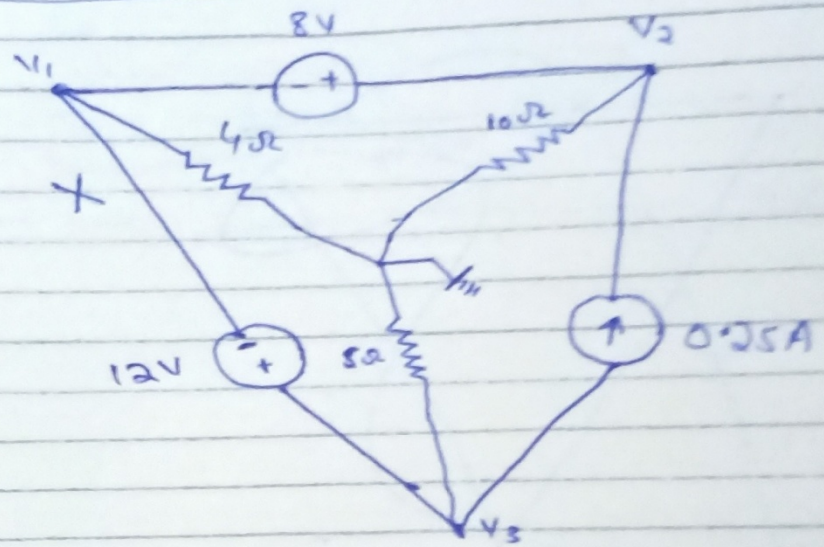
Answer NO 3:



Applying KCL to the supernode X gives.

$$\frac{V_2}{10} + \frac{V_1}{4} + \frac{V_3}{5} = 0 \quad \text{—— (1)}$$

By inspection, it is clear that

$$V_2 - V_1 = 8V$$

$$\Rightarrow V_2 = V_1 + 8 \quad \text{—— (2)}$$

$$V_3 - V_1 = 12V$$

$$\Rightarrow V_3 = V_1 + 12 \quad \text{—— (3)}$$

Substituting Eq (2) & Eq (3) in Eq (1)

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$$\frac{V_1+8}{10} + \frac{V_1}{4} + \frac{V_1+12}{5} = 0$$

$$\frac{2(V_1+8) + 5V_1 + 4(V_1+12)}{20} = 0$$

$$2V_1 + 16 + 5V_1 + 4V_1 + 48 = 0$$

$$11V_1 + 64 = 0$$

$$\frac{11V_1}{11} = \frac{-64}{11}$$

$$\boxed{V_1 = -5.818\,V}$$

put V_1 in eq (2)

$$V_2 = V_1 + 8$$

$$V_2 = -5.818 + 8$$

$$\boxed{V_2 = 2.182\,V}$$

Now put V_1 in eq (3)

$$V_3 = V_1 + 12$$

$$V_3 = -5.818 + 12$$

$$\boxed{V_3 = 6.182\,V}.$$

P $\overline{+1}$ 0

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Thus Nodel Voltages are

$V_1 = -5.818V$

$V_2 = 2.182V$

$V_3 = 6.182V$

——xx —— xx —— xx —— xx ——