East West University

Assignment

Semester: Summer-2024

Course Title: Electrical Circuits **Course Code:** CSE209

Sec: 01

Submitted by-

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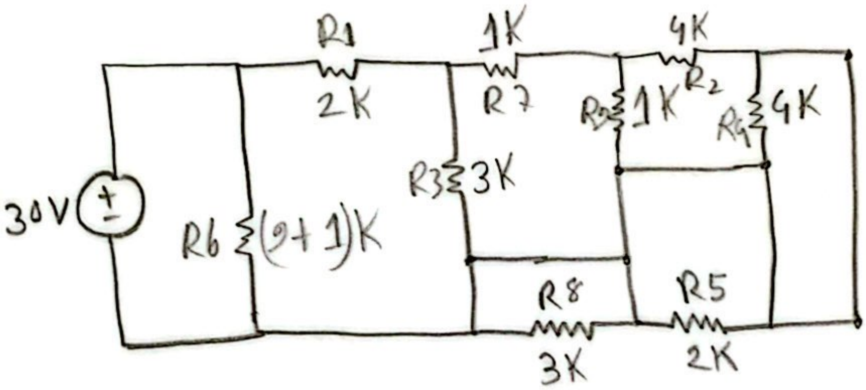
Date of Submission: 4-September-2024

Ans to the Q: NO: 1

Last Digit of my id = 9



Soln:

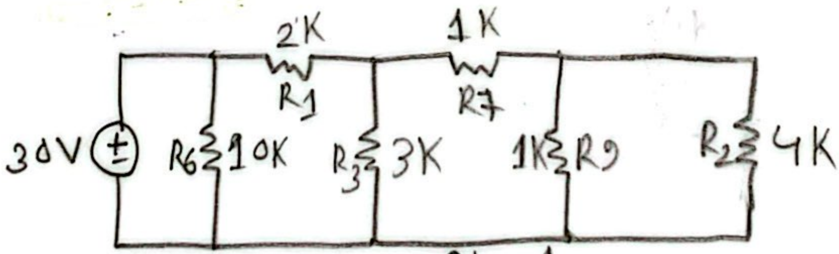


fig-1

$$(R9 \parallel R2) = (1 \parallel 4) = R' = 0.8K$$

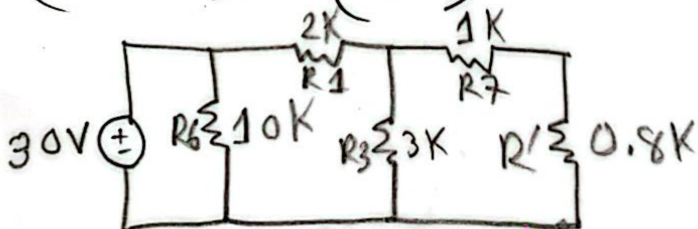


fig-2

$$(R7 + R') \parallel R3 = (1 + 0.8) \parallel 3 = 1.125K = R''$$

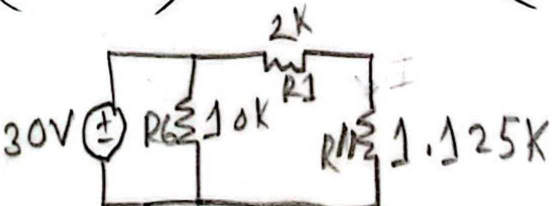


fig-3

$R1 + R'' = 2 + 1.125\,K = 3.125\,K = R'''$

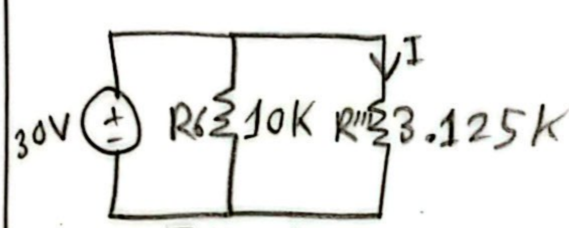


Fig-4

$\therefore R_{eq} = R6 \parallel R''' = \dfrac{10 \times 3.125}{10 + 3.125} = 2.38K$

$\therefore I_s = \dfrac{V_s}{R_{eq}} = \dfrac{30}{2.38} = 12.6\,A$

From Fig-4, We can get I Using CDR Method,

$\therefore I = \dfrac{I_s \times R_6}{R6 + R'''} = \dfrac{12.6 \times 10}{10 + 3.125} = 9.6\,A$

Applying VDR, in figure 3,

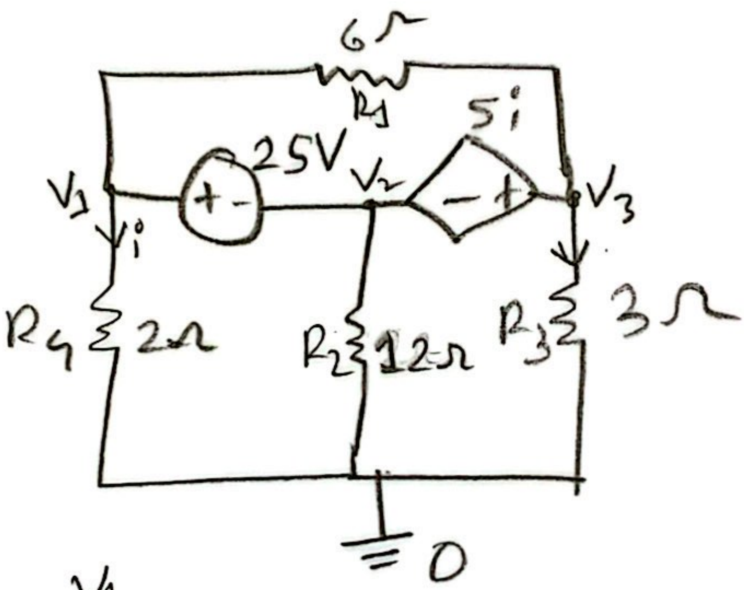
$V_{R_3} = \dfrac{30 \times 1.125}{2 + 1.125} = 10.8V$

$\therefore V_{R_3} = 10.8\,V$

Ans to the Q: No: 2

Last digit of my id is 9

$R_2 = (3+9) = 12\,\Omega$



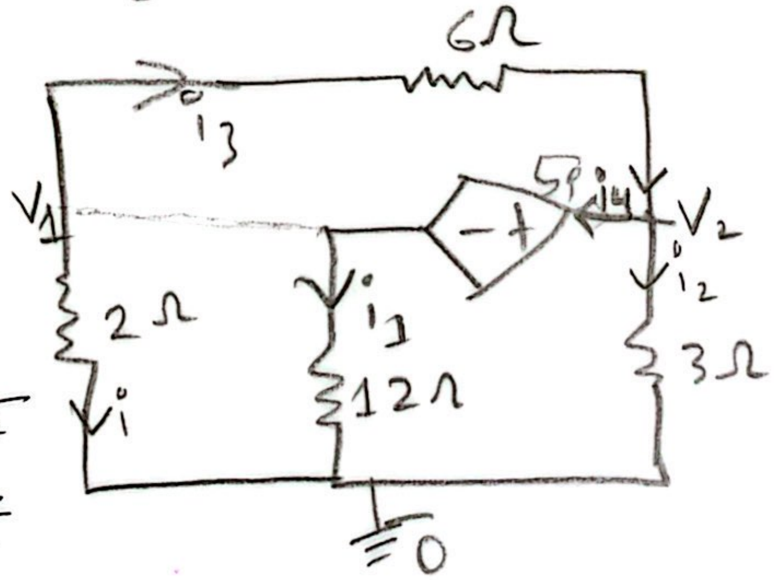
$i = \frac{V_1}{2}$

$i_2 = \frac{V_2}{3}$

$i_3 = \frac{V_1 - V_2}{6}$

$i_1 = \frac{V_1}{12}$

$i_4 = 5i = 5\frac{V_1}{2}$



Applying KCL at V_2,

$i_3 = i_2 + i_4$

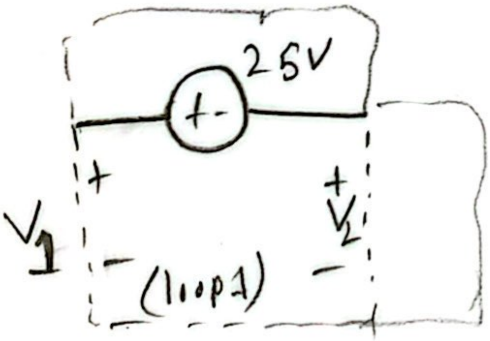
$$\Rightarrow \frac{V_1 - V_2}{6} = \frac{V_2}{3} + \frac{5V_1}{2}$$

$$\Rightarrow \frac{V_1 - V_2}{6} - \frac{V_2}{3} - \frac{5V_1}{2} = 0$$

$$\Rightarrow \frac{V_1 - V_2 - 2V_2 - 15V_1}{6} = 0$$

$$\Rightarrow \frac{-14V_1 - 3V_2}{6} = 0$$

$$\Rightarrow \therefore 14V_1 + 3V_2 = 0 \quad \text{—— (I)}$$



Applying KVL in loop 1,

$$-V_1 + 25 + V_2 = 0$$

$$\Rightarrow V_2 - V_1 = -25$$

$$\therefore V_1 - V_2 = 25 \quad \text{—— (II)}$$

Using cramer's rule,

$$\begin{bmatrix} 14 & 3 \\ 1 & -1 \end{bmatrix} \begin{bmatrix} V_1 \\ V_2 \end{bmatrix} = \begin{bmatrix} 0 \\ 25 \end{bmatrix}$$

$\Delta = -11$

$\Delta_1 = -75$

$\Delta_2 = -350$

$V_1 = \frac{-75}{-11} = 6.81V$

$V_2 = 31.8V$

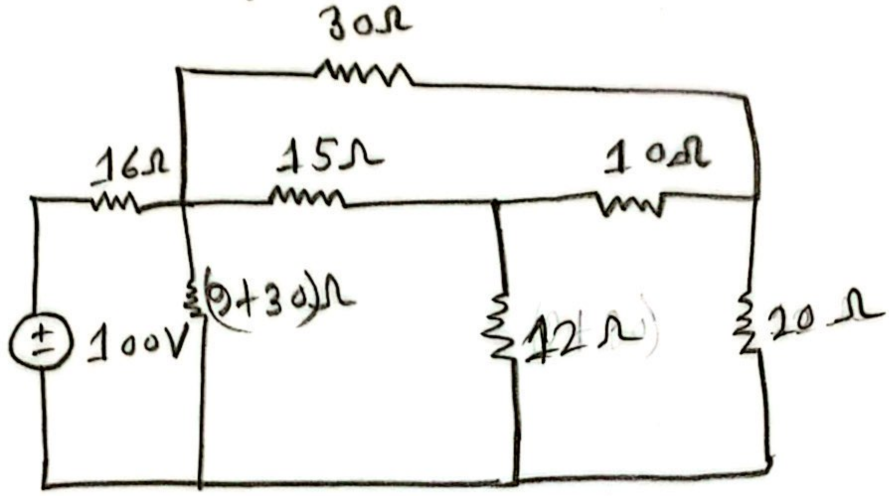
$\therefore i = \frac{V_1}{2} = \frac{6.85}{2} = 3.41A$

$\therefore i = 3.41A.$

③

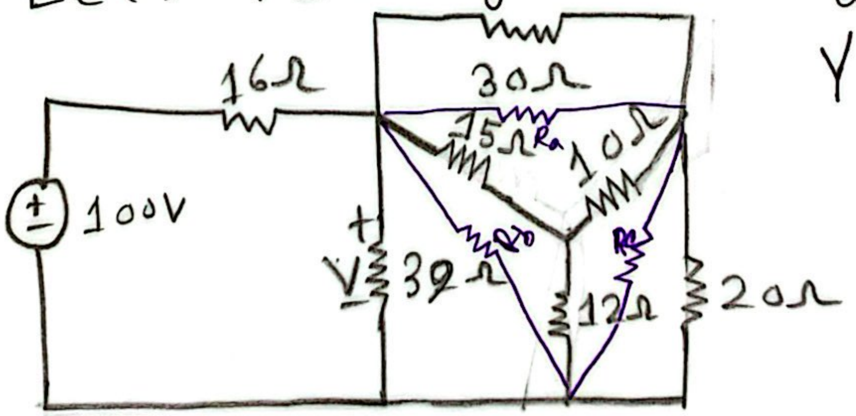
Ans to the Q: NO: 3

Last digit of my id is 9.



Soln:

Let's rearranged the circuits, and apply Y to Δ conversion.



Assuming, $R_1 = 15\Omega$

$R_2 = 10\Omega$

$R_3 = 12\Omega$

③

$$R_a = \frac{(R_1 \times R_2) + (R_1 \times R_3) + (R_2 \times R_3)}{12}$$

$$= \frac{(15 \times 10) + (15 \times 12) + (15 \times 12)}{12}$$

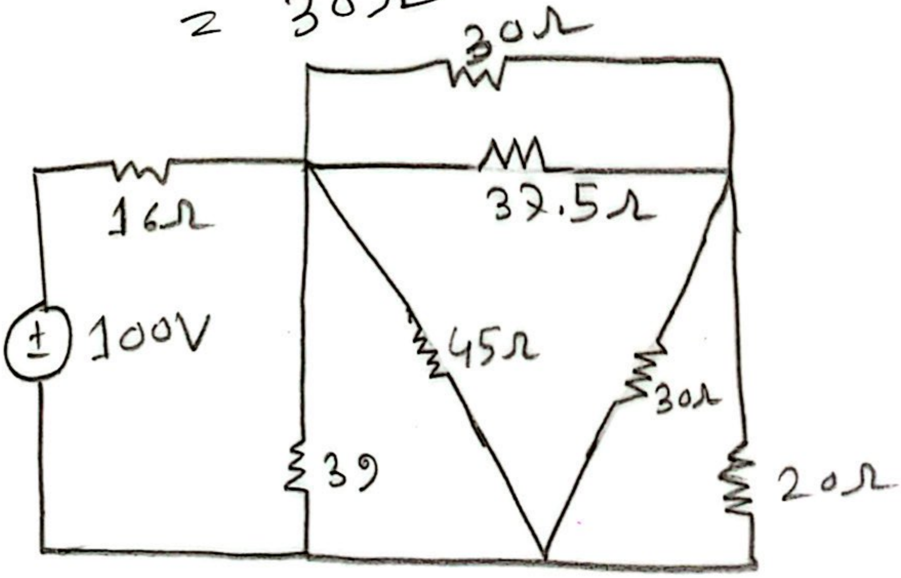
$$= 32.5\,\Omega$$

$$R_b = \frac{450}{10}$$

$$= 45\,\Omega$$

$$R_c = \frac{450}{15}$$

$$= 30\,\Omega$$

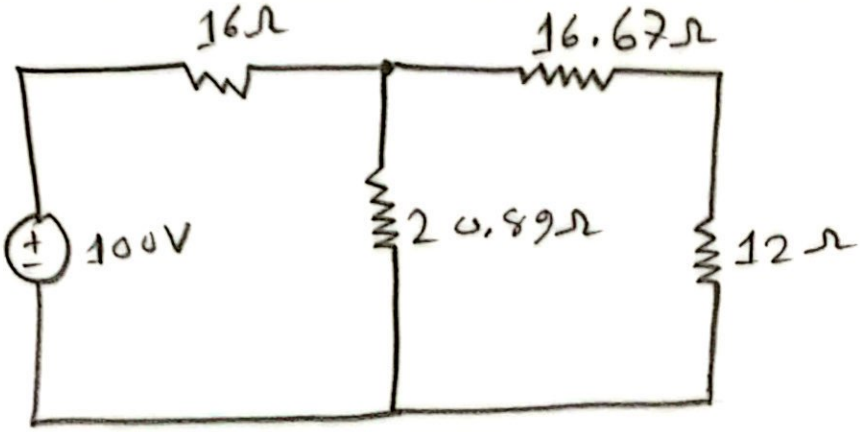


$(30 \parallel 32.5) = 16.67\,\Omega$

$(30 \parallel 20) = 12\,\Omega$

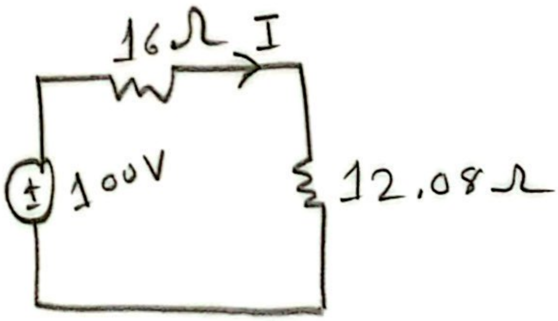
$(39 \parallel 45) = 20.89\,\Omega$

3



$$16.67 + 12 = 28.67\,\Omega = R'$$

$$R' \parallel 20.89 = 28.67 \parallel 20.89 = 12.08\,\Omega$$



$$\therefore R_{eq} = 16 + 12.08\,\Omega = 28.08\,\Omega$$

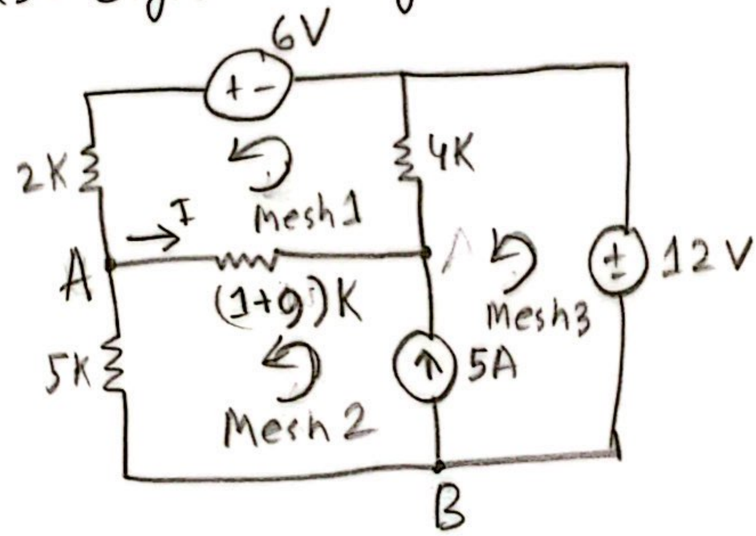
Using Ohm's law,

$$I = \frac{V_s}{R_{eq}} = \frac{100}{28.08} = 3.56\,A$$

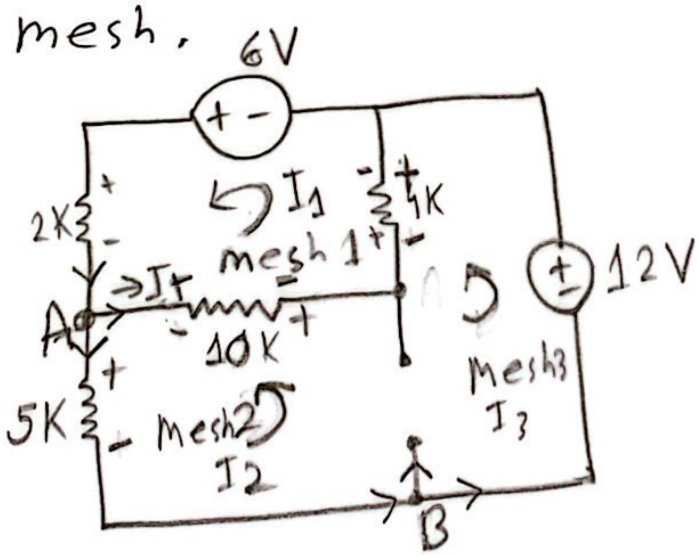
④

Ans to the Q: NO:-4

Last digit of my id is 9.



Since the current source is in between two mesh, So we have to apply supermesh.



Applying KVL in Supermesh,

$$-12+4I_3-4I_1+10I_2-10I_1+5I_2=0$$

$$\Rightarrow -14I_1+15I_2+4I_3=12 \quad \text{—— (1)}$$

Applying KVL in mesh 1,

$\Rightarrow -6 + 2I_1 + 10I_1 - 10I_2 + 4I_1 - 4I_3 = 0$

$\Rightarrow 16I_1 - 10I_2 - 4I_3 = 6$

$\Rightarrow 8I_1 - 5I_2 - 2I_3 = 3$ —— (II) [Divided by 2]

Now, letts apply KCL at node B,

$I_3 = 5 + I_3$

$\Rightarrow I_2 - I_3 = 5$ —— (III)

Applying cramer's rule,

$$\begin{bmatrix} -14 & 15 & 4 \\ 8 & -5 & -2 \\ 0 & 1 & -1 \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \\ I_3 \end{bmatrix} = \begin{bmatrix} 12 \\ 3 \\ 5 \end{bmatrix}$$

$\Delta = 110$

$\Delta_1 = 343$

$\Delta_2 = 438$

$\Delta_3 = -112$

(4)

$$I_1 = \frac{\Delta_1}{\Delta} = \frac{343}{110} = 3.11\ A$$

$$I_2 = \frac{\Delta_2}{\Delta} = \frac{438}{110} = 3.89\ A$$

$$I_3 = \frac{\Delta_3}{\Delta} = \frac{-112}{110} = -1.018\ A$$

Applying KCL at node A,

$$I_1 = I + I_2$$

$$\Rightarrow I = I_1 - I_2$$

$$= 3.11 - 3.89$$

$$= -0.78\ A$$