Question 4 (4 Marks)

For the circuit shown in Figure 6, use mesh current analysis to find

a- The mesh currents I1, I2, and I3
b- The current through the 30 Ω resistor.
c- The power dissipated by the 15 Ω resistor.

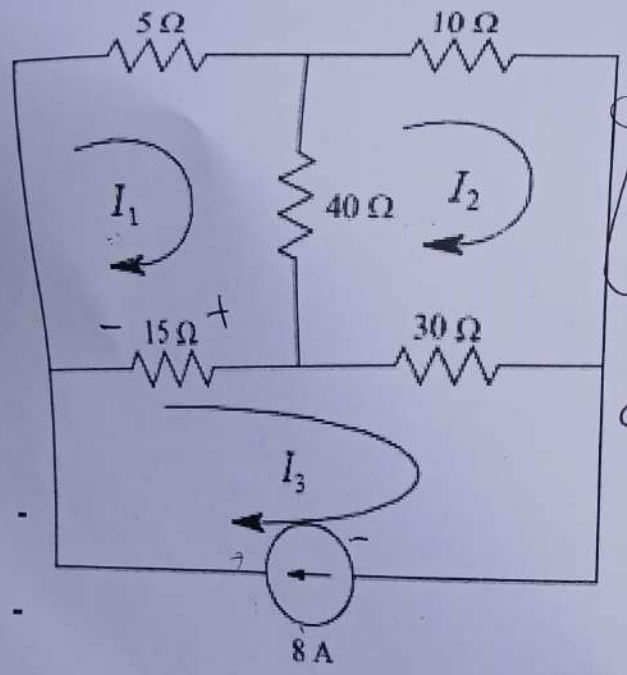


Figure 6:

at mesh ① %

$+40I_1 + 15I_1 + 5I_1 - 40I_2 - 15I_3 = 0$

$60I_1 - 40I_2 - 15I_3 = 0$

at mesh ②

$10I_2 + 30I_2 + 40I_2 - 40I_1 - 30I_3$

~~$80I_2 - 40I_1 = 0$~~

at mesh 3 =

$I_3 = 8$

① $60I_1 - 40I_2 = 120$

② $80I_2 - 40I_1 = 240$

③ $I_3 = 8$

④

$I_1 = 6$ A

$I_2 = 6$A

$I_3 = 8$A

$I_{(30\Omega)} = I_3 - I_2$

$8 - 6$

⑤ $I_{(30\Omega)} = 2$ A

$P_{(15)} = IV$

$= I(IR)$

$= (6)(6.15)$

⑥ $P_{15\Omega} = 540$ W

b- In Figure. 4, Find I_o/I_s

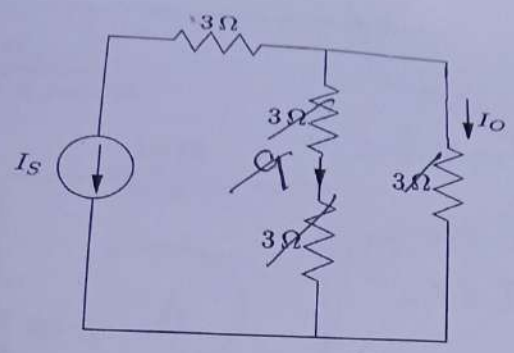
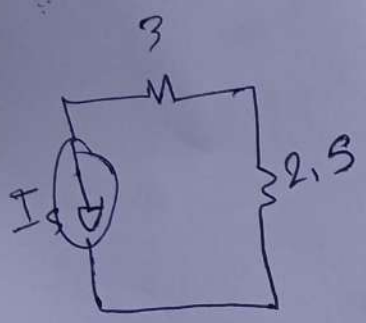


Figure 4:



$$\frac{15}{6} = \frac{I_o}{I_s}$$

c- In the circuit shown in Figure. 5. Find V_0

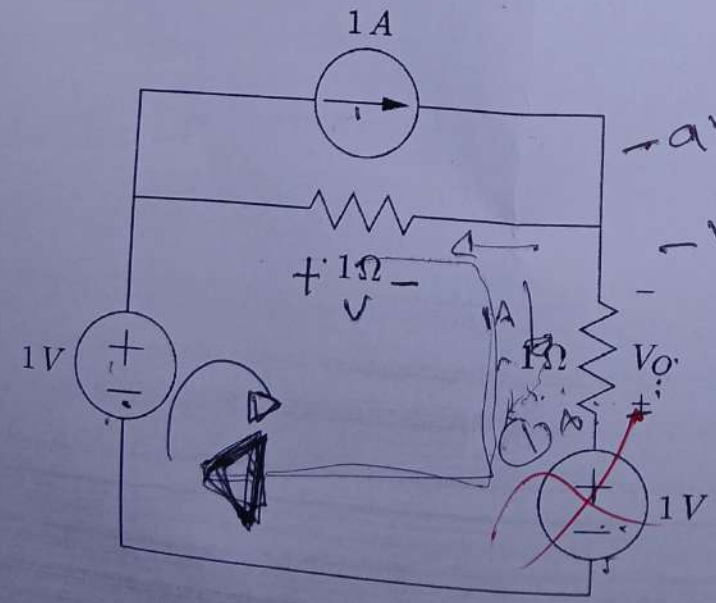


Figure 5:

Question: 3

(6 Marks)

This question consist of 3 parts (2 marks each)

a- The equivalent resistance at the terminals a-b for the circuits shown in Figure. 3 is equal to

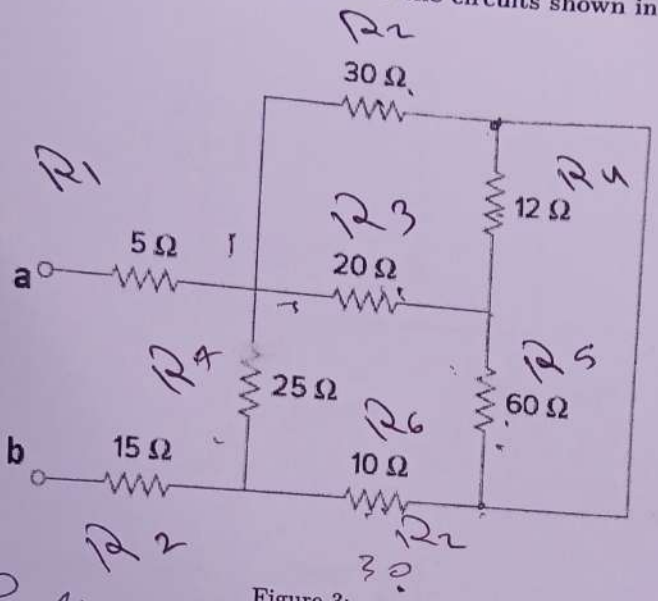
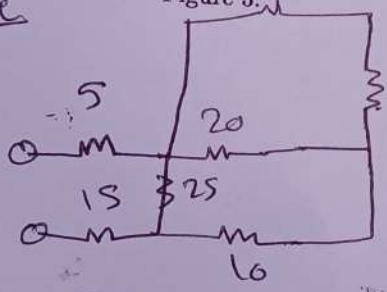


Figure 3:

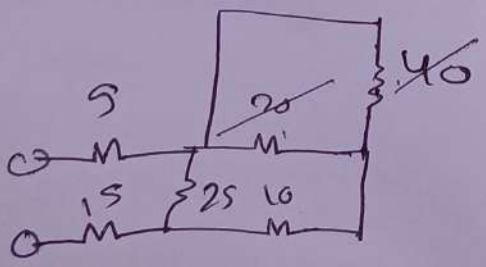
* $R_4 // R_5$ = Parallel

$$R_{45} = \frac{12 \times 60}{72} =$$



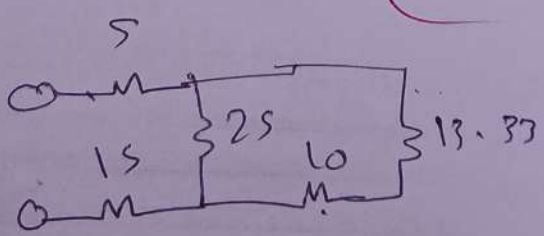
* R_{45}, R_2 series

$30 + 10 = 40$ =

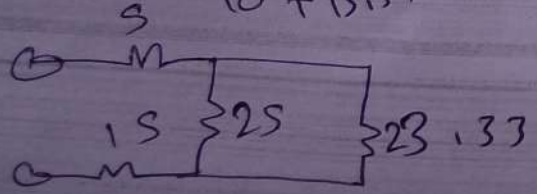


* R_{452}, R_3 //

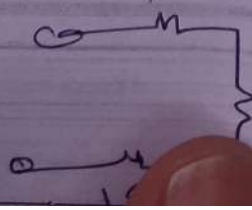
$$\frac{40 \times 20}{60} = 13.33 =$$



10, 13.33 //



25, 23.33 //



5, 12.0, 15 //

$R_{eq} = 32$

Question 2:

For the circuit shown in figure 2, Use the Nodal analysis method to find
a-The nodal voltages, V1 and V2.
b-The current I3
c-The power absorbed/ supplied by the current source.

(6 marks)

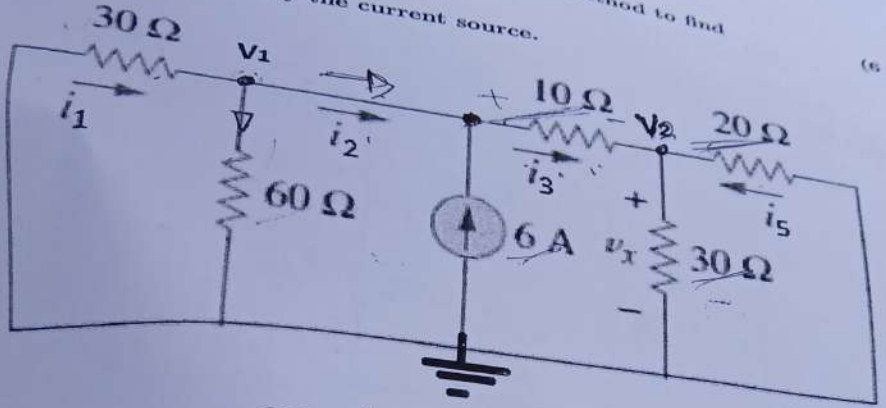


Figure 2:

at Node V_1 :- $\Sigma I_{in} = \Sigma I_{out}$

$$\frac{V_1}{30} = \frac{V_1}{60} + \frac{V_1 - V_2}{10} = \frac{V_1}{60} + \frac{6 \times V_1 - V_2}{6 \times 10} \frac{2 \times V_1}{2 \times 30} = \frac{V_1}{\cancel{60}} + \frac{6V_1 - 6V_2 - 2V_1}{60}$$

at Node V_2 : $\frac{V_1 - V_2}{10} + \frac{V_2}{20} = \frac{V_2}{\cancel{30}}$ ✗

$$= \frac{5V_1 - 6V_2}{60} =$$

$$= \frac{6 \times V_1 - V_2}{6 \times 10} + \frac{3 \times V_2}{3 \times 20} - \frac{2 \times V_2}{2 \times 30} = 0$$

$$\frac{6V_1 - 6V_2 + 3V_2 - 2V_2}{60} = \frac{6V_1 - 5V_2}{60}$$

$2 = 24 + I_2$

$-24 = 24$

Question: 1 (4 Marks)

For the circuit shown in Figure 1 Find,

a- The mesh currents, I1 and I2

b-The voltage v across the current source

b)

3 by voltage div

$= V = \frac{V_o \times 3}{3}$

$= 20 = V_o$

$V_o = 20$

$I_1 = 24$

$I_2 = -22$

$I = \frac{V}{\Sigma R}$

$I_1 = \frac{20}{\frac{1}{2} + \frac{1}{3}}$

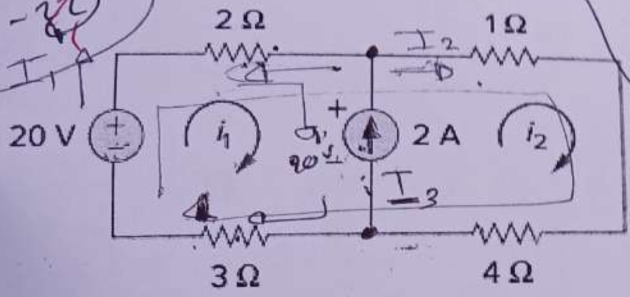


Figure 1:

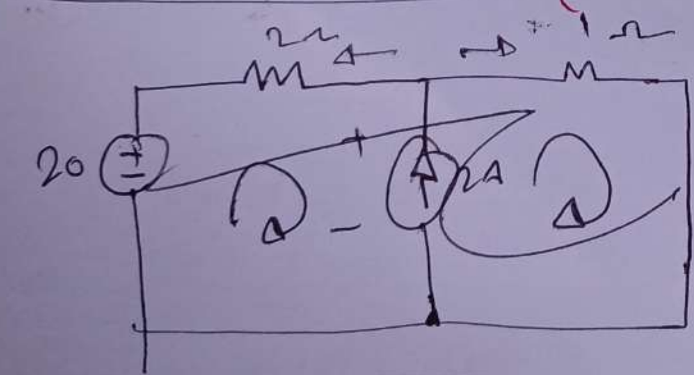
Mesh(1):- $-20 + I_1 2 + 2 + 3I_1 - 2 = 2I_1 + 3I_1 =$

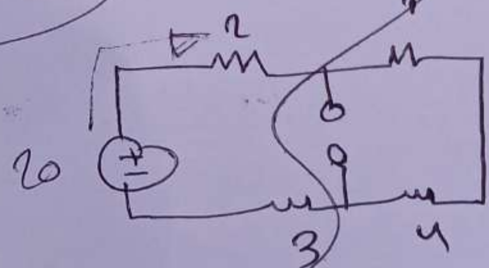
Mesh(2) = $2 + 1I_2 + 4I_2 - 2$

SuperMesh:- $-20 + 2I_1$

$-20 + 2I_1$

leave 20v and kill 2A





- apply KCL =

$V = IR$

$= I\Sigma R$

$2 = I(2 + 1 + 3 + 4)$

$= I\,10/10$

$2/10$

$I = 0.4$

at mesh(1)

$-20 + 2I_1 - 2 + 3I_1 - 2 =$

at mesh(2)

$+2 + 1I_2 + I_2 4 =$