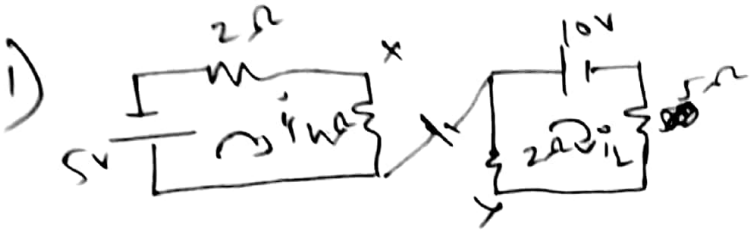
ECE Digital assignment 1

1)



Loop 1,

$5 = 6i_1$

$\Rightarrow i_1 = 5/6$

Loop 2,

$10 = 7i_2$

$i_2 = 10/7$

Potential at 4Ω $= i_1 \times 4$

$= 5/6 \times 4$

$= \frac{10}{3}$ V

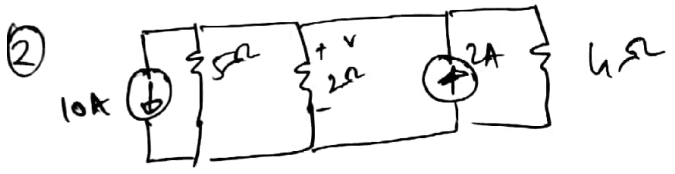
Potential at 2Ω $= i_2 \times 2$

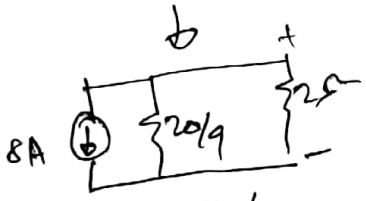
$= \frac{10}{7} \times 2 = \frac{20}{7}$ V

$\Rightarrow$ V Between x & y $= \frac{10}{3} + \frac{20}{7} + 2$

$= \frac{172}{21} = 8.19047$ V

2)





By source transformation

$V = IR$

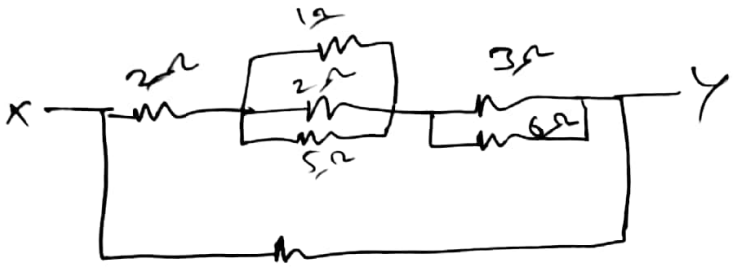
$17.78 = I \times 1.11$

$I = 16$

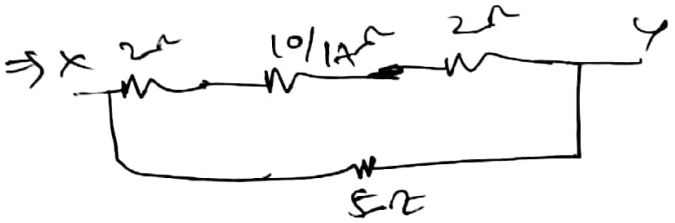
$V_{2\Omega} = IR$

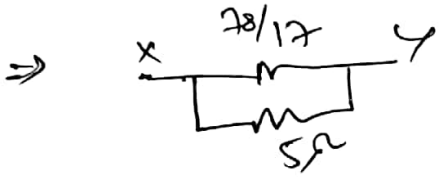
$= 16 \times 2 = 32$ V

(3)



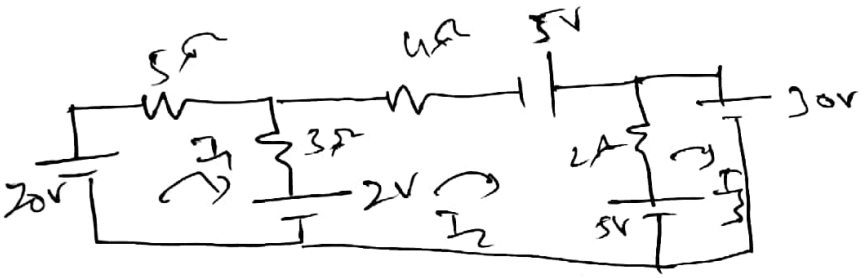
find Req. b/w x and y





$$Req = \frac{\frac{78}{17} \times 5}{5 + \frac{78}{17}} = 2.39\ \Omega$$

(4)



Loop 1,

$$20 - 2 = 8I_1 - 3I_2$$

$$18 = 8I_1 - 3I_2$$

$$2 + 5 - 5 = 9I_2 - 3I_1 - 2I_3$$

$$2 = 9I_2 - 3I_1 - 2I_3$$

$$5 - 30 = 2I_3 - 2I_2$$

$$-25 = 2I_3 - 2I_2$$

$$I_3 = \frac{2I_2 - 25}{2}$$

$I_1 = 1.213A \quad I_2 = -2.766A$

$I_3 = -15.26A$

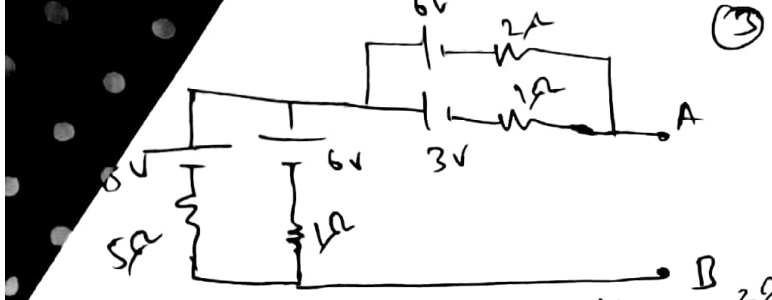
→ Current through 2V is 3.979 A

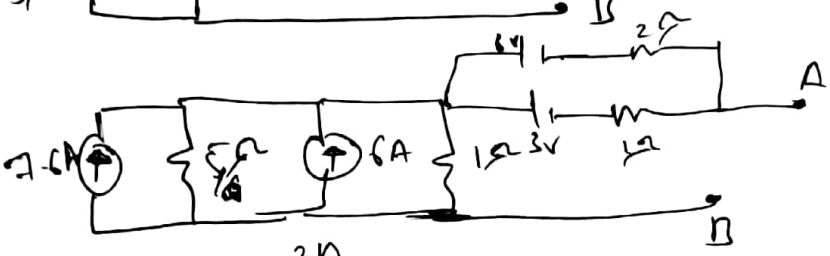
→ Current in 20V is 1.213 A

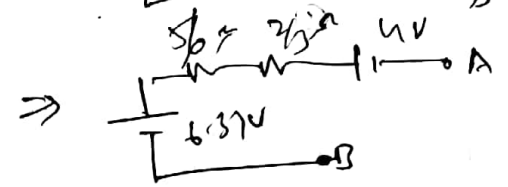
→ Current in 5V is -12.5A

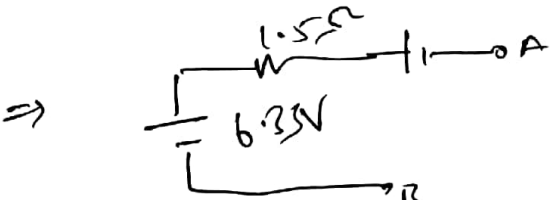
→ Current in 5V is -2.766A

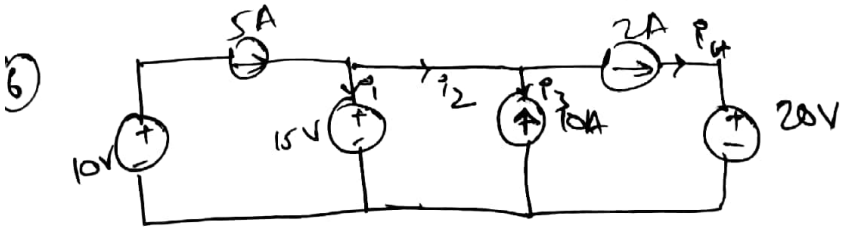
→ Current in 30V is 15.266A











By KCL, $5 = i + i_L \rightarrow (1)$

Also $i_2 = i_3 + i_4$

$i_L = -10 + 2$

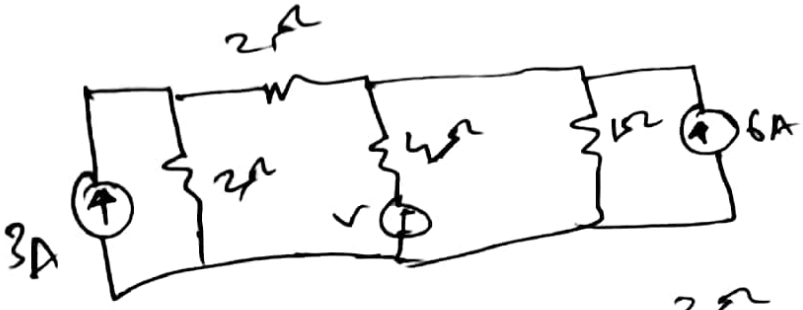
$\boxed{i_L = -8\,A}$

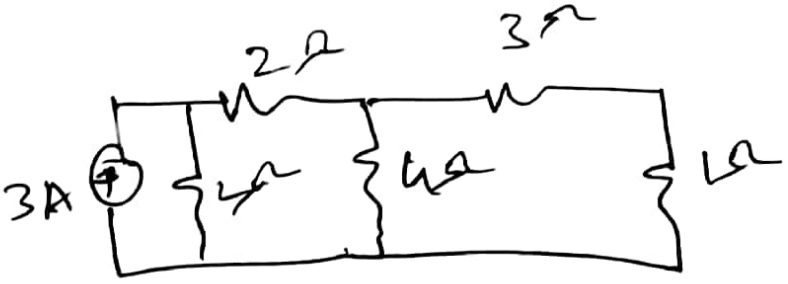
from (1)

$\Rightarrow 5 = i + i_L$

$\boxed{i = 13\,A}$

(7)





$$6 = 2i_1 + 2i_1 + 4(i_1 - i_2)$$

$$6 = 4i_1 + 4i_1 - 4i_2$$

$$3 = 4i_1 - 2i_2 \rightarrow (1)$$

$$0 = 4(i_2 - i_1) + 3i_2 + i_L$$

$$0 = 2i_2 - i_1 \rightarrow (2)$$