NAME : Himanshu Dixit
BATCH : B10
ROLL NO. : 21103262

ELECTRICAL SCIENCE - I

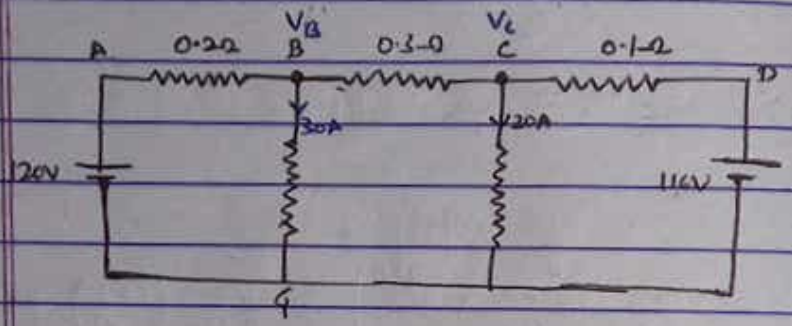
Q.1. $I_4 = I_1 + I_4 + I_5$

$I_5 = I_5 - I_1 - I_4 = 7 - 4.5 - 0.5 = 2A$ Ans

$I_1 = I_2 + I_3$

$I_3 = I_1 - I_2 = 4.5 - 3 = 1.5A$ Ans

Q.2.

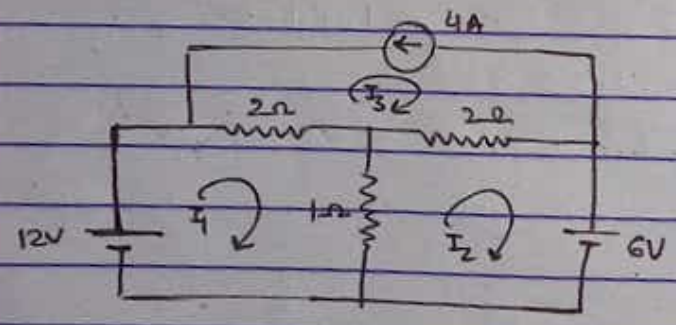


$\frac{V_B - 120}{0.2} + \frac{V_B - V_C}{0.3} = -30$ — (1)

$\frac{V_C - V_B}{0.3} + \frac{V_C - 116}{0.1} = -20$ — (2)

$V_B = V_C = 114V$ Ans

Q.3.



$-(I_2 - I_1) - (I_2 - I_3)2 - 6 = 0$ — (1)

$12 - 2(I_1 - I_2) - 1(I_1 - I_2) = 0$ — (2)

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

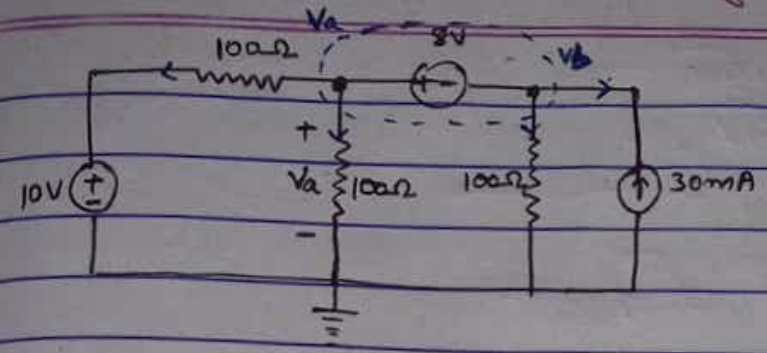
$2I_3 = I_1 + I_2$ — (3)

$I_3 = -4A$ Ans

$I_1 = -0.25A$ Ans

$I_2 = -4.75A$ Ans

Q.4.



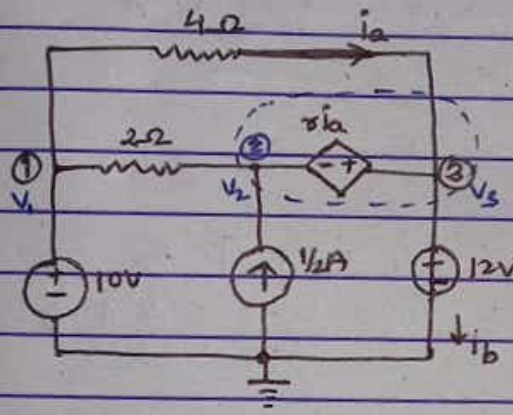
Applying KCL at super node :

$$\frac{V_a - 10}{100} + \frac{V_a}{100} + \frac{V_b}{100} + (-30)10^{-3} = 0 \quad -(1) \qquad V_a - V_b = 8 \quad -(2)$$

$$\frac{3V_a}{100} - \frac{18}{100} - \frac{3}{100} = 0 \quad \therefore \quad \frac{3V_a}{100} = \frac{21}{100}$$

$$V_a = \frac{21}{3} V = 7V$$

Q.5.



Apply KCL to supernode of the CCVS.

$$\frac{V_2 - V_3}{2} + i_a = i_b - \frac{1}{2} \quad -(1)$$

$$V_3 - V_2 = r i_a \quad -(2)$$

$$V_3 = 12V$$

$$V_1 = 10V.$$

$$i_a = \frac{V_1 - V_3}{4} = \frac{10 - 12}{4} = -\frac{1}{2} A$$

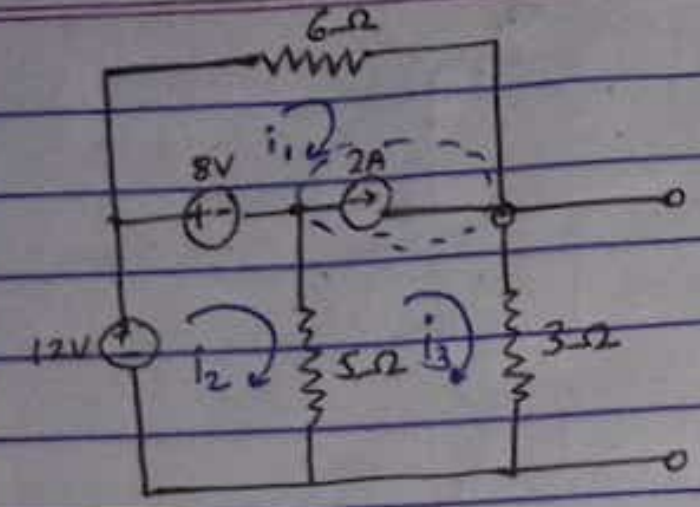
$$i_b = \frac{V_3 - 0}{}$$

$$\frac{10 - V_2}{2} = i_b \quad -(2)$$

(a) $$\frac{10 - 14}{2} = i_b = -2 A$$

(b) $$\frac{12 - 14}{-1/2} = r \rightarrow r = 4 V/A$$

Q.6.



$-3i_3 - 6i_1 + 12 = 0$ — ① $\quad i_3 - i_1 = 2A$ — ②

$-5(i_2 - i_3) + 12 - 8 = 0$ — ③

$i_1 = 4/3$ A $\quad i_3 = 4/3 + 2 = 10/3$ A

$-5(i_2 - 10/3) + 4 = 0$

$5i_2 = 62/3 \rightarrow i_2 = 62/15$ A

$i_3 + i_1 = 2$

$-\ i_3 + 2i_1 = 4$

$-3i_1 = -2 \quad \therefore i_1 = 2/3$ A

$i_3 = 2/3 + 2 = 8/3$ A

$V_{3\Omega} = \frac{8}{3} \times 3 = 8$ V