Bonus Assignment

Name : Nabiha Kawsar

ID: 22201609

Section : 30

Course Code : CSE250

Ans to the que no: 01

Battery voltage = E

let's assume,

Radio resistance $R_1 = 3\Omega$

Headlight " $R_2 = 2\Omega$

$\therefore I_1 = \frac{V_1}{R_1} = \frac{12.5}{3} = 4.167\Omega$

$I_2 = \frac{V_2}{R_2} = \frac{11.7}{2} = 5.85\Omega$

Now,

$$\frac{E - 12.5}{4.167} = R_{TH} \longrightarrow (i)$$

$$\frac{E - 11.7}{5.85} = R_{TH} \longrightarrow (ii)$$

$$\frac{E - 12.5}{4.167} = \frac{E - 11.7}{5.85}$$

$\Rightarrow 5.85E - 73.125 = 4.167E - 48.7539$

$\Rightarrow 5.85E - 4.167E = 73.125 - 48.7539$

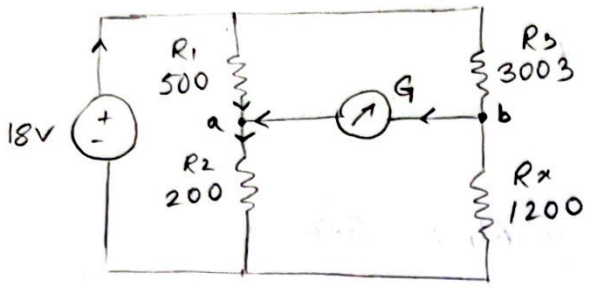
$\Rightarrow E = \frac{24.3711}{1.683}$

$= 14.48\ V$

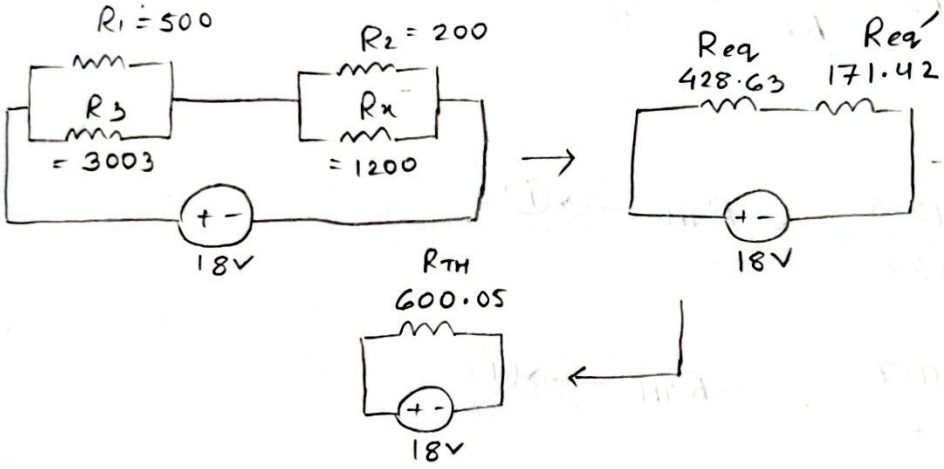
$\therefore V_{TH} = E = 14.48\ V$

$R_{TH} = \frac{14.48 - 12.5}{4.167} = 0.475\Omega$

Ans to the que no: 02



if the current is unbalanced then Galvanometer G will not make the resistors R_1 & R_3, R_2 & R_x parallel to each other.



$\therefore R_{TH} = 600.05\ \Omega$

$V_{TH} = 18\ V$

$\therefore I = 0.03\ A$

Now, $V_{Req} = I \times Req = 12.8\ V$

$V_{Req'} = I \times Req' = 5.14\ V$

$I_1 = V_{Req}/R_1 = 0.0256\ A$

$I_3 = V_{Req}/R_3 = 4.26 \times 10^{-3}\ A$

$I_2 = V_{Req'}/R_2 = 0.0257\ A$

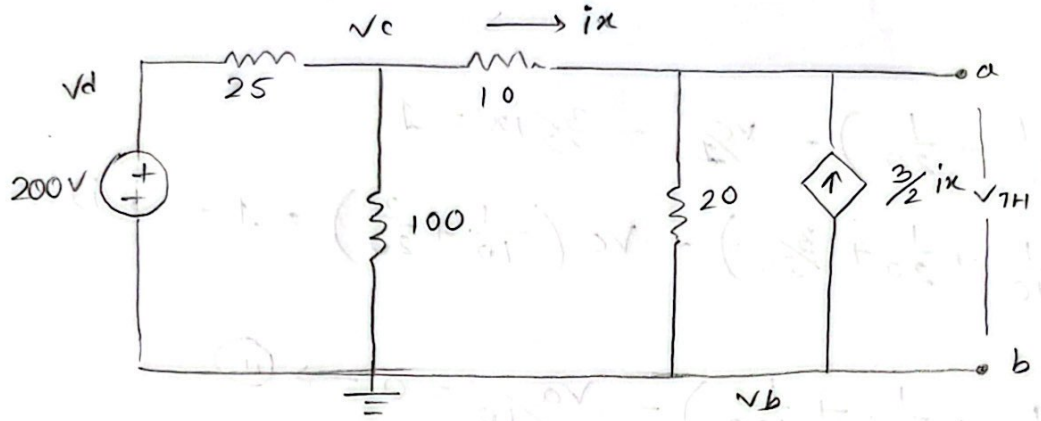
$I_x = V_{Req'}/R_x = 4.28 \times 10^{-3}\ A$

For point a,

$$I_1 + I_G = I_2$$

$$\Rightarrow I_G = I_2 - I_1 = 0.0257 - 0.0256 = 1\times10^{-4}\ A \text{ Am}//$$

Ans to the que no: 03



$V_b = 0\ V$, $V_d = 200\ V$

$$V_a\left(\frac{1}{10}+\frac{1}{20}\right) - V_c/10 - \frac{3}{2}i_x = 0 \qquad \left|\ \frac{V_c - V_a}{10} = i_x\right.$$

$$\Rightarrow V_a\left(\frac{1}{10}+\frac{1}{20}\right) - V_c/10 - \frac{3}{2}\left(\frac{V_c - V_a}{10}\right) = 0$$

$$\Rightarrow V_a\left(\frac{1}{10}+\frac{1}{20}\right) - V_c/10 + \frac{3}{20}(V_a - V_c) = 0$$

$$\Rightarrow V_a\left(\frac{1}{10}+\frac{1}{20}+\frac{3}{20}\right) - V_c\left(\frac{1}{10}+\frac{3}{20}\right) = 0 \longrightarrow (i)$$

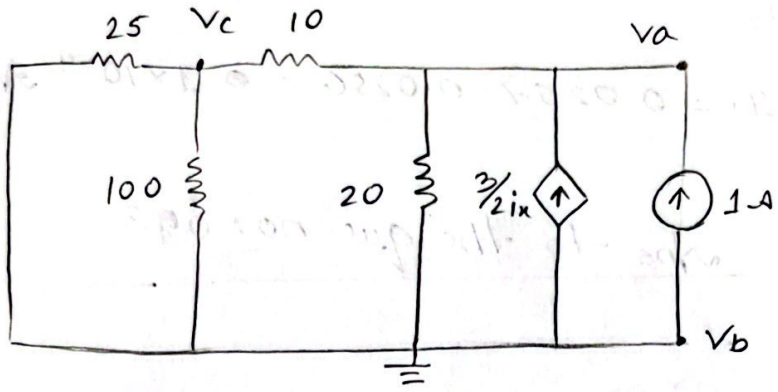
$$V_c\left(\frac{1}{25}+\frac{1}{10}+\frac{1}{100}\right) - V_a/10 - \frac{200}{25} = 0 \longrightarrow (ii)$$

from (i) & (ii) $\Rightarrow$ $V_a = 100\ V$

$V_c = 120\ V$

$\therefore V_{TH} = 100\ V$

for R_{TH},



$$Va\left(\frac{1}{10}+\frac{1}{20}\right) - Vc/10 - 3/2\, ix = 1$$

$$\Rightarrow Va\left(\frac{1}{10}+\frac{1}{20}+\frac{3}{20}\right) - Vc\left(\frac{1}{10}+\frac{3}{20}\right) = 1 \longrightarrow (i)$$

$$Vc\left(\frac{1}{25}+\frac{1}{10}+\frac{1}{100}\right) - Va/10 = 0 \longrightarrow (ii)$$

from (i) & (ii) $\Rightarrow Va = 7.5\ V$

$Vc = 5\ V$

$\therefore R_{TH} = 7.5\ \Omega$

We know,

$$P = \frac{(V_{TH})^2}{(R_{TH}+R_o)^2} \times R_o$$

$$\Rightarrow 250 = \frac{100^2}{(7.5+R_o)^2} \times R_o$$

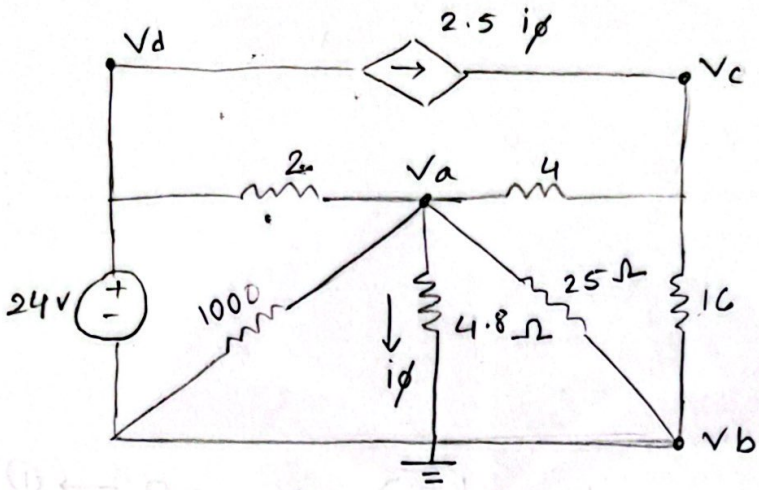
$$\Rightarrow \frac{1}{40} = \frac{R_o}{(7.5+R_o)^2}$$

$$\Rightarrow R_o^2 + 15R_o - 40R_o + 56.25 = 0$$

$$\Rightarrow R_o = 22.5 \text{ or } 2.5$$

Ans.

Ans to the que no: 04



$V_b = 0V$, $V_d = 24V$

$$V_a\left(\frac{1}{4}+\frac{1}{2}+\frac{1}{100}+\frac{1}{4.8}+\frac{1}{25}\right) - \frac{24}{2} - \frac{V_c}{4} = 0 \quad \longrightarrow (1)$$

$$V_c\left(\frac{1}{4}+\frac{1}{16}\right) - \frac{V_a}{4} - 2.5\,i\phi = 0$$

$$\Rightarrow V_c\left(\frac{1}{4}+\frac{1}{16}\right) - V_a\left(\frac{1}{4}+\frac{2.5}{4.8}\right) = 0 \quad \longrightarrow (11)$$

$$\frac{V_a - V_b}{4.8} = i\phi$$

$$\Rightarrow \frac{V_a}{4.8} = i\phi$$

from (1) & (11) $\Rightarrow$ $V_a = 30.63\ V$

$V_c = 75.57\ V$

$$P = V^2/R$$

$$= \frac{(30.63)^2}{4.8}$$

$$= 195.45\ W \quad \text{Ans}$$