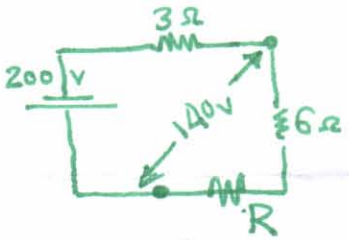
Answers to the Exam. Questions.

Q1 :- Find the unknown for :-

(a) $140 = \frac{200(R+6)}{3+6+R}$

$60R = 1260 - 1200$

$\therefore R = \frac{60}{60} = 1\,\Omega$



(a)

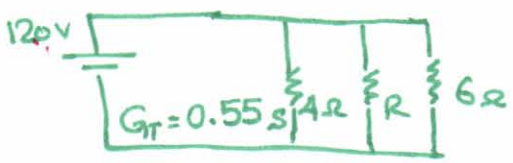
(b)

$G_T = \frac{1}{4} + \frac{1}{R} + \frac{1}{6}$

$0.55 = 0.25 + \frac{1}{R} + 0.166$

$\therefore 0.134R = 1$

$\therefore R = 1/0.134\ \Omega.$



(b)

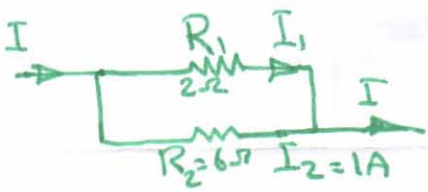
(c)

Using C.D.R

$I_2 = \frac{I \cdot R_1}{R_1 + R_2} = \frac{2I}{2+6} = 1$

$\therefore I = \frac{8}{2} = 4\,A$

$I_1 = I - I_2 = 4 - 1 = 3\,A$



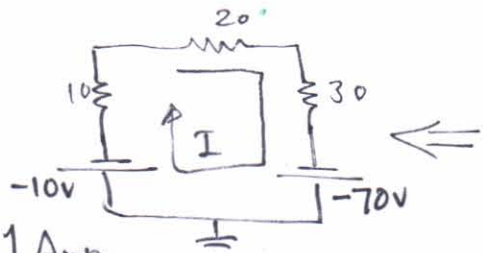
(C)

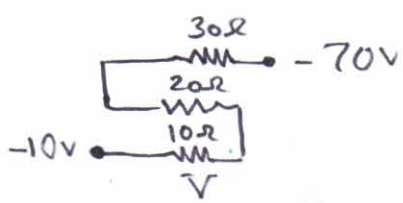
Q2 - a - Determine the Current.....

$E = R_T I$

$\therefore I = \frac{70-10}{10+20+30} = 1\,Amp$

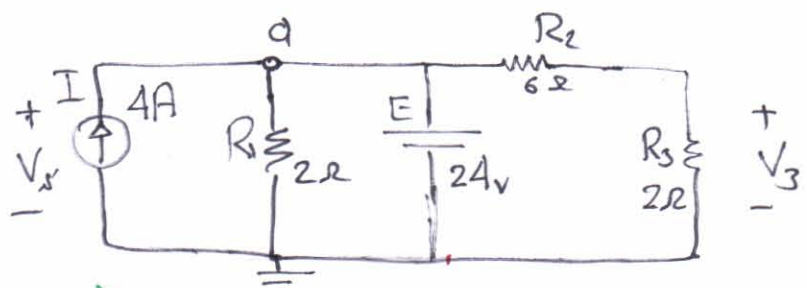
$V = IR = 1 \times 10 = 10V.$





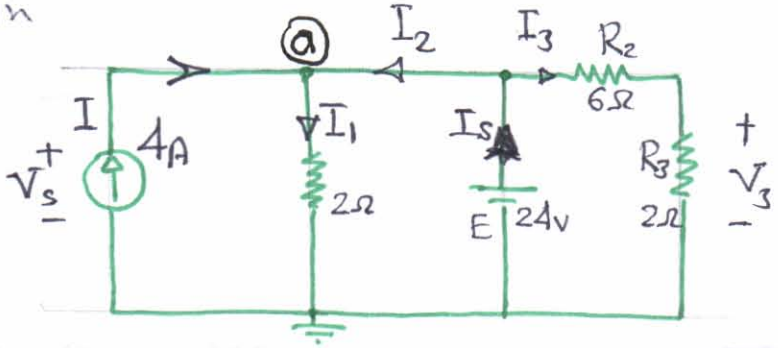
(a)

b-



The Figure is redrawn as shown

Since the c/cs have 4. branches in Parallel, all Voltages equal



$\therefore I_1 = E/R_1 = \frac{24V}{2\Omega} = 12$ Amp

$I_s = I_2 + I_3$

$I_3 = E/R_2+R_3 = 24/2+6 = 3A$

K.C.L at Point (a)

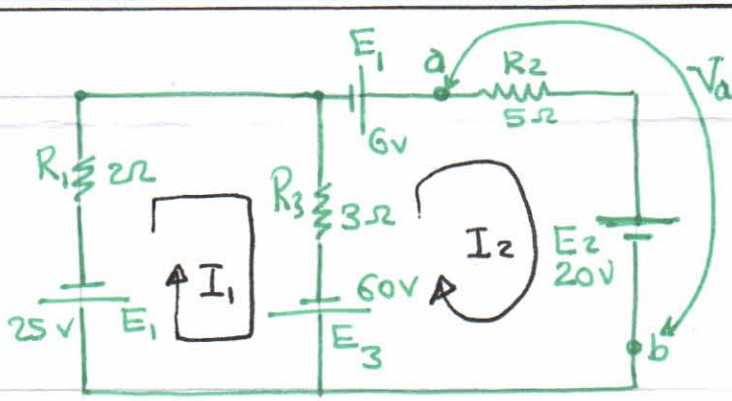
$\therefore I + I_2 = I_1 \quad \therefore I_2 = 12 - 4 = 8A$

$\therefore I_s = 8 + 3 = 11$ Amps.

$V_s = E = 24v.$

$V_3 = I_3 . R_3 = 3 \times 2 = 6v.$

Q3:. Using mesh format....



Assign the Loop Currents CW.

I_1 :-

$(2+3)I_1 - 3I_2 = 60-25$

$5I_1 - 3I_2 = 35$

I_2 :- $(5+3)I_2 - 3I_1 = 6-60-20$

$8I_2 - 3I_1 = -74$

$\therefore 5I_1 - 3I_2 = 35 \quad \ldots (1)$

$-3I_1 + 8I_2 = -74 \quad \ldots (2)$

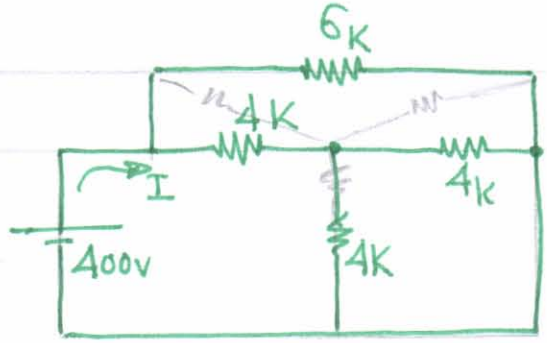
$$\therefore I_1 = \frac{\begin{vmatrix} 35 & -3 \\ -74 & 8 \end{vmatrix}}{\begin{vmatrix} 5 & -3 \\ -3 & 8 \end{vmatrix}}$$

$= 1.8$ Amps

$$I_2 = \frac{\begin{vmatrix} 5 & 35 \\ -3 & -74 \end{vmatrix}}{\begin{vmatrix} 5 & -3 \\ -3 & 8 \end{vmatrix}}$$

$= -8.5$ Amps.

Q4 - a) Determine the Current I ....

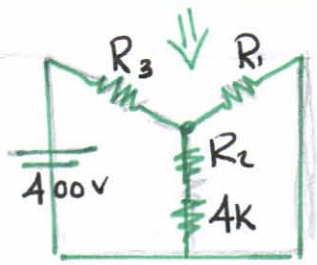


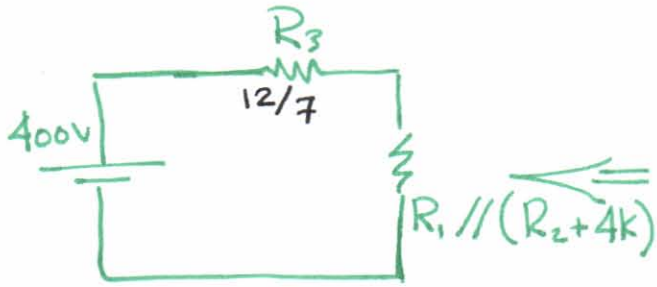
△ circuit of 6K - 4K - 4K to be Converted into Y:.

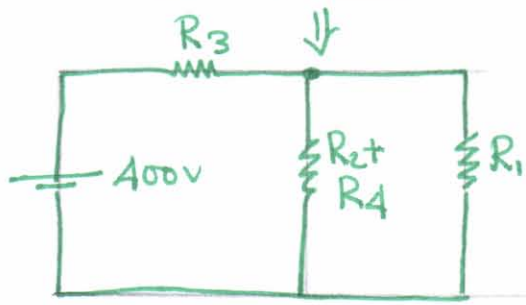
$$R_1 = \frac{6\times4}{4+4+6} = \frac{12}{7}\ K\Omega$$

$$R_2 = \frac{4\times4}{4+4+6} = \frac{8}{7}\ K\Omega$$

$$R_3 = \frac{6\times4}{4+4+6} = 12/7\ K\Omega.$$







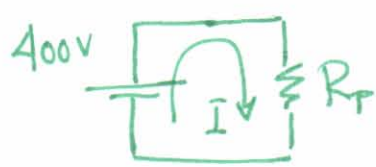
$$R_1 // (R_2+4K) = \frac{12\times36}{7\times7}\times\frac{7}{48} = 9/7\ K\Omega.$$

$$R_T = R_3 + R_1 // (R_2+4K)$$

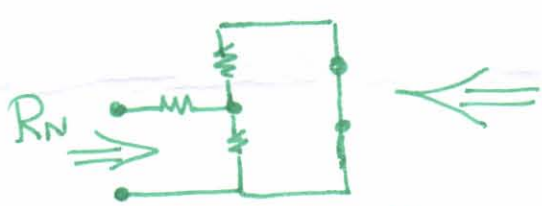
$$= 12/7 + 9/7$$

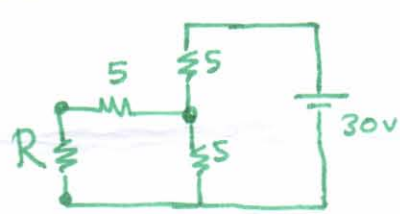
$$= 3K\Omega$$

$$\therefore I = \frac{400v}{3K\Omega} = 133.3\ mA.$$



b) Find the Norton ...

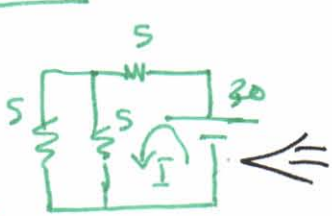


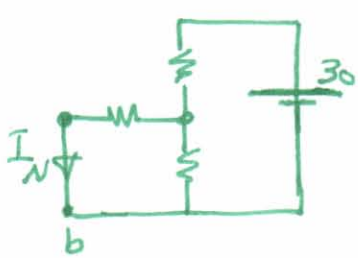


$$R_N = 5//5 + 5$$

$$= 7.5\Omega$$

$$I_{sc} = \frac{30}{5+\frac{5}{2}} = \frac{60}{15}\ Amp$$



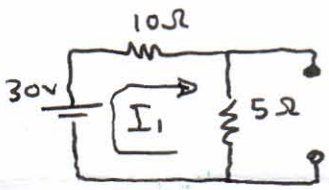


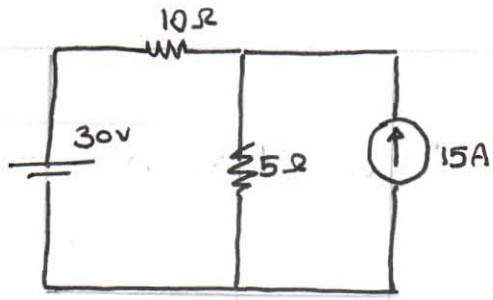
(3-5)

$$I_N = \frac{5\times 60/15}{10} = 1.33\ Amp$$

Q5/ Using Superposition....

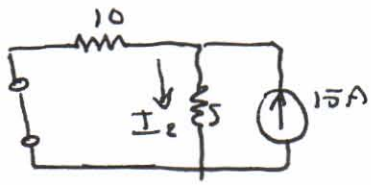
Consider the effect of the 30v source as shown





$$I_1 = \frac{E}{R_T} = \frac{30}{10+5} = 2A$$

The effect of the 15A-Source :. Using C.D.R



$$I_2 = \frac{10 \times 15}{10+5} = \frac{150}{15} = 10A$$

∴ Total Current through 5Ω is $I_{5\Omega} = 10 + 2 = 12A$

The actual Power to the 5Ω is $I^2R = (12)^2 \times 5 = 720\ W$

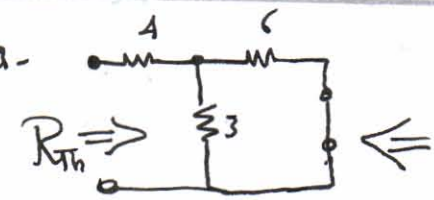
The calculated Power to the 5Ω due to each source

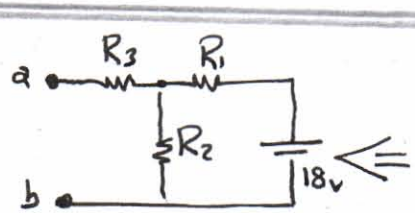
$$P_1 = I_1^2 . R = (2)^2 \times 5 = 20\ w$$

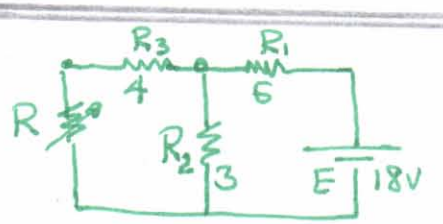
$$P_2 = I_1^2 . R = (10)^2 \times 5 = 150\ w.$$

$$P_1 + P_2 = 20 + 150 = 170 \neq 720$$

Q6 a-

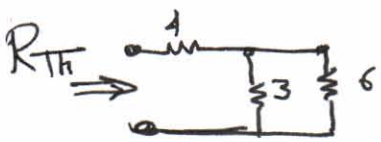


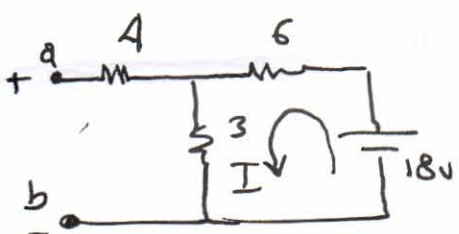




$$R_{Th} = 4 + (6 // 3)$$

$$= 4 + \frac{6 \times 3}{6+3} = 6\Omega$$

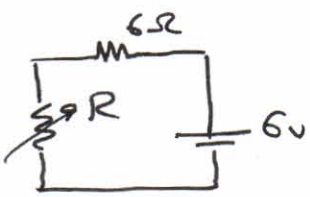




$$I = \frac{18}{6+3} = \frac{18}{9} = 2A$$

$$V_{3\Omega} = I . R_2 = 2 \times 3$$

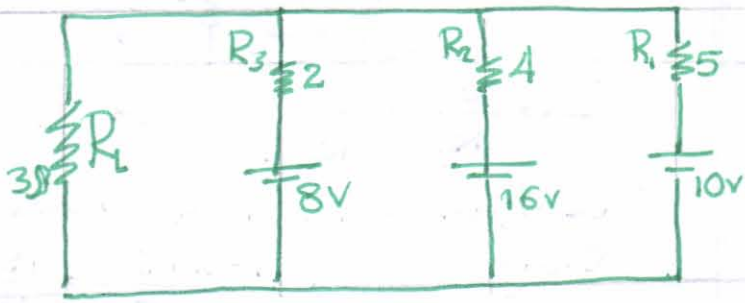
$$\mathcal{E}_{TH} = = 6v.$$



$$I_{R2\Omega} = \frac{6}{6+2} = \frac{6}{8} = 0.75A$$

$$I_{R30} = \frac{6}{6+30} = \frac{6}{36} = 0.166\ A.$$

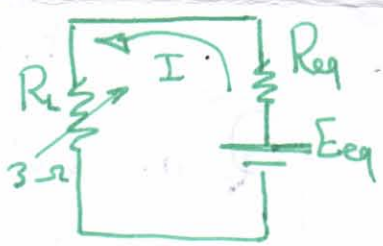
Q6 - b:. Find the Current through & Voltage...
Using Millman



$$E_{eq} = \frac{+\frac{E_1}{R_1} - \frac{E_2}{R_2} + \frac{E_3}{R_3}}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}} = \frac{\frac{10}{5} - \frac{16}{4} + \frac{8}{2}}{\frac{1}{5} + \frac{1}{4} + \frac{1}{2}}$$

$$= \frac{2}{0.95} = 2.105\,V.$$

$$R_{eq} = \frac{1}{\frac{1}{5} + \frac{1}{4} + \frac{1}{2}} = \frac{1}{0.95} = 1.053\,\Omega.$$



The resultant Source is shown

$$I_L = \frac{2.105}{1.053 + R_L} = \frac{2.105}{1.053 + 3}$$

$$= 0.519\,A$$

$$\therefore V_L = I_L R_L = (0.519)(3)$$
$$= 1.557\,V.$$