

Problem 2.7-2

$$V_x = (4 - 2 + 1) (3 \parallel 2) = 3 \times \frac{6}{5} = \boxed{\frac{18}{5} \text{ V}}$$

$$i_x = \frac{V_x}{3} = \boxed{\frac{6}{5} \text{ A}}$$

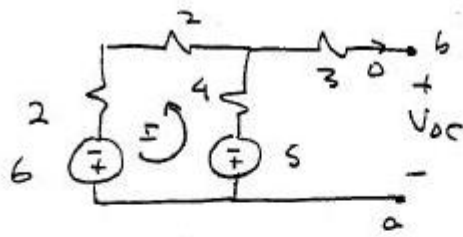
Problem 3.1-5

$$i_x' = - \frac{2+1}{2+1+2+1} 3 = - \frac{3}{2}$$

$$i_x'' = - \frac{2+2}{2+2+1+1} 4 = - \frac{8}{3}$$

$$i_x = i_x' + i_x'' = - \frac{3}{2} - \frac{8}{3} = \boxed{- \frac{25}{6} \text{ A}}$$

Problem 3.4-1

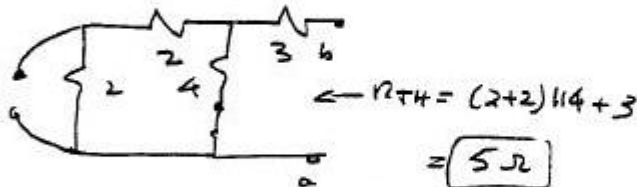


$$I = \frac{6-5}{2+2+4} = \frac{1}{8} \text{ A}$$

$$V_{oc} = -4I - 5$$

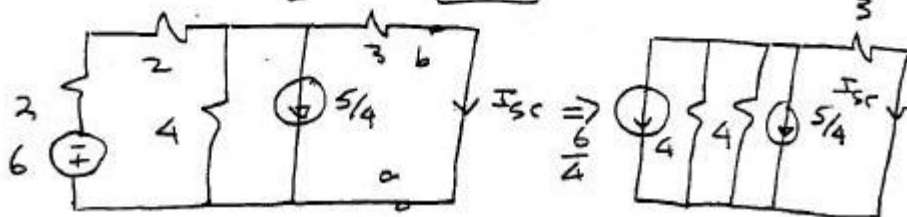
$$= -\frac{1}{2} - 5$$

$$= \boxed{-\frac{11}{2} \text{ V}}$$



$$R_{TH} = (2+2) \parallel 4 + 3$$

$$= \boxed{5 \Omega}$$



$$I_{sc} = \frac{4 \parallel 4}{4 \parallel 4 + 3} \left(-\frac{6}{4} - \frac{5}{4} \right) = \frac{2}{5} \left(-\frac{11}{4} \right) = \boxed{-\frac{11}{10} \text{ A}}$$

$$V_{oc} = R_{TH} I_{sc} \quad \checkmark$$



$$R_L = 5$$

$$I = \frac{-11/2}{5+5} = -\frac{11}{20}$$

$$P = I^2 R_L$$

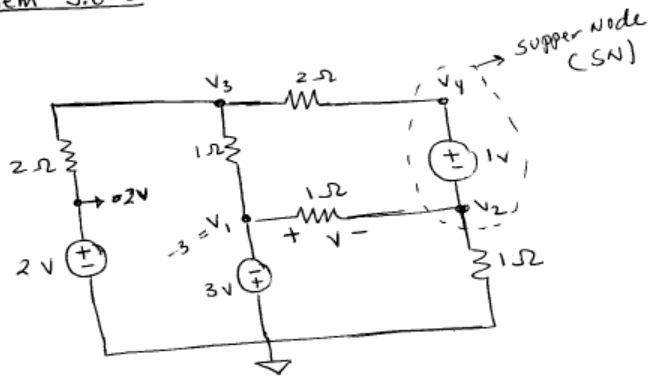
$$= \left(-\frac{11}{20} \right)^2 \times 5$$

$$= \boxed{\frac{121}{80} \text{ W}}$$

$$P = \frac{V_{oc}^2}{4R_L}$$

$$= \frac{121}{80} \text{ W} \quad \checkmark$$

Problem 3.6-2



$v_1 = -3V$ by inspection

Kcl at (SN)

$$\frac{v_2 - v_1}{1} + \frac{v_2}{1} + \frac{v_4 - v_3}{2} = 0$$

$$-4v_2 + v_3 - v_4 = 6 \quad \text{--- (1)}$$

Kcl at v_3

$$\frac{v_3 - 2}{2} + \frac{v_3 - v_4}{2} + \frac{v_3 + 3}{1} = 0$$

$$4v_3 - v_4 = -4 \quad \text{--- (2)}$$

$$v_4 - v_2 = 1 \quad \text{--- (3)}$$

$$\begin{bmatrix} -4 & 1 & -1 \\ 0 & 4 & -1 \\ -1 & 0 & 1 \end{bmatrix} \begin{bmatrix} v_2 \\ v_3 \\ v_4 \end{bmatrix} = \begin{bmatrix} 6 \\ -4 \\ 1 \end{bmatrix}$$

solving for v_2 , we have,

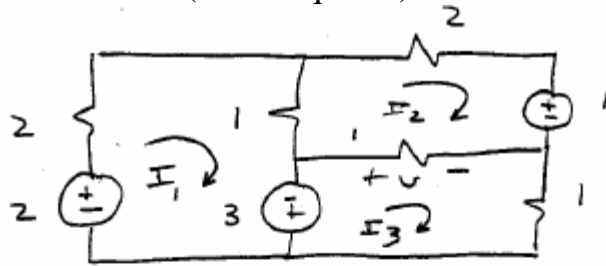
$$v_2 = -1.6316$$

$$\Rightarrow v = v_1 - v_2$$

$$= -3 - (-1.6316)$$

$$= -1.3684$$

Using Mesh Method (Not Required)



$$M1: 2I_1 + 1(I_1 - I_2) = 2 + 3$$

$$M2: 2I_2 + 1(I_2 - I_1) + 1(I_2 - I_3) = -1$$

$$M3: 1I_3 + 1(I_3 - I_2) = -3$$

$$\begin{bmatrix} 3 & -1 & 0 \\ -1 & 4 & -1 \\ 0 & -1 & 2 \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \\ I_3 \end{bmatrix} = \begin{bmatrix} 5 \\ -1 \\ -3 \end{bmatrix}$$

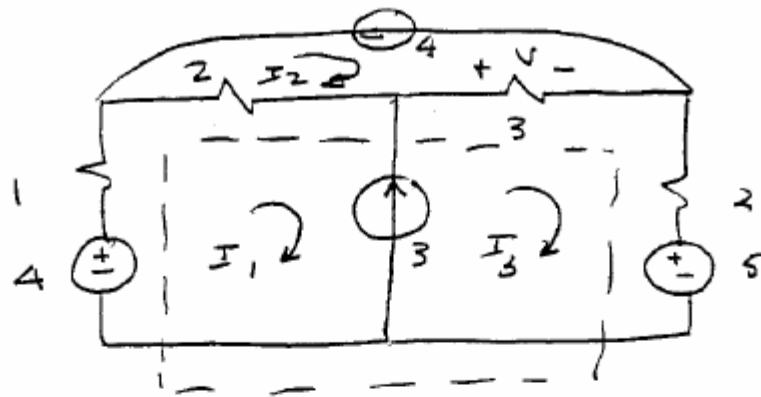
$$I_1 = 1.5789 \text{ A} \quad I_2 = -0.2632 \text{ A}$$

$$I_3 = -1.6316 \text{ A}$$

$$V = 1(I_3 - I_2)$$

$$= \boxed{-1.368 \text{ V}}$$

Problem 3.6-8



$$M2: I_2 = -4$$

$$M1 + M3: 1 I_1 + 2 (I_1 - I_2) + 3 (I_3 - I_2) + 2 I_3 = 4 - 5$$

$$I_3 - I_1 = 3 \quad \therefore I_1 = I_3 - 3$$

$$\therefore I_3 - 3 + 2 (I_3 - 3) = 2(-4) + 3 I_3$$

$$-3(-4) + 2 I_3 = -1$$

$$\therefore 8 I_3 = -1 + 3 + 6 - 8 - 12$$

$$= -12$$

$$\therefore I_3 = -1.50 \text{ A}$$

$$V = 3 (I_3 - I_2) = \boxed{7.5 \text{ V}}$$