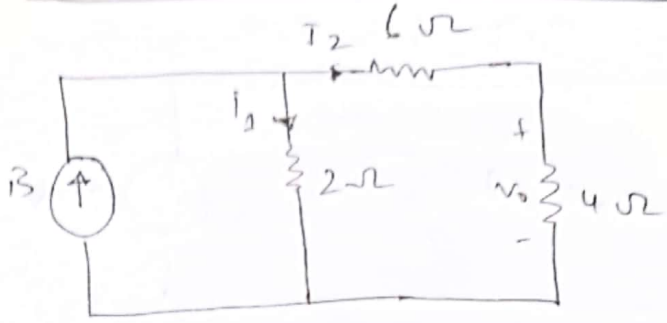
Ahmed Al-kuhlr
ID: 17010302003 8
Assignment - 02 D: 25/011/20

4.1



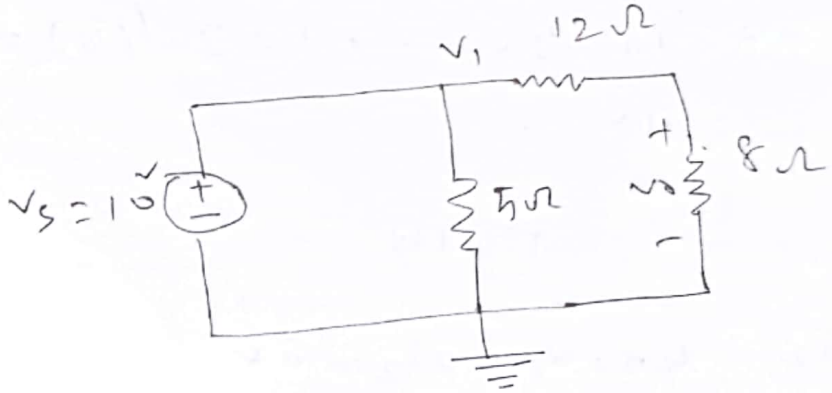
division, $I_2 = \frac{2}{2+6+4} I_s = \frac{1}{6} i_s$

$v_o = 4 i_2 = \frac{2}{3} i_s$

$\therefore I_s = 15\,A, \; v_o = \frac{2}{3}(15) = 10\,V$

$\therefore i_s = 30\,A, \; v_o = \frac{2}{3}(30) = 20\,V$

4.2



Let, $v_o = 1$

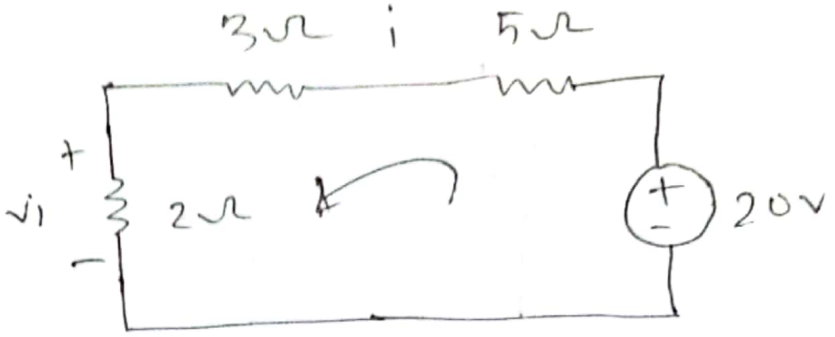
$i = \frac{1}{8}$

$v_1 = \frac{1}{8}(12+8) = 2.5$

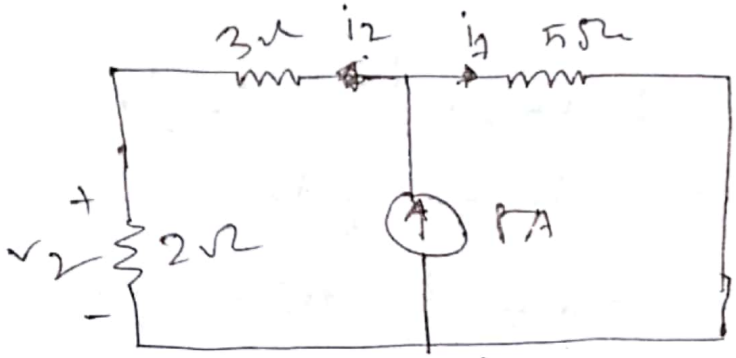
$\therefore v_s = 2.5\,V$

$v_s = 10V$, then $v_o = 4\,V$

4.3



(a)



(b)

Get, v_1 ——— Fig (a)

$(2+3+5)\,i = 20 \longrightarrow i = 20/(10) = 2A$

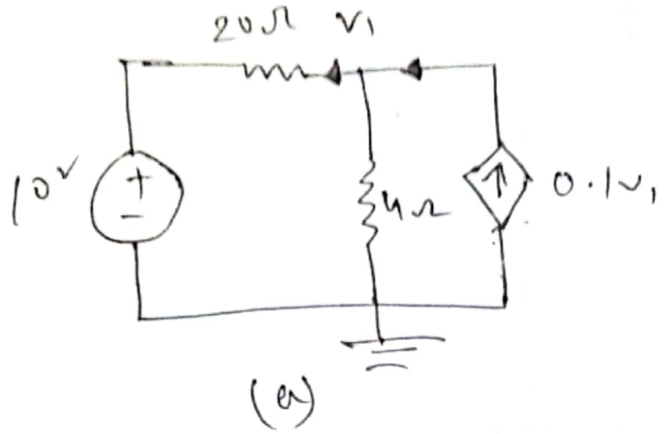
$v_1 = 2i = 4V$

Get v_2 ——— Fig (b)

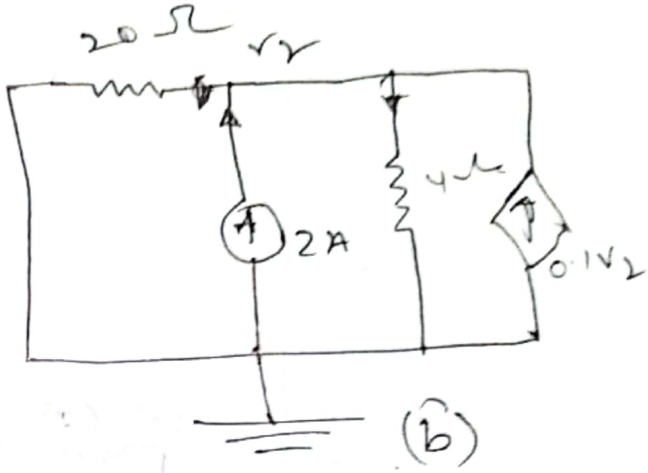
$i_1 = i_2 = 4A$, $v_2 = 2i_2 = 8V$

$\therefore v = v_1 + v_2 = 4 + 4 = 12V$

4.4



(a)



(b)

Let, v_1 consider Fig (a)

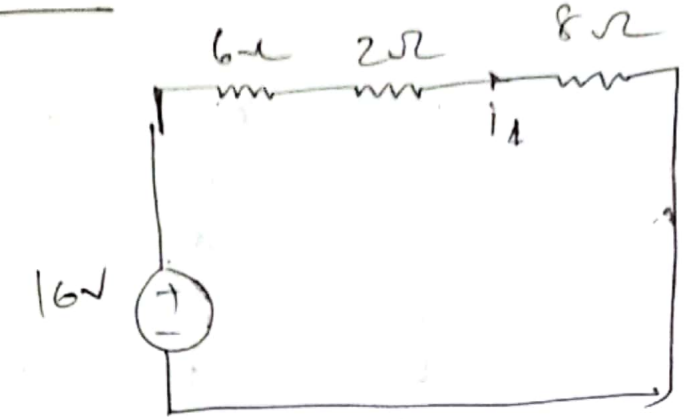
$$0.1v_1 + \frac{10 - v_1}{20} = \frac{v_1}{4} \longrightarrow v_1 = 2.5$$

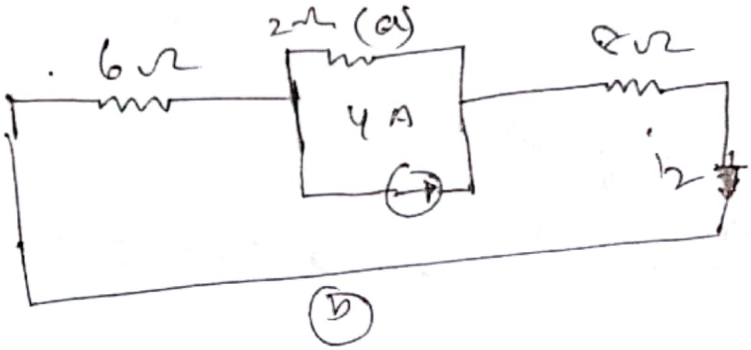
$\therefore$ v_2 consider Fig (b).

$$2 + 0.1v_2 + \frac{0 - v_2}{20} = \frac{v_2}{4} \rightarrow v_2 = 10$$

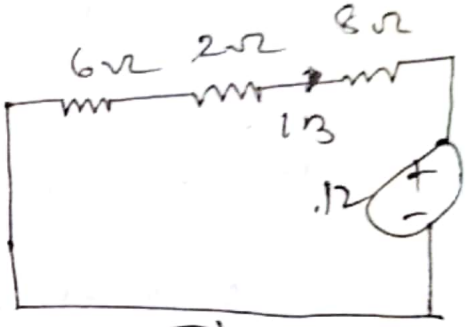
$\therefore$ $v_x = v_1 + v_2 = 12.5$ V

4.3





(b)



(c)

For i_1, consider Fig (a)

$$i_1 = \frac{16}{6+2+8} = 1\ A$$

$\therefore$ I_2 consider Fig (b)

$$I_2 = \frac{2}{2+14}\ (4) = 0.5$$

$\therefore$ I_3 consider Fig (c)

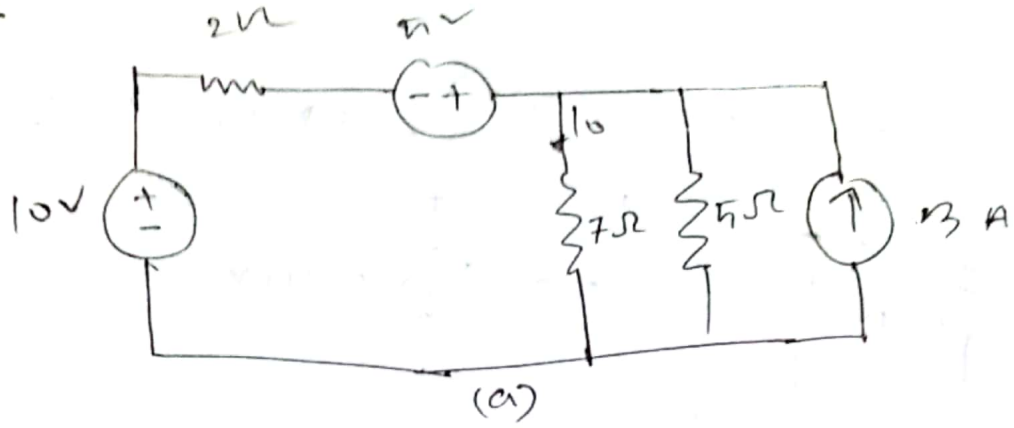
$$I_3 = \frac{-12}{16} = -0.75\ A$$

thus, $i = i_1 + i_2 + i_3$

$= 1 + 0.5 - 0.75$

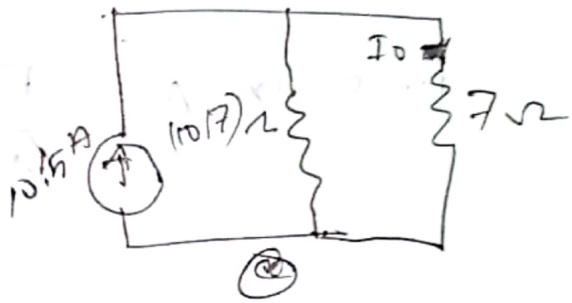
$= 750\ mA$

4.6.



(a)

(b)



(c)

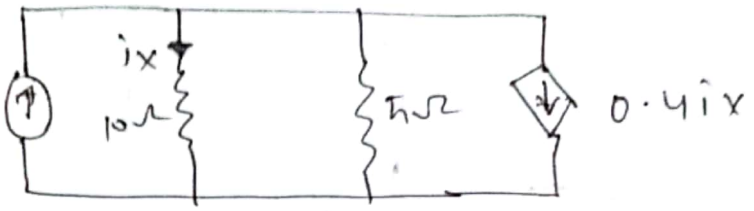
Adding the 10V and 5-V voltage source in series 2-Ω resistor eqv. circuit (b) combin the two current source 2-Ω 5-Ω resistor leads to the circuit in Fig (c) using circuit division.

$$i_o = \frac{\frac{10}{7}}{\frac{10}{7} + 7} (10.5)$$

$$= 1.78A$$

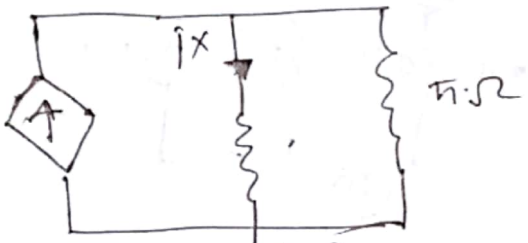
4.7

$$i_x = \frac{5}{15}(4 - 0.4i_x) \longrightarrow i_x = 1.76\ A$$



(a)

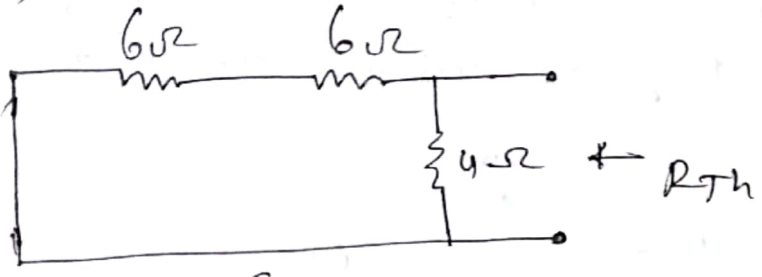
$4 - 0.4i_x$ A



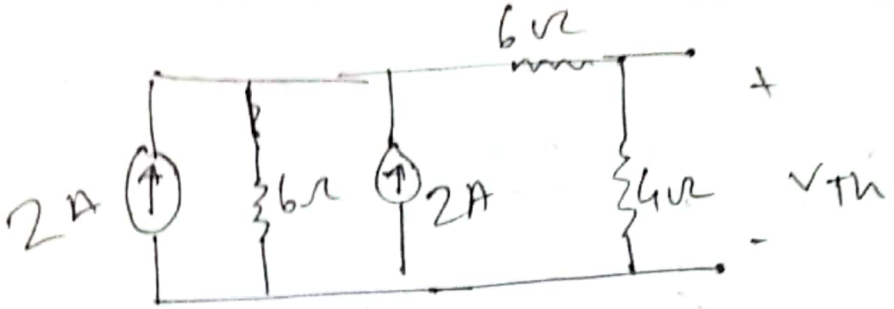
(b)

4.8

To Find R_{Th}, consider the circuit in Fig. (a)



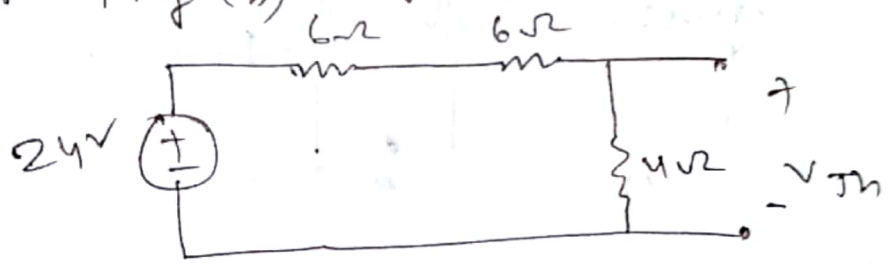
(a)



(b)

$$R_{Th} = (6+6) \| 4 = \frac{12 \times 4}{18} = 3\Omega$$

To find V_{Th}, we use source transformation in Fig (b) and (c)



(c)

Using div in Fig (c)

$$V_{Th} = \frac{4}{4+12}(24) = 6V$$

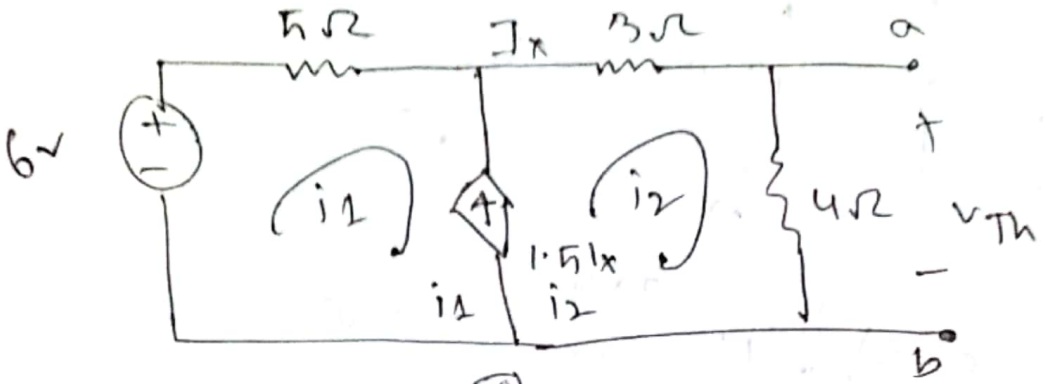
$$i = \frac{V_{Th}}{R_{Th}+1}$$

$$= \frac{6}{3+1}$$

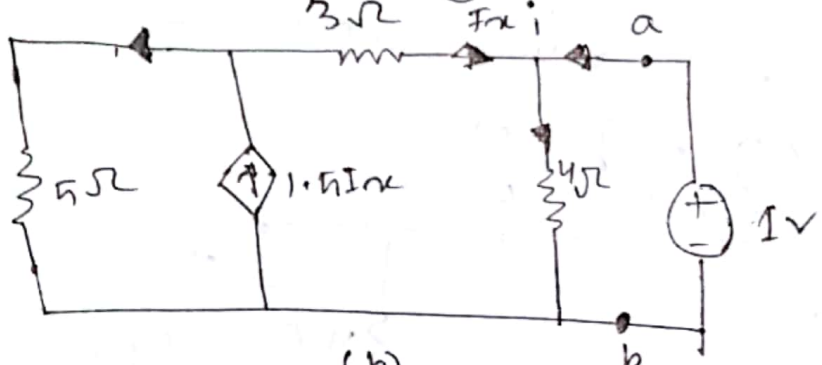
$$= 1.5A$$

4.9

To Find V_{Th} consider circuit Fig (a)



(a)



(b)

$I_x = i_2$

$i_2 - i_1 = 1.5I_x = 1.5i_2 \longrightarrow i_2 = -2i_1$ ——— (1)

For the mesh $-6 + 5i_1 + 7i_2 = 0$ ——— (2)

From (1) and (2), $I_2 = 4/(3)$ A

$V_{Th} = 4i_2 = 5.333$ V

To find R_{Th} consider Fig (a) Applying KVL around the outer loop.

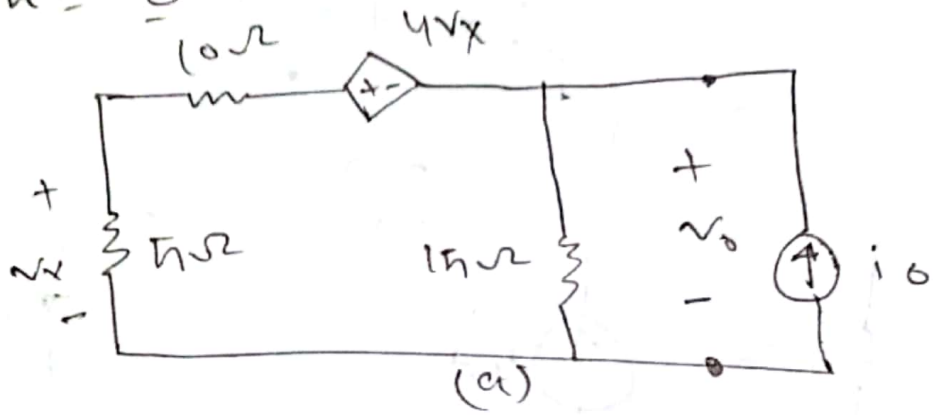
$5(0.5I_x) - 1 - 1 - 3I_x = 0 \longrightarrow I_x = -2$

$i = \frac{1}{4} - I_x = 2.25$

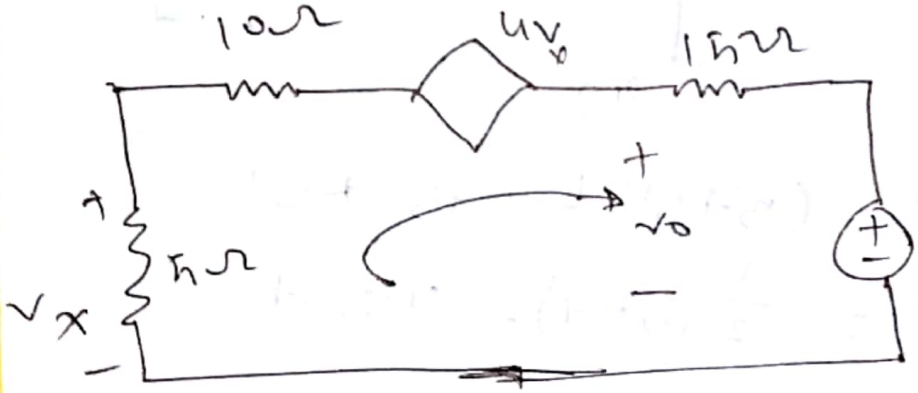
$R_{Th} = \frac{4}{1} = \frac{1}{2.25} = 444.4$ mΩ

4.10 since there are no independent source

$V_{th} = 0$



(a)



(b)

To Find R_{Th} consider Fig (b) using source transformation the circuit is transformed to that in Fig (b)

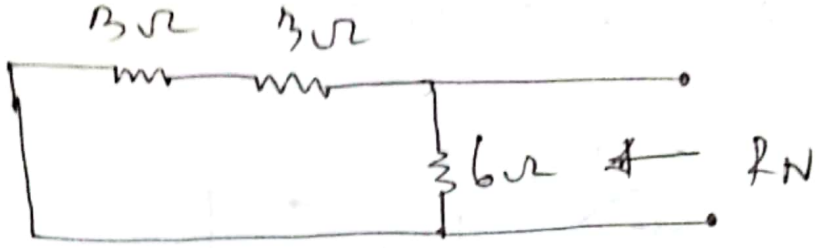
applying KVL

But $V_x = 5i$, Hence, $30i - 20i + 15i_o = 0 \rightarrow 10i = -15i_o$

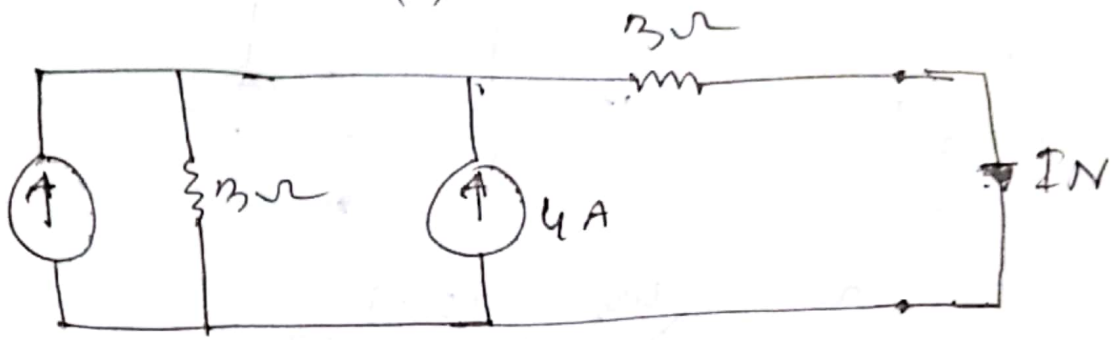
$V_o = (15i + 15i_o) = 15(-15i_o + i_o) = -7.5i_o$

$R_{Th} = V_o/(1_o) = -7.5\Omega$

4.11



(a)

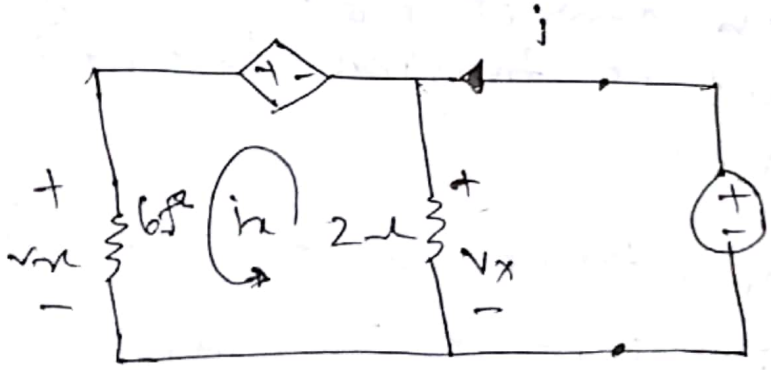


(b)

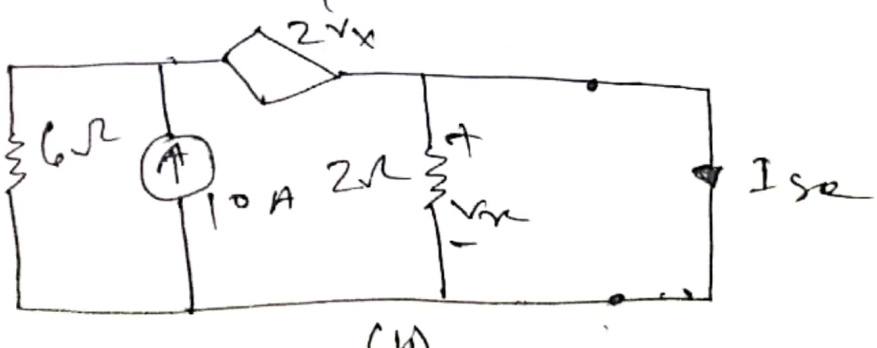
Fig (a) $R_N = (3+3) \| 6 = 3\ \Omega$

Fig (b) $I_N = \frac{1}{2}(5+4) = 4.5\ A$

4.12



(a)



(b)

To get RN consider the circuit fig (a)

Applying KVL, $6i_x - 2v_x - 1 = 0$

But $v_x = 1$, $6i_x = 3 \longrightarrow i_x = 0.5$

$$i = i_x + \frac{v_x}{2} = 0.5 + 0.5 = 1$$

$$R_N = R_{Th} = \frac{1}{i} = 1\,\Omega$$

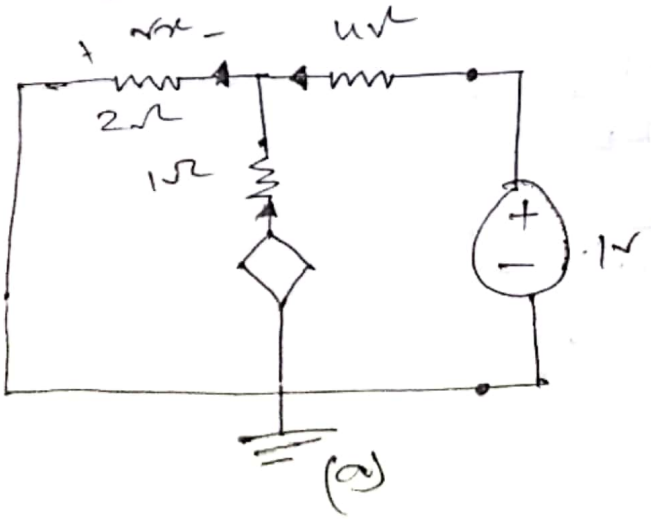
To find IN consider circuit in Fig (b)

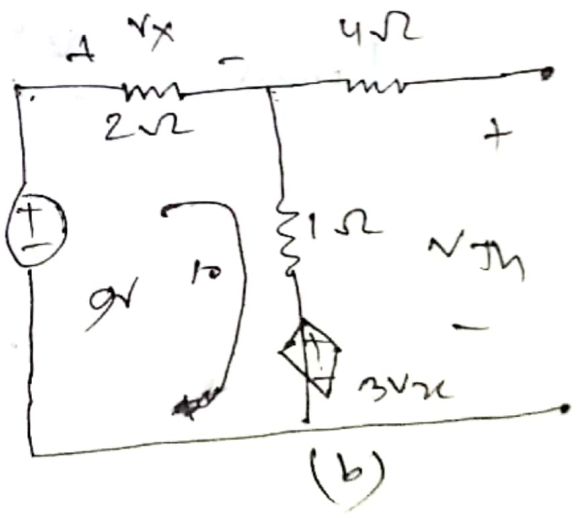
Because 2Ω resistor is shorted, $v_x = 0$ and the dependent source is inactive

Hence $I_N = i_{sc} = 10\,A$

4.13 we first to find R_{Th} and V_{Th}.

to find R_{Th}. we consider the circuit in fig (a)





Applying KCL at the top node gives

$$\frac{1-v_o}{4} + \frac{3v_x - v_o}{1} = \frac{v_o}{2}$$

But $v_x = -v_o$. Hence

$$\frac{1-v_o}{4} - 4v_o = \frac{v_o}{2} \longrightarrow v_o = 1/(19)$$

$$i = \frac{1-v_o}{4} = \frac{1-\frac{1}{19}}{4} = \frac{9}{38}$$

$$R_{Th} = 1/i = 38/(9) = 4.222\,\Omega$$

To find v_{Th} consider circuit Fig (b)

$$-9 + 2i_o + i_o + 3v_x = 0$$

But $v_x = 2i_o$, Hence

$$9 = 3i_o + 6i_o = 9i_o \longrightarrow i_o = 1\,A$$

$$v_{Th} = 9 - 2i_o = 7\,V$$

$$R_L = R_{Th} = 4.222\,\Omega$$

$$P_{max} = \frac{V_{Th}^2}{4R_L}$$

$$= \frac{49}{4(4.222)}$$

$$= 2.901\,W$$