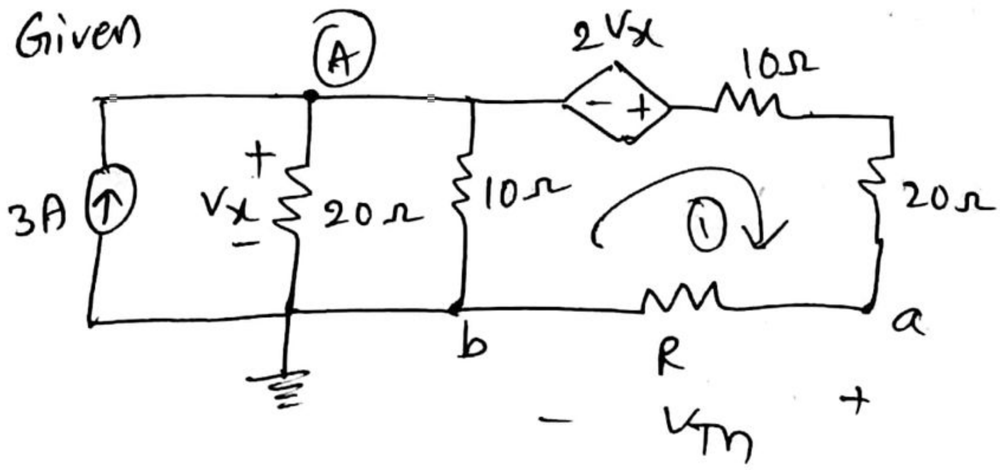
Answer

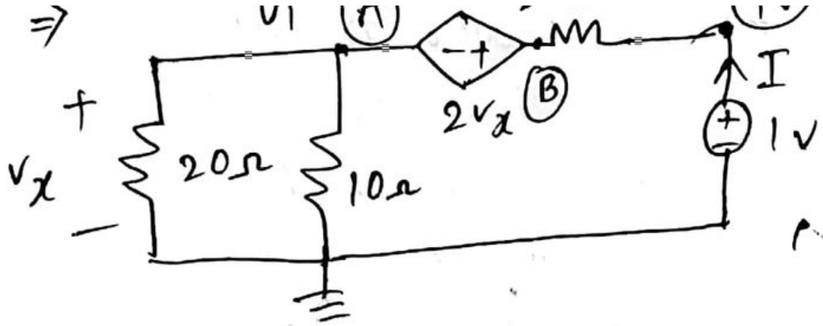
Step 1

Maximum power transfer theorem

Step 2

⇒ Given





$v_1 = v_x$

$$v_2 - v_1 = 2v_x$$

$$v_2 = 2v_x + v_1 = 2v_x + v_x = 3v_x$$

Step 3

KCL at node (A)

$$\frac{V_x}{20} + \frac{V_x}{10} + \frac{V_2 - 1}{30} = 0$$

$$\frac{V_x}{20} + \frac{V_x}{10} + \frac{3V_x - 1}{30} = 0$$

$$3V_x + 6V_x + 6V_x - 2 = 0$$

$$15V_x = 2$$

$$V_x = \frac{2}{15}\,V$$

$$\therefore I = \frac{1 - V_2}{30} = \frac{1 - 3V_x}{30}$$

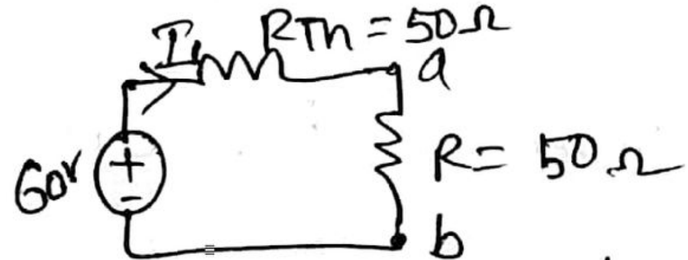
$$= \frac{1 - 2/5}{30}$$

$$= \frac{3/5}{30}$$

$$= \frac{1}{50}\,A$$

$$\therefore R_{Th} = \frac{1V}{I} = \frac{1}{(1/50)} = 50\,\Omega$$

∴ Thevenins Equivalent circuit



For maximum power transfer

$$R = R_{Th} = 50\Omega$$

∴ max. power transferred to load

$$= I_1^2 R$$

$$= \left(\frac{60}{50+50}\right)^2 (50)$$

$$= 18 W$$