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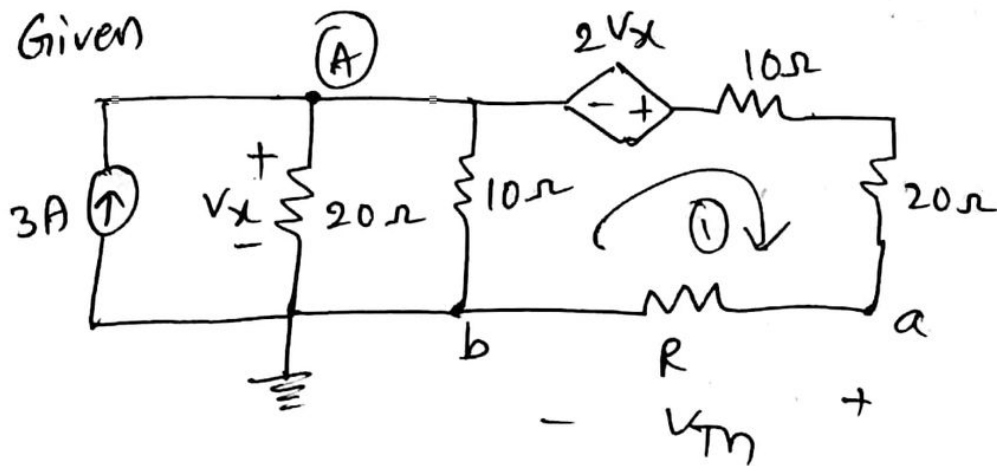
Answer

Step 1

Maximum power transfer theorem

Step 2

⇒ Given



V_{Th} ⇒ open circuit voltage between 'a' and 'b'

∴ voltage drop across 10Ω , $20\Omega = 0, V$
(∵ no current flows)

KCL at node (A)

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

$$\frac{3V_x}{20} = 3$$

$$V_x = 20, \text{ Volts.}$$

∴ KVL in loop ①

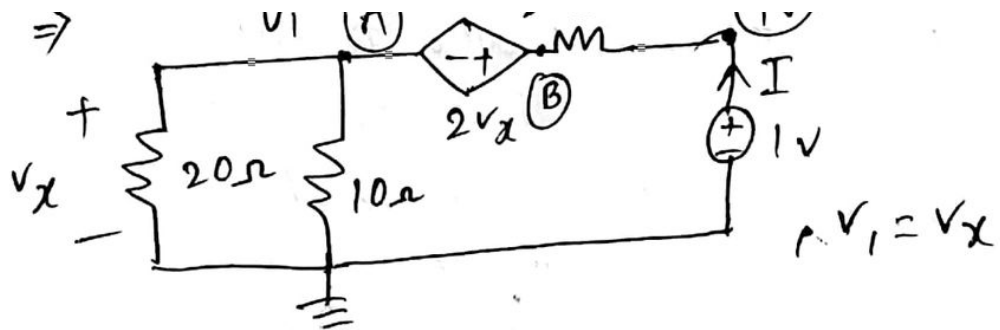
$$-V_x - 2V_x + 0 + 0 + V_{Th} = 0$$

$$\therefore V_{Th} = 3V_x$$

$$V_{Th} = 60, \text{ Volts}$$

⇒ R_{Th} = equivalent resistance between 'a' & 'b'
when all independent sources are turned off

$$\therefore R_{Th} = 30\Omega$$



$$v_2 - v_1 = 2v_x$$

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

Step 3

KCL at node (A)

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

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

$$3V_x + 6V_x + 3V_x - 1 = 0$$

$$15V_x = 1$$

$$V_x = \frac{1}{15} \text{ V}$$

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

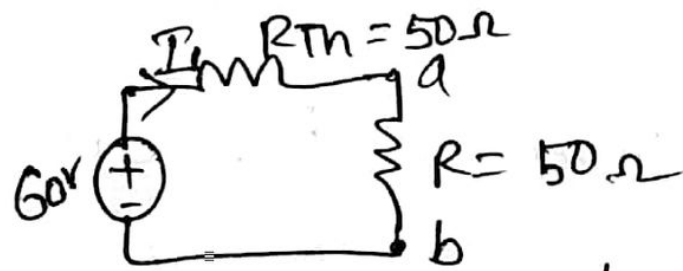
$$= \frac{1 - \frac{2}{15}}{30}$$

$$= \frac{\frac{3}{15}}{30}$$

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

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

∴ Thevenin's equivalent circuit



For maximum power transfer

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

∴ ^{max.} power transferred to load

$$\begin{aligned} &= I_{Th}^2 R \\ &= \left(\frac{60}{50+50} \right)^2 (50) \\ &= 1.8W \end{aligned}$$