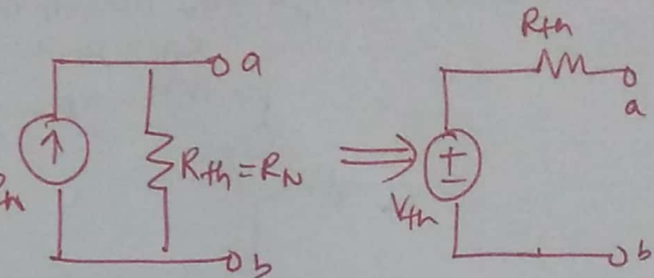
NORTON EQUIVALENT



NORTON EQUIVALENT

THEVENIN EQUIVALENT

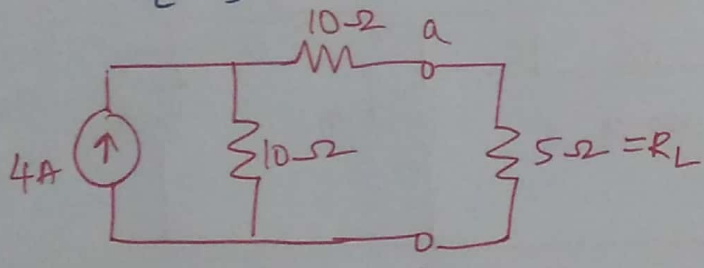
1

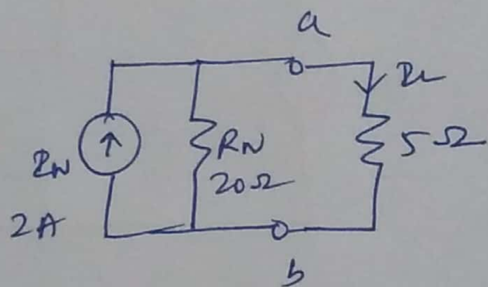
I_N = Norton Current

= Short circuit current across the load.

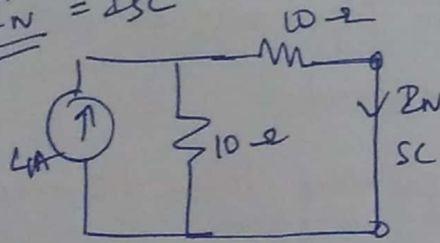
Example

1. Find the Norton Equivalent across the load $R_L = 5\Omega$

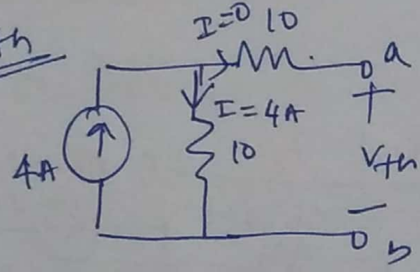




$I_N = I_{SC}$



V_{th}



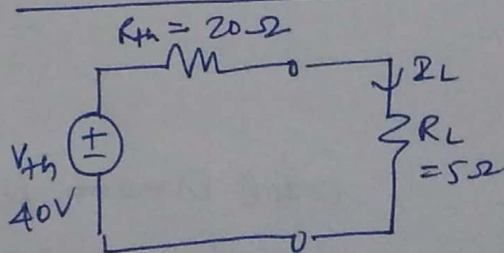
By current division.

$$I_N = 4 \times \frac{10}{10+10}$$

$$I_N = \frac{40}{20} = 2A$$

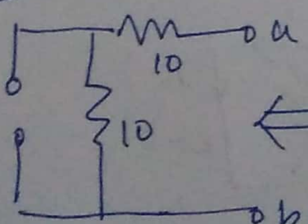
$$V_{th} = 4 \times 10$$
$$= 40V$$

THEVENIN EQUIVALENT



$$I_L = \frac{40}{20+5} = 1.6A.$$

$R_N = R_{th}$ OC - current source



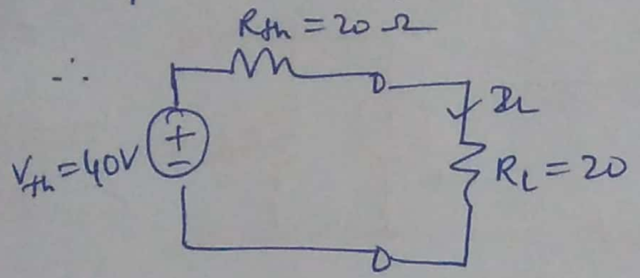
$\Leftarrow R_N = 10+10$

$= 20\Omega$

(2)

maximum power transfer occurs when $R_L = R_{th} = 20\,\Omega$

$\therefore$



$$P_{max} = \frac{V_{th}^2}{4R_{th}}$$

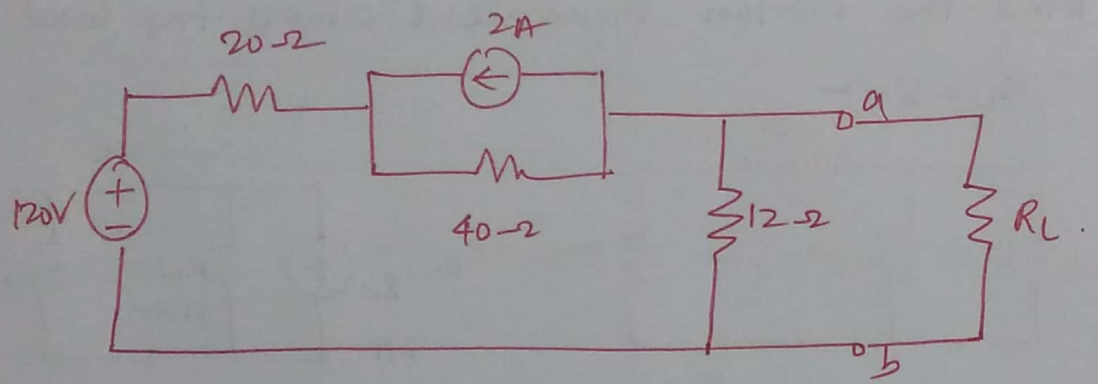
$$I_L = \frac{40}{20+20} = 1A.$$

$$= \frac{40^2}{4 \times 20}$$

$$P_{max} = I_L^2 R_L = 20\,W$$

$$P_{max} = 20\,W$$

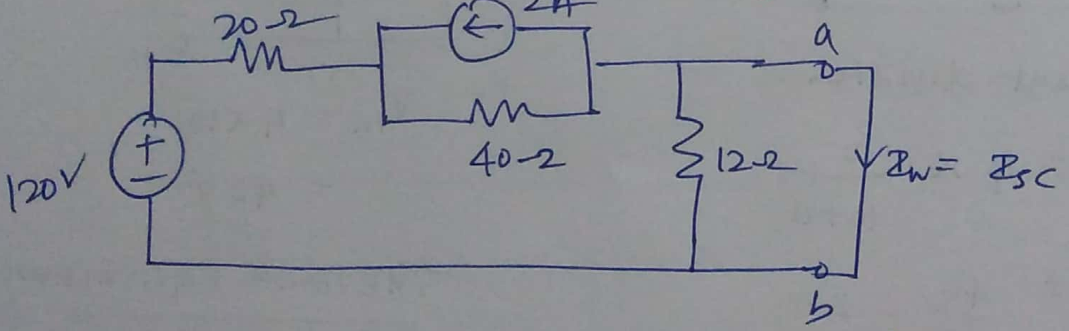
(2).



Find Thevenin & Norton Equivalents.

max power transferred?

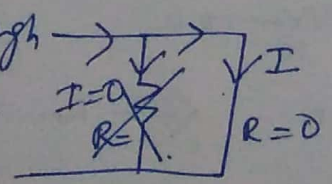
To find I_N: SC current through the load terminals.



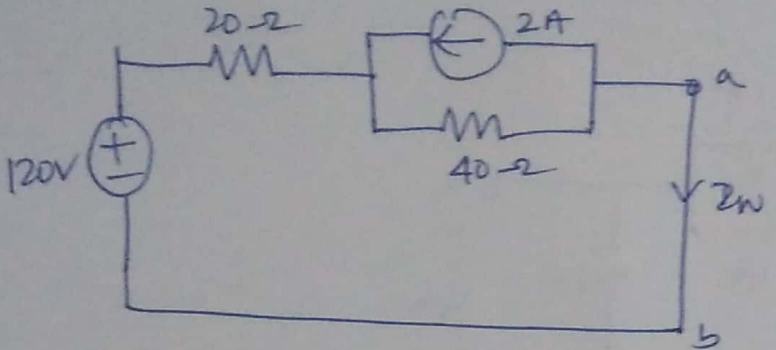
(R = 0)

Resistor in parallel to SC path

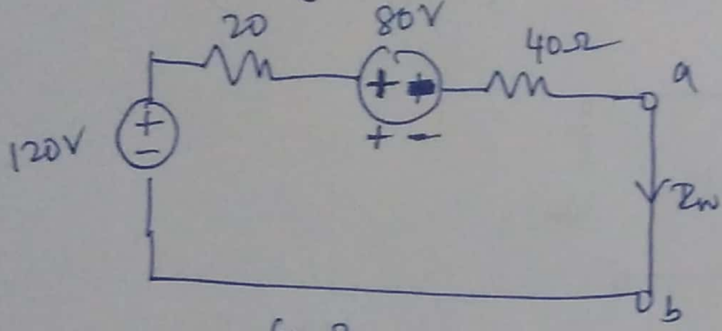
entire current flows through the zero resistance path. i-e (short circuit)

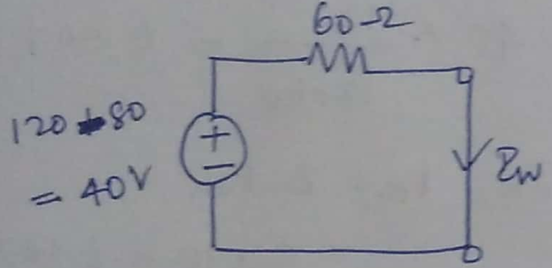


no current will flow through $R = 12\,\Omega$, hence discarded.



To simplify use source transformation, $V = 2 \times 40 = 80\,V$

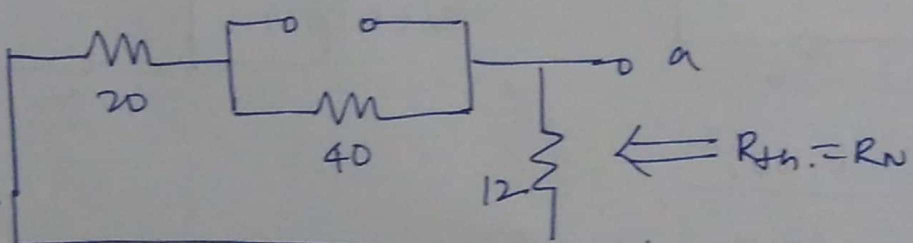


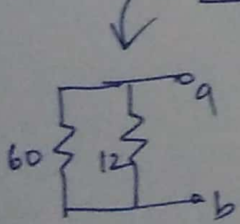


$$I_N = \frac{40}{60} = \frac{2}{3}\,A.$$

To find R_{th}.

OC - current source, SC - voltage source.



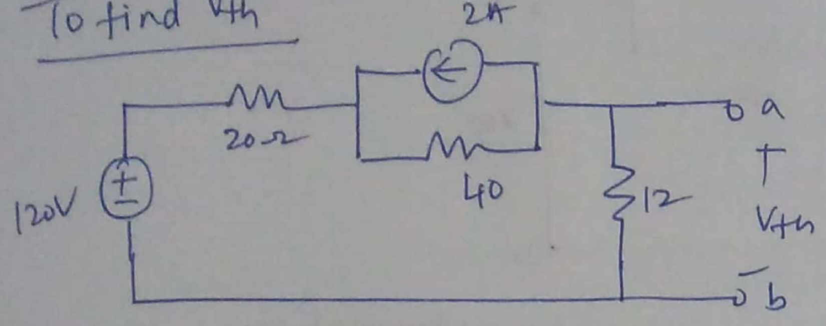


20, 40 series $R = 60\,\Omega$

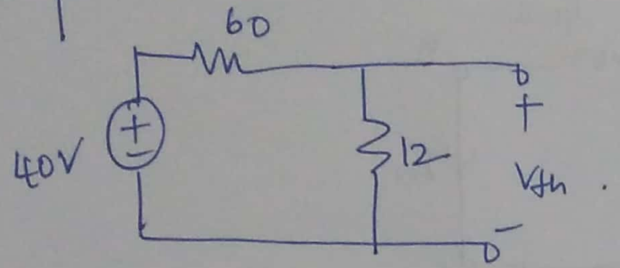
60 parallel 12 $R_N = \dfrac{12 \times 60}{12 + 60} = 10\,\Omega$

(4).

To find V_{th}



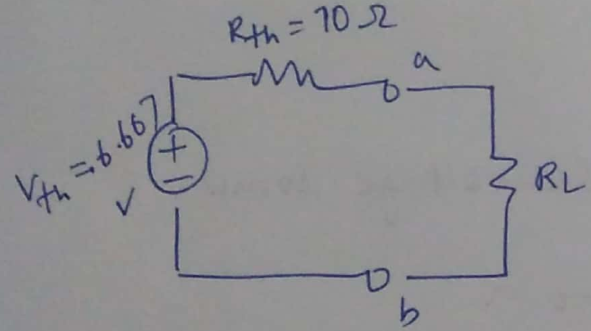
using the source transformation (ref norton)



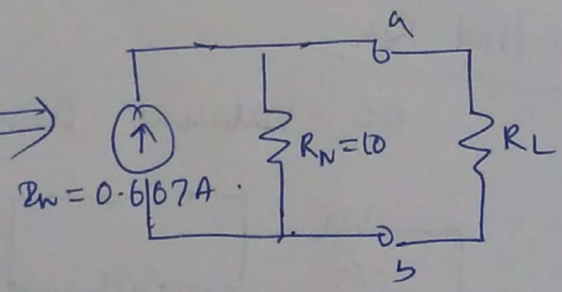
By voltage division, $V_{th} = 40 \times \frac{12}{12+60} = 6.667\,V$

This can be verified using I_N, $V_{th} = I_N \cdot R_{th}$

$= \frac{2}{3} \times 10 = 6.667\,V.$



$\Rightarrow$



$$P_{max} = \frac{6.667^2}{4 \times 10}$$

$$= 1.1111\,W$$

Scanned by CamScanner