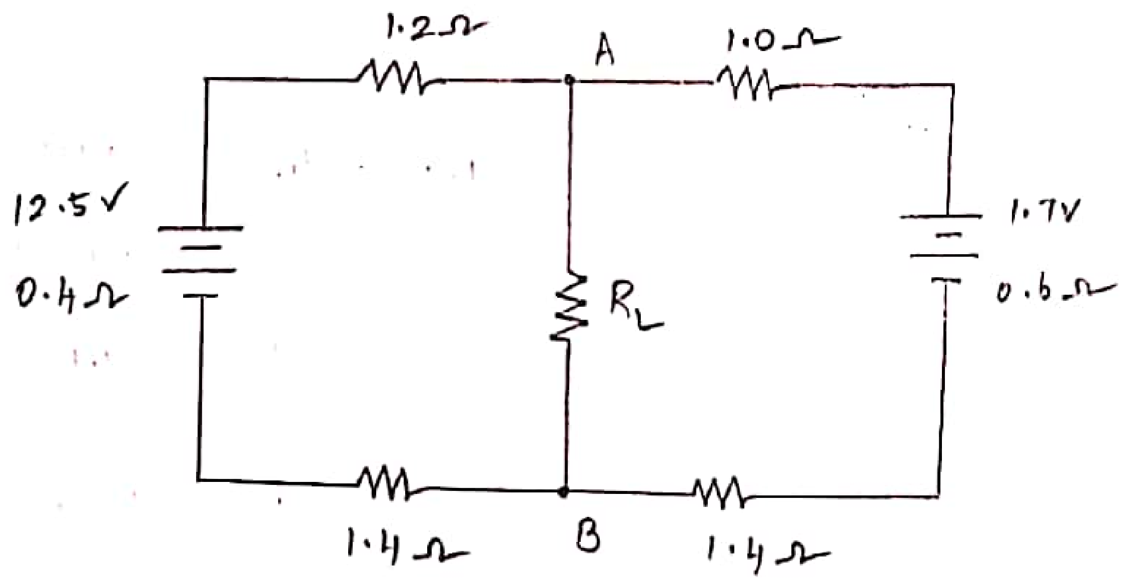
Maximum power transfer theorem:

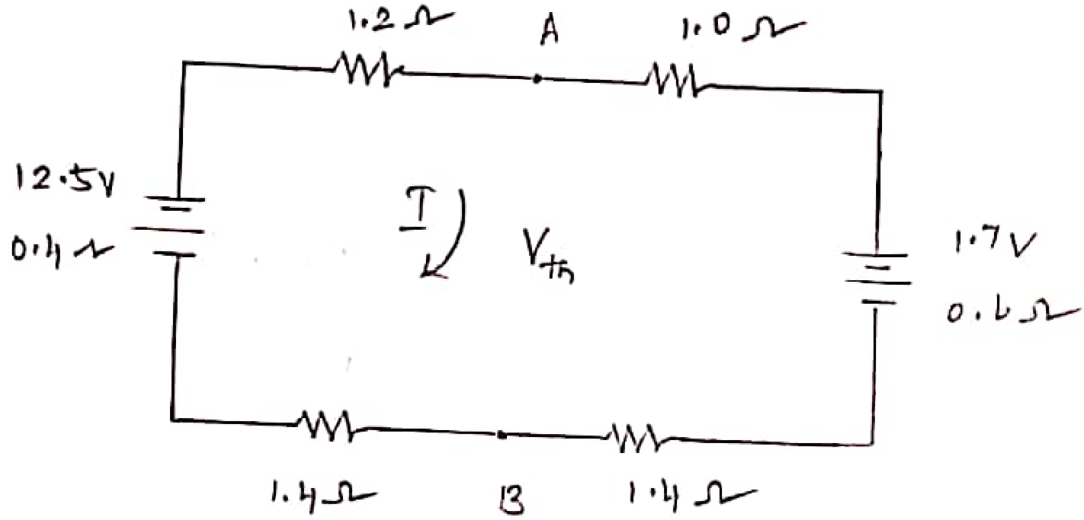
Statement: Maximum power will be delivered from source to load when (R_L) load resistance is equal to thevenin's resistance (R_{th}).

$$\boxed{P_{max} = \frac{V_{th}^2}{4R_L}} \quad \text{when} \quad R_L = R_{th}$$

1. For the circuit of the figure. Find the value of R_L for maximum power delivered to it. Calculate also the maximum load power.



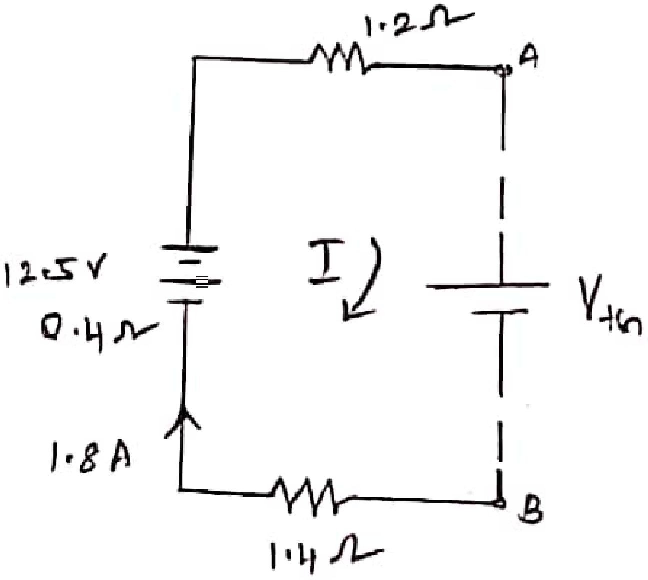
V_{th} :



$$I = \frac{V}{R}$$

$$= \frac{12.5 - 1.7}{0.4 + 1.2 + 1.0 + 0.6 + 1.4 + 1.4}$$

$$\boxed{I = 1.8\ A}$$



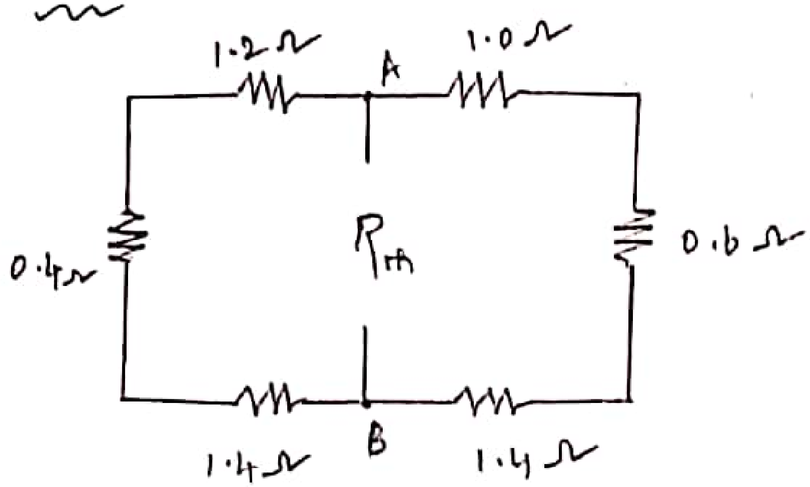
$$12.5 - V_{th} = 3 \times 1.8$$

$$= 5.4 - 12.5$$

$$-V_{th} = -7.1$$

$$\boxed{V_{th} = 7.1\ V}$$

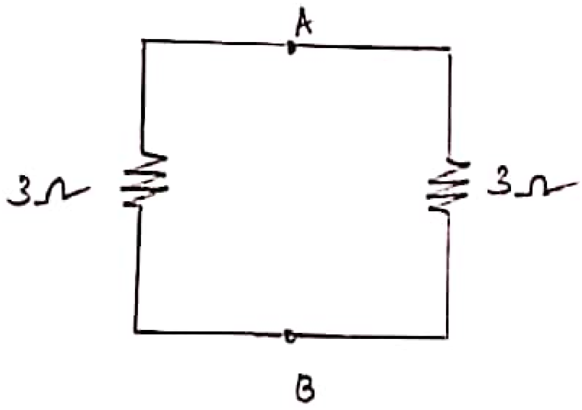
R_{th} :



$\Rightarrow 0.4 + 1.2 + 1.4 = 3$

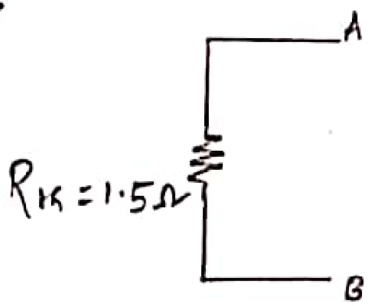
$\Rightarrow 1.0 + 0.6 + 1.4 = 3$

$\Rightarrow$



$$\frac{3 \times 3}{3+3} = \frac{9}{6} = 1.5\,\Omega$$

$\Rightarrow$



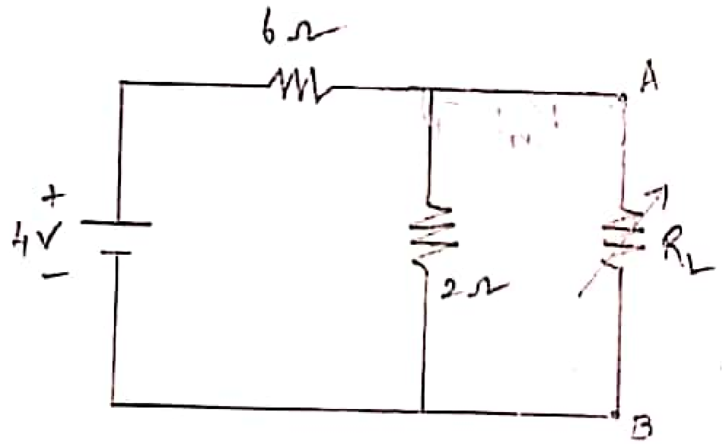
$$\boxed{R_{th} = 1.5\,\Omega}$$

$R_L = R_{th}$

$$P_{max} = \frac{V_{th}^2}{4R_L} = \frac{(7.1)^2}{4(1.5)} = \frac{50.41}{6} = 8.40\,W$$

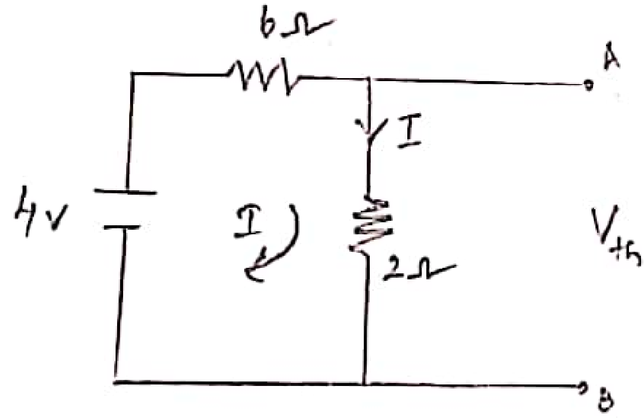
$$\boxed{P_{max} = 8.40 \text{ watts}}$$

2. Determine the value of load resistance R_L when it is dissipating maximum power. Also find the maximum power dissipated in the load resistance for the circuit given.



V_{th} :

Remove R_L find V_{th}

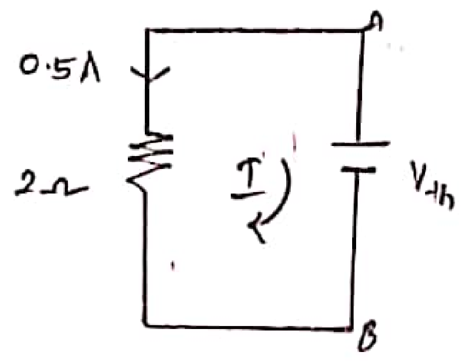


$$4 = 6I + 2I$$

$$4 = 8I$$

$$I = \frac{4}{8} = 0.5$$

$$\boxed{I = 0.5 \text{ A}}$$

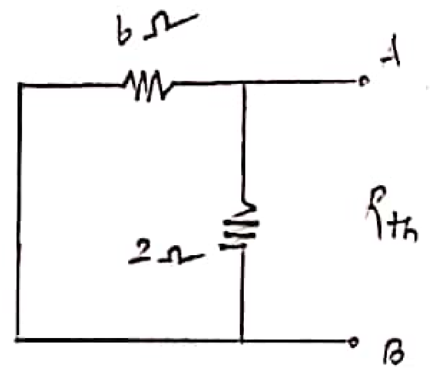


$$-V_{th} = 2(-0.5)$$

$$-V_{th} = -1$$

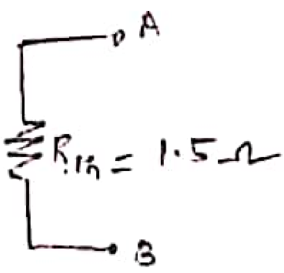
$$\boxed{V_{th} = 1V}$$

R_{th}:



$$\frac{6 \times 2}{6+2} = \frac{12}{8} = 1.5\Omega$$

$$\boxed{R_{th} = 1.5\Omega}$$



$$R_L = R_{th}$$

$$P_{max} = \frac{V_{th}^2}{4R_L} = \frac{1^2}{4(1.5)} = \frac{1}{6} = 0.1667 \text{ watts}$$

$$\boxed{P_{max} = 0.1667 \text{ watts}}$$