JAY PRAKASH

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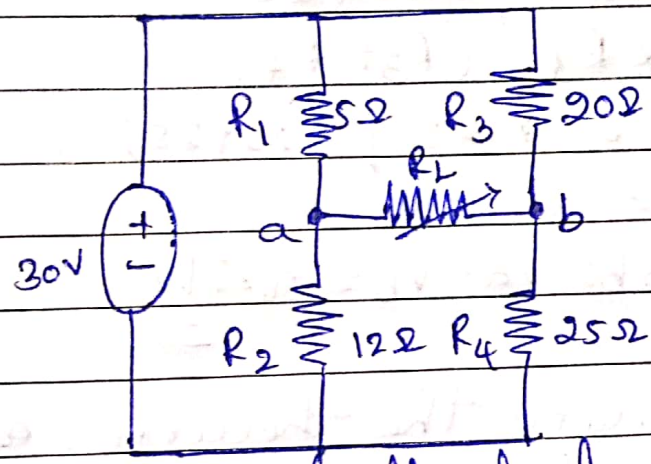
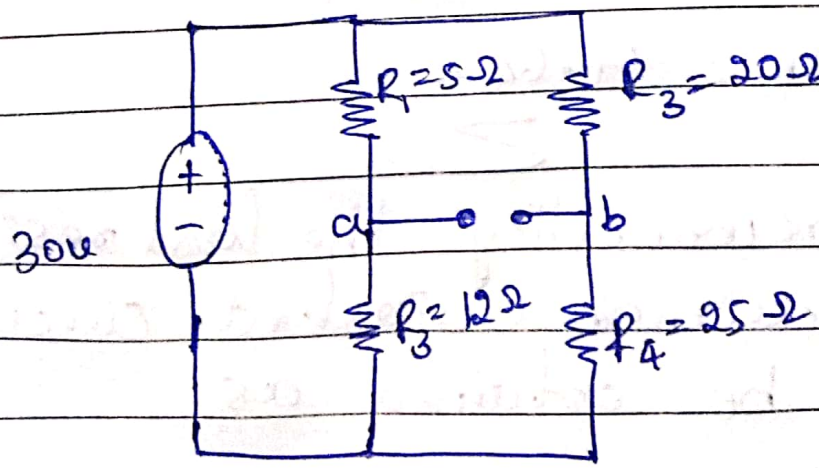
Circuit simulation for the given problem using Circuit lab [Maximum power transfer]



Disconnect the load resistance from the load terminals a and b. To represt the given circuit as thevenin's equivalents. We are to determine the thevenin's voltage Vth and the venins equivalent resistance R_{Th}.



The thevenin's Voltage @ Voltage across the terminals ab is $V_{ab} = V_a - V_b$

$$V_a = V_a - V_b$$

$$V_a = V \times R_2 / (R_1 + R_2)$$

$$= 30 \times 12 / (5+12)$$

$$V_a = 21.174 V$$

$$V_b = V \times R_4 / (R_3 + R_4)$$

$$= 20 \times 25 / (20+25)$$

$$= 16.66 V$$

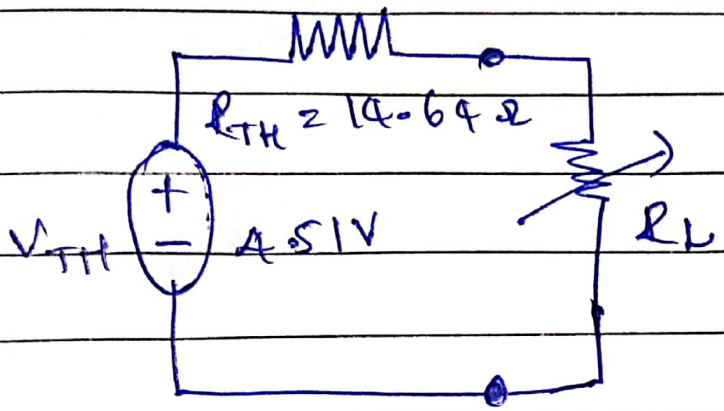
$$V_{th} = V_{ab} = V_a - V_b = 4.51 V$$

To calculate the thevinens equivalent resistance R_{th} by replacing Source with their internal resistance (here assume that the voltage source has zero intern resistance so it becomes a short circuited)

$$R_{th} = R_{ab} = (R_1 R_2 / (R_1 + R_2)) + (R_3 R_4 / (R_3 + R_4))$$

$$R_{TH} = 14.64 \Omega$$

By reconnecting the load resistance the thevinins equivalent circuit can be obtained as



for the maximum power transfer, R_L value must equal to the R_{TH} to deliver maximum to the load.

$\therefore R_L = R_{TH} = 14.64\ \Omega$

And the maximum power transfered to load R_L i.e

$$P_{max} = V_{TH}^2 \,/\, 4R_{TH}$$

$$P_{max} = (4.51)^2 \,/\, 4 \times 14.64$$

$$= 347.3 \text{ m Watt}$$