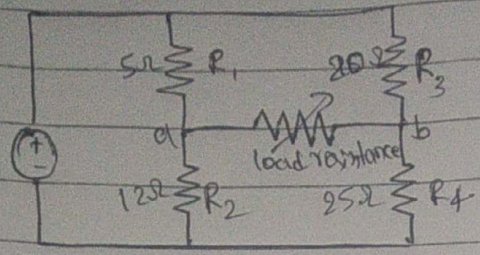
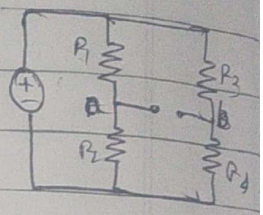
Circuit challange (simulation)



Disconnect the load resistance from the load terminals a and b. To represent the given circuit as thevenin's equivalent. we are to determine the thevenins voltage. V_{TH} and thevenin's equivalent resistance R_{TH}



The thevenin's voltage or voltage across the terminal AB is $V_{AB} = V_A - V_B$

$$V_A = V \times R_2/(R_1+R_2)$$
$$= 30 \times 12/(5+12)$$
$$= 21.17\ V$$

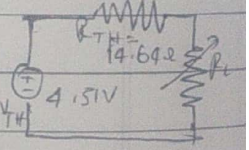
$$V_B = V \times R_4/(R_3+R_4)$$
$$= 30 \times 25/(20+25)$$
$$= 16.66\ V$$

$$V_{TH} = V_{AB} = V_A - V_B = 4.51\ V$$

To calculate the thevenin's equivalent circuit R_{TH} by replacing source with their internal resistance

$$R_{TH} = R_{AB} = (R_1 R_2/(R_1+R_2)) + (R_3 R_4/(R_3+R_4))$$

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



By reconnecting the load resistance the thevenin's equivalent circuit can be obtain

For the maximum power transfer, R_L value must be equal to R_{TH} to deliver maximum power to the load. $\therefore R_L = R_{TH} = 14.64\ \Omega$.

And the maximum power transfered to load R_L is $P_{max} = V_{TH}^2/4R_{TH}$

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

$$P_{max} = 347.3\ m\ watt$$