Circuit challenge [SIMULATION]

Date: / /

→ Max. power transfer :-

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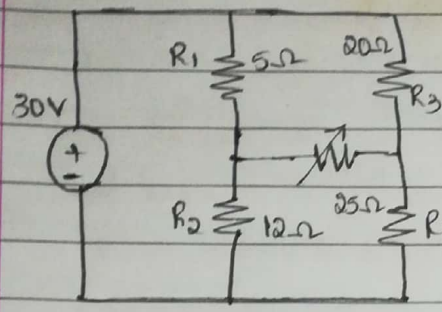
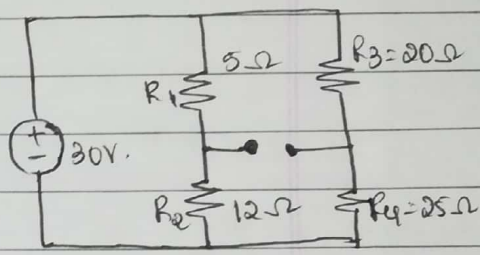


Disconnect the load resistance from the load terminals a & b. To represent the given ckt as. The Venin's equivalent we have to determine V_{th} & R_{th}.

The therevin's voltage or voltage across the terminal AB is

$V_{AB} = V_A - V_B$.

$V_A = V \times \frac{R_2}{(R_1+R_2)} = 30 \times \frac{12}{(5+12)} = 21.7V$.



$V_B = V \times \frac{R_4}{(R_3+R_4)} = 30 \times \frac{25}{(20+25)}$

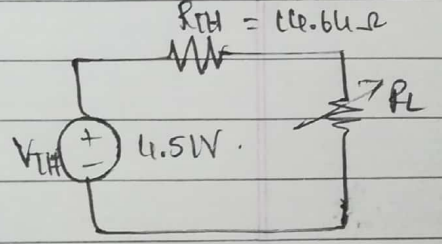
$V_B = 16.66V$

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

- To Calculate R_{TH} : By replacing source with their internal resistance.

$R_{TH} = R_{AB} = \left(\frac{R_1R_2}{R_1+R_2}\right) + \left(\frac{R_3R_4}{R_3+R_4}\right)$

$R_{TH} = 14.64\Omega$.



Where $R_L = R_{TH} = 14.64\Omega$.

And the max. power transmitted to load R_L is

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

$= \frac{(4.51)^2}{4 \times 14.64}$

$P_{max.} = 343.3 mW$