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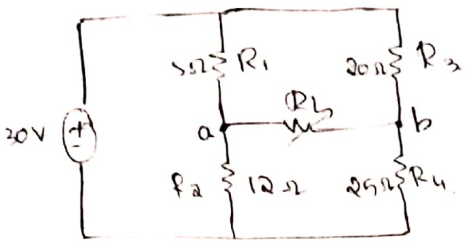
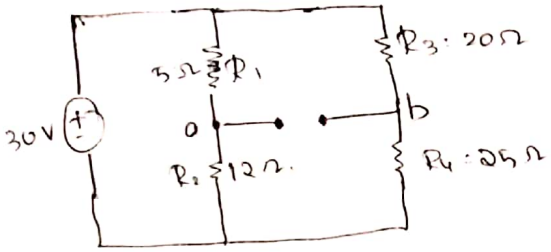
4ALI18EC050

Circuit Simulation for the problem:

[Maximum power transfer]



Disconnect the load resistance from the load term a & b. To represent the given circuit as Thevenin's equivalent. We are to determine V_{TH} & R_{TH}



Thevenin's voltage or voltage across the terminals ab is $V_{ab} = V_a - V_b$

$V_a = V_a - V_b$.

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

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

$V_a = 21.17\ V$

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

$= 30 \times 25 / (20+25)$

$= 16.66\ V$

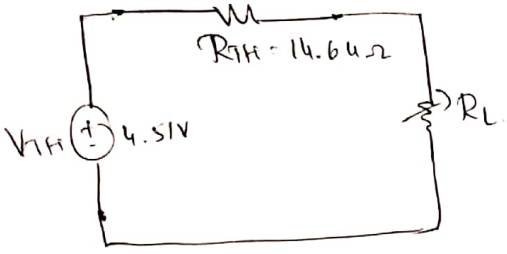
$\therefore V_{TH} = V_{ab} = V_a - V_b = 4.51\ V$.

To calculate Thevenin's equivalent resistance R_{TH} by replacing sources with internal resistance [Here assume that voltage source has zero internal resistance]

$R_{TH} = R_{ab} = (R_1R_2/(R_1+R_2)) + (R_3R_4/(R_3+R_4))$

$R_{TH} = 14.64\Omega$

By reconnecting the load resistance, the thevenins equivalent circuit can be obtained as



For the max. power transform, R_L value must be equal to the R_{TH} to deliver max. power to the load.

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

And the maximum power transformed to R_L is.

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

$P_{max} = (4.51)^2 / 4 \times 14.64 \Rightarrow$ 347.3m Watt