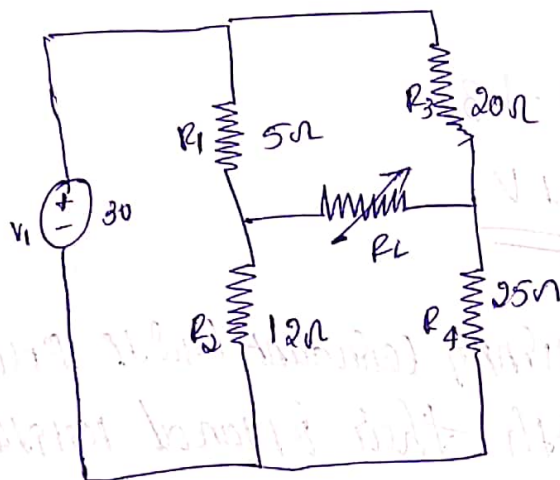


CIRCUITE CHALLENGE [USING CIRCUITELAB OR PARTSIM]

⇒ Maximum power transfer:



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

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

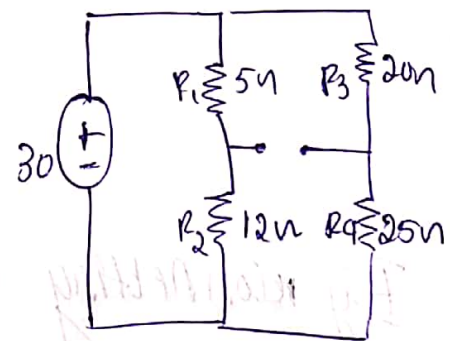
$$V_{AB} = V_A - V_B$$

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

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

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

$$V_A = \underline{\underline{21.17 \text{ V}}}$$



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

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

$$V_B = \underline{\underline{16.66 V}}$$

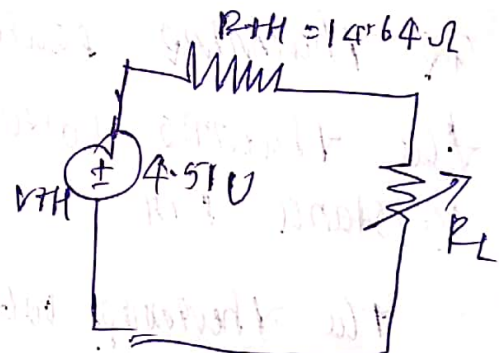
$$\therefore V_{TH} = V_{AB} = V_A - V_B$$

$$= \underline{\underline{4.51 V}}$$

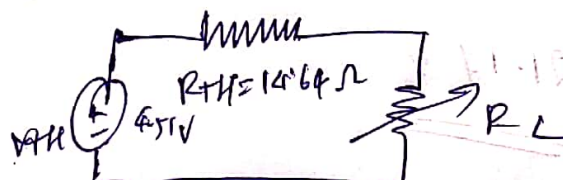
To calculate the thevenin equivalent circuit R_{TH} by replacing source with their internal resistance

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

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



By reconnecting the load resistance the thevenin equivalent circuit can be obtained as for the maximum power transfer theorem, R_L value must be equal to R_{TH} to deliver maximum power to the load.



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

And the maximum power transferred to the load R_L is,

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

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

$$P_{max} = 347.3 \text{ mWatt}$$

CIRCUIT LAB File Edit Run Help Hi there, soorya01 Warning: unsaved changes! CircuitLab / Welcome to CircuitLab

DC

DC Sweep

Parameter: V1.V

Sweep Type: Linear

Start: 0

End: 30

Step: 0.1

Second Parameter: ☐

Outputs:

P(RL)

+ Add Expression

Advanced Graphing...

Run DC Sweep

Time Domain

Frequency Domain

Circuit diagram showing a DC voltage source V1 (30 V) connected in series with resistor R1 (5 Ω). This series combination is connected to a parallel network. The parallel network consists of resistor R2 (12 Ω) in series with a load resistor RL (14.64 Ω), and another parallel branch containing resistors R3 (20 Ω) and R4 (25 Ω) in series. The bottom terminals of R2, RL, and R4 are connected to a common ground.

