CIRCUITE CHALLENGE [USING CIRCUITELAB OR PARTSIM]

⇒ Maximum power transfer:

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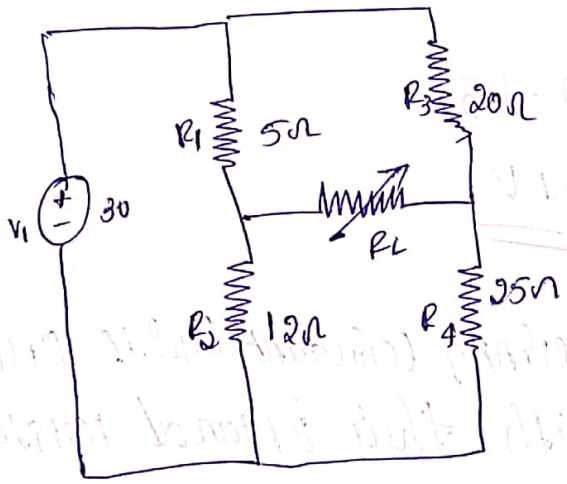
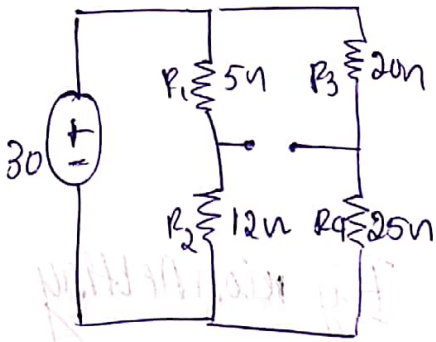


Disconnect the load resistance from the load terminals a & b. To represent the given circuite as Thevenins equivalent. We are to determine the thevenins voltage V_{TH} & Thevenins equivalent resistance R_{TH}



The thevenins voltage or voltage across the terminal AB is

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

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

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

$$V_A = 21.17\ V$$

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

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

$$V_B = 16.66\ V$$

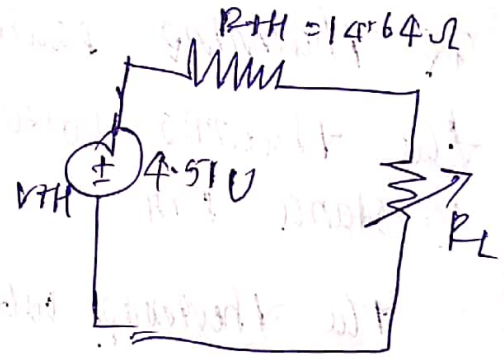
$$\therefore V_{TH} = V_{AB} = V_A - V_B$$

$$= 4.51\ V$$

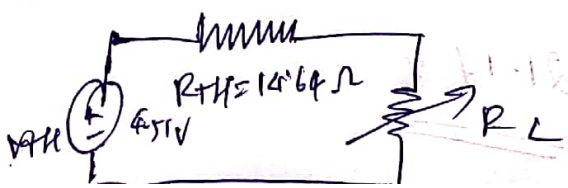
To calculate the thevenin equivalent bench R_{TH} by replacing source with their internal resistance

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

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



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



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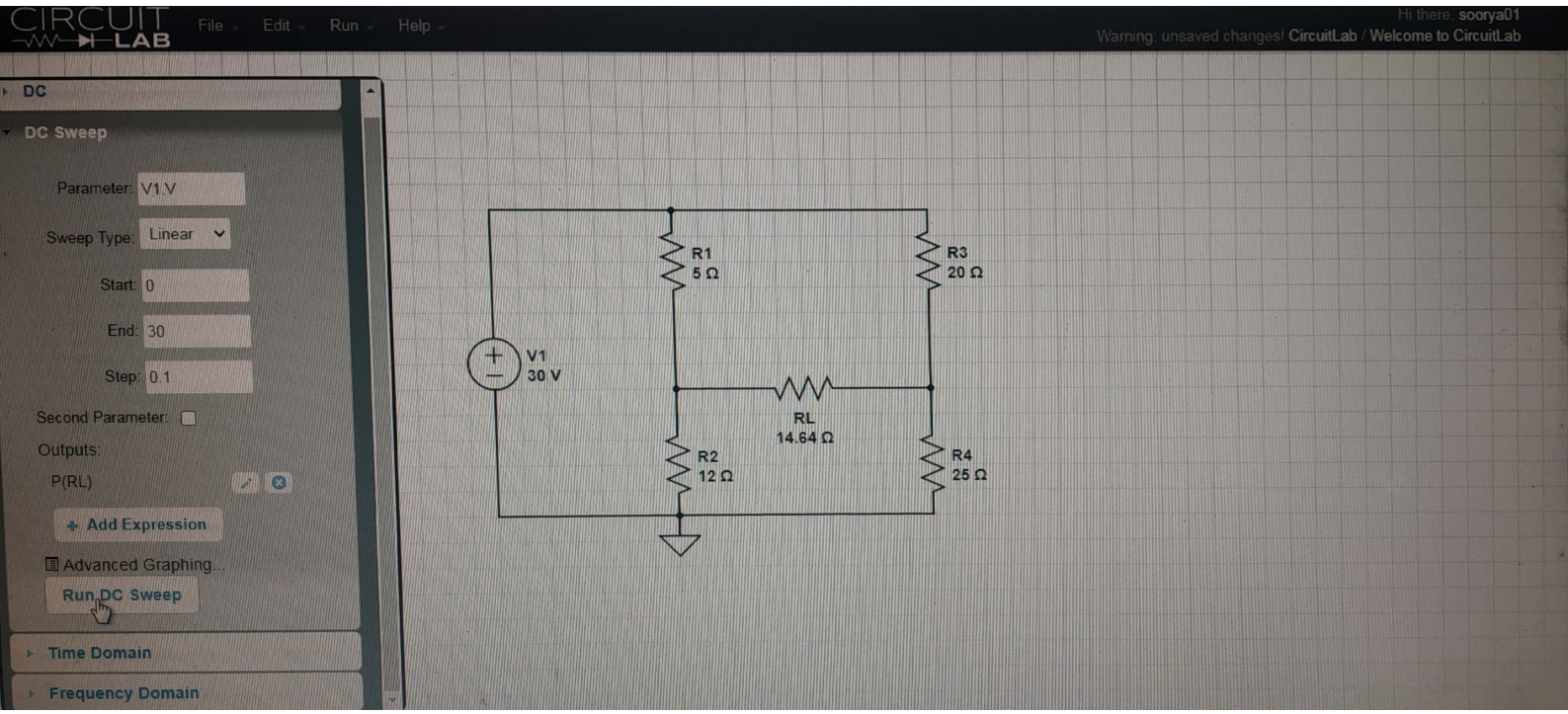
$\therefore R_L = R_{TH} = 14.64\Omega$

And the maximum power transferred to the load R_L is,

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

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

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



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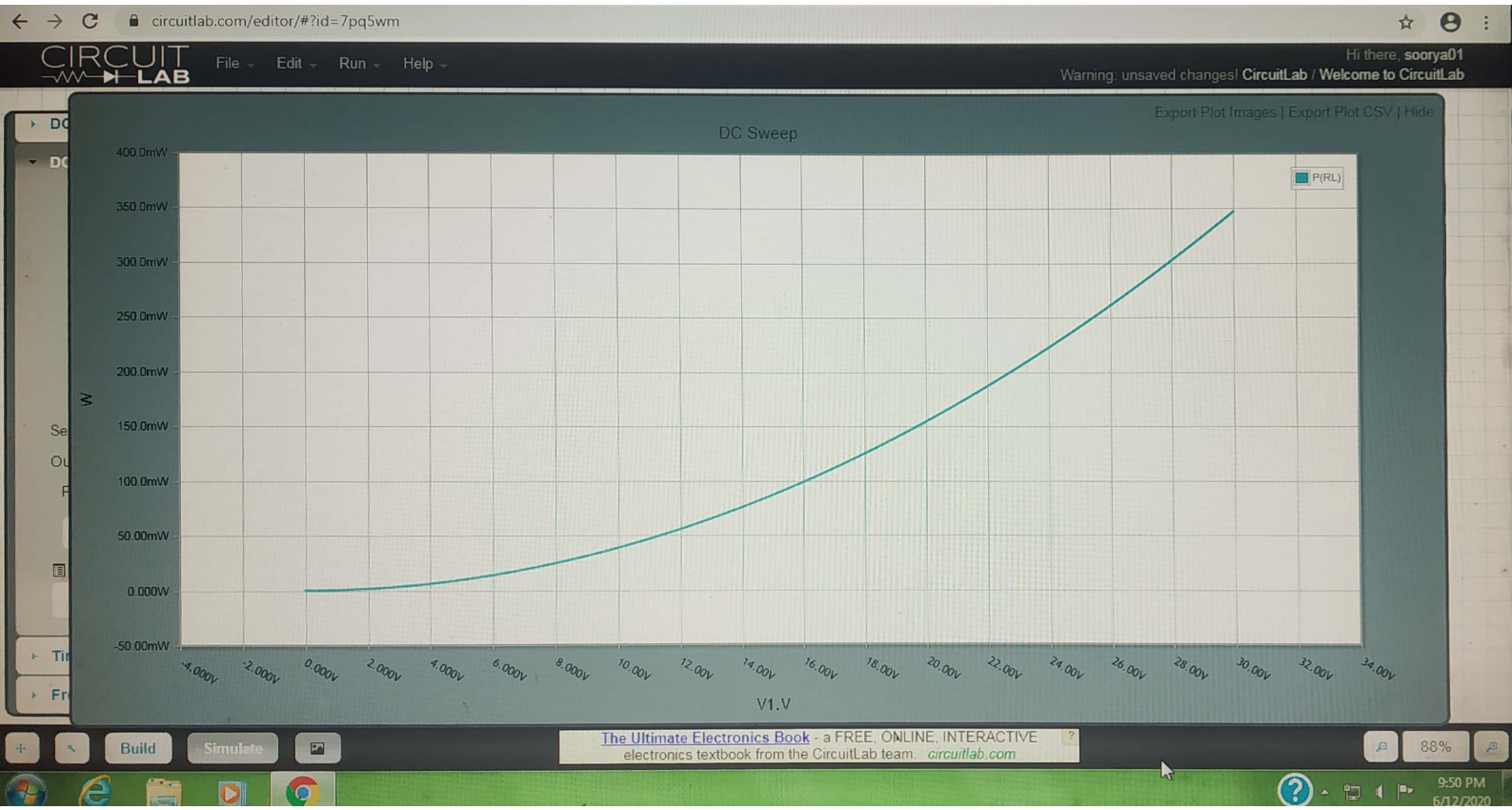

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