21BDS0340

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Question 81

Electrical Lab FAT

# Maximum Power Transfer Theorem

## Aim:

To find the maximum power dissipated in the load resistor.

## Apparatus:

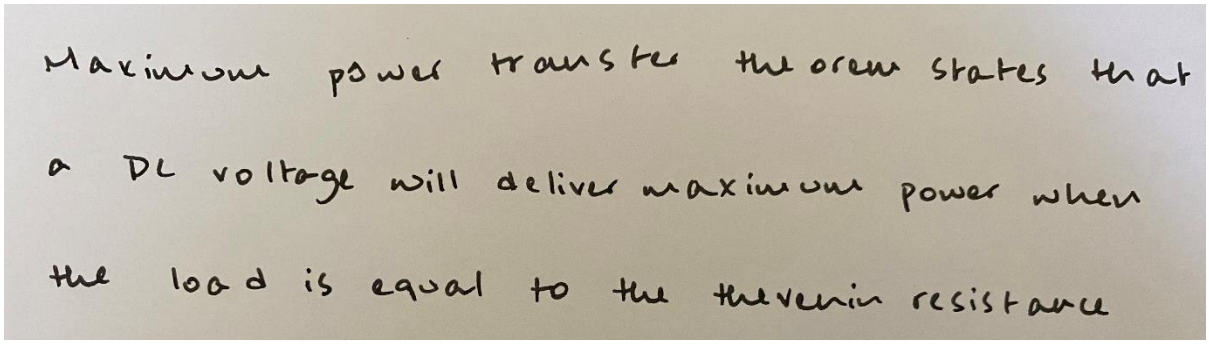
ORCAD / Capture CIS: Analog Library – R

Source Library – Vdc, Idc

Ground (GND) – 0 (zero)

Simulation Settings: Analysis Type – DC Sweep

## Statement:

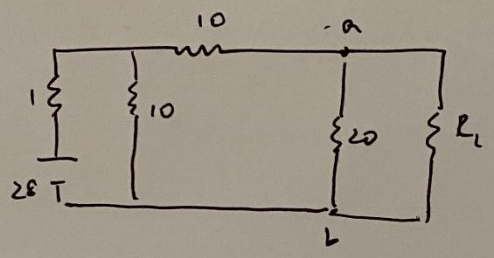


## Manual Calculations:

Registeration No. 21BDS0340

Question 8)

V = 28 V




Finding thevenin voltage:

~~considering outer loop~~

Eq. resistance = 8.5 ohm

$I = \frac{28}{8.5} = 3.29$ amps

current in outer loop:

I = 0.824 amp

Potential at a = $V_a$

$V_a = 28 - (3.29) - 10(0.824)$

$= 16.47$ V

$V_b = 0$

$\therefore V_{th} = V_a - V_b$

$= 16.47$ V

Finding thevenin resistance:

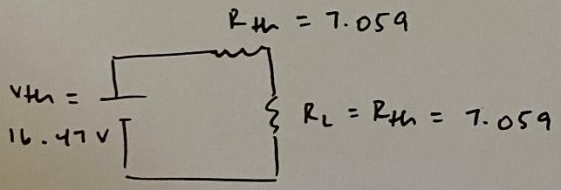
(DC source is shorted)

$R_{th} // 10$

$$\frac{\left(\frac{10}{11} + 10\right) \times 20}{\left(\frac{10}{11} + 10\right) + 20} = R_{th}$$

$\Rightarrow R_{th} = 7.059$ ohm

Thevenin Eq. circuit



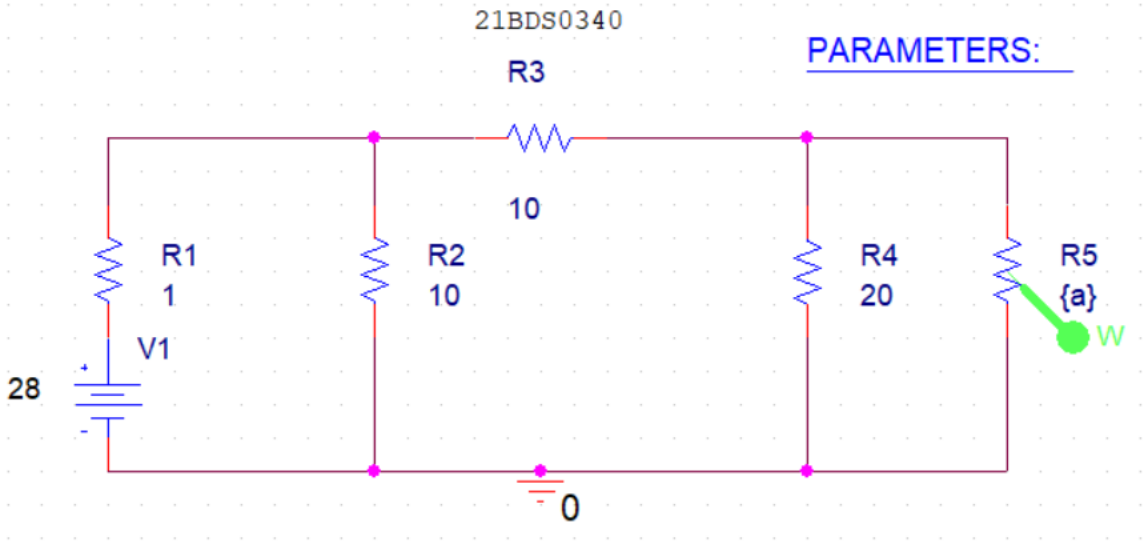

$\therefore$ Maximum power is $\frac{V^2}{R} = \frac{16.47^2}{7.059 \times 2}$

$= 19.214$ W

**Max power with both resistors = 19.214 watts**

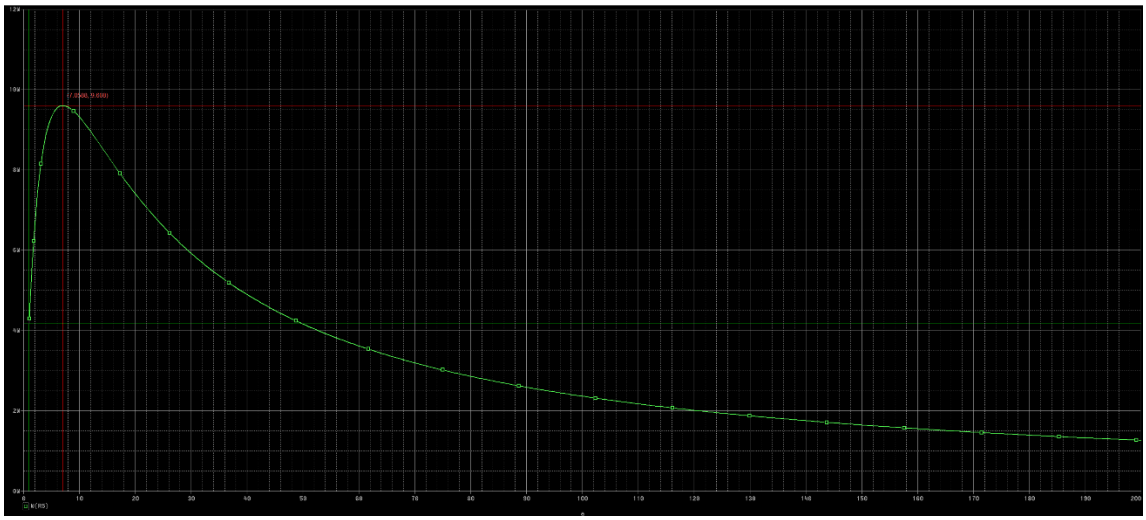
**For load resistance only = 9.607 watts**

## Simulation Circuit:

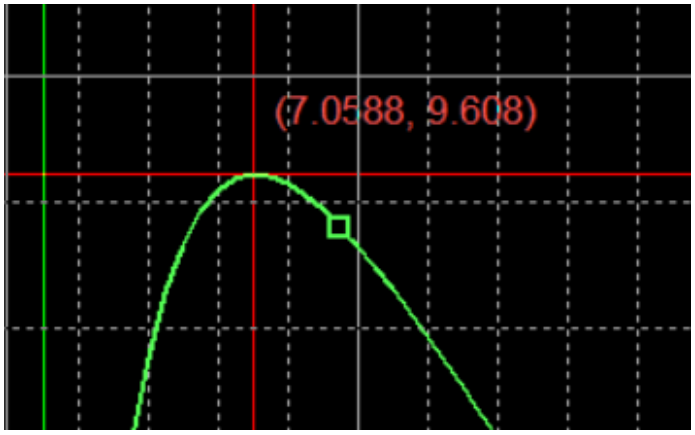



## Result:

### Resistance Value vs. Power Graph



### Zoomed in value of maximum power



| NOTATION | MANUAL CALCULATIONS | SIMULATED RESULT |
|---|---|---|
| $R_{TH}$ | 7.059 | 7.0588 |
| $P_{MAX}$ | 9.607 | 9.608 |

## Inference: