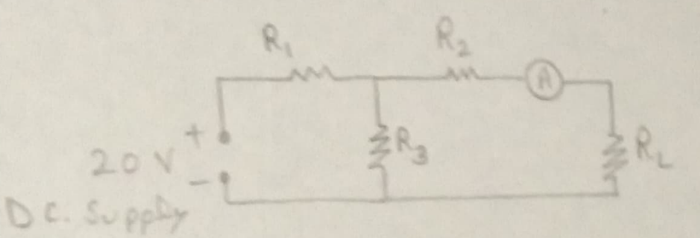
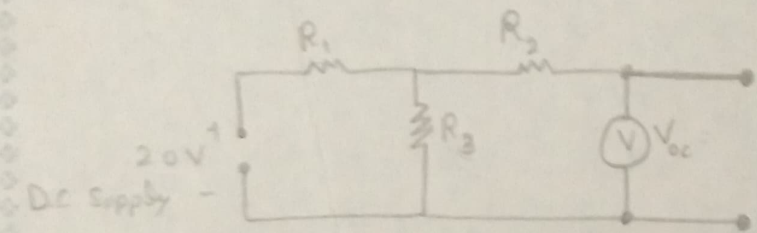
Circuit Diagram :-

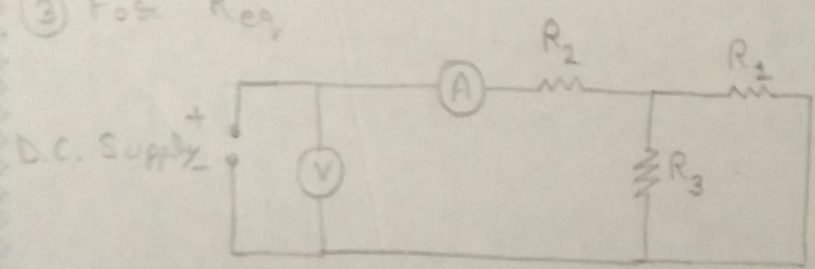
① For I_{LA}



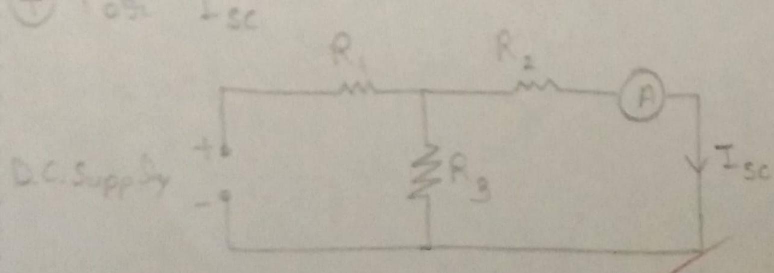
② For V_{oc}



③ For R_{eq}



④ For I_{sc}



Object :- To verify the Thevenin's and Norton's Theorem.

Apparatus :-

· D.C. Voltmeter	0 - 10/20 Volt	1 No.
· D.C. Ammeter	0 - 1/2 A	1 No.
· Load Resistance	19 Ω	1 No.
· Power Supply (D.C.)	0. - 17.5 volt	1 No.
· Network kit		
· Connecting Leads		

Theory :-

Thevenin's Theorem :-

For any linear bilateral network irrespective of its complexities can be reduced into a Thevenin's equivalent circuit having the Thevenin's open circuit voltage 'V_{Th}' in series with the Thevenin's equivalent resistance R_{Th} along with load resistance R_L.

Norton's Theorem :-

Any linear bilateral network irrespective of its complexities can be reduced into a Norton's equivalent circuit having a

Observation Table :-

S.No.	I_{LA} (mA)	R_L (Ω)	V_{oc} (V)	I_{sc} (mA)	V (V)	I
1	3.1 mA	0.047	0.33	5.7 mA	7.43	33.1
2	3.9 mA	0.047	0.40	6.9 mA	9.13	40.9

R_1	0.216 kΩ
R_2	0.047 kΩ
R_3	0.011 kΩ

Norton's short circuit current 'I_N' in parallel with Norton's equivalent resistance R_N in parallel with load resistor R_L.

Formula Used :-

$$I_L = \frac{V_{Th}}{(R_{Th} + R_L)}$$

$$I_L = I_{sc} \cdot \frac{R_{eq}}{R_L + R_{eq}}$$

where,

I_L = Load Current

$V_{Th} = V_{oc}$ = Open Circuit Voltage = Thevenin's Voltage

$R_{Th} = R_{eq.}$ = Equivalent Resistance across load terminals

R_L = Load Resistance (13 Ω)

I_{sc} = Short Circuit Current

Calculation :-

$$R_{Th} = (R_1 || R_3) + R_2$$

$$= \frac{0.216 \times 0.011}{0.216 + 0.011} + 0.047$$

$$= 0.010 + 0.047$$

$$R_{Th} = 0.057 \text{ k}\Omega$$

$V_{Th} = ?$

Using fig. 2,

$R_T = 0.227 \text{ k}\Omega$

9/3/22

$$I_T = \frac{V}{R_T} = \frac{7.43}{0.227\times10^3}$$

$I_T = 32.73$ mA (Total Current)

$V_{Th} = I_T \times R_3$

$= 32.73 \times 0.011$

$V_{Th} = 0.36$ V

$$I_L = \frac{V_{Th}}{(R_{Th}+R_L)}$$

$$I_L = \frac{0.36}{0.057+0.047} = \frac{0.36}{0.104}$$

$I_L = 3.46$ mA

$$\% \text{ error} = \frac{|3.46-3.1|}{3.1}\times100 = 11.61\ \%$$

Calculation of Norton's Theorem,

$$I_L = I_{sc} \times \frac{R_{eq.}}{R_L+R_{eq}}$$

$$= 5.7 \times \frac{0.057}{0.057+0.047}$$

$$= 5.7 \times \frac{0.057}{0.104}$$

$I_L = 3.12$ mA

$$\% \text{ error} = \frac{|3.12-3.10|}{3.1}\times100 = 0.64\ \%$$

Result :- Here Thevenin's theorem is verified, having a % error of 11.61 % and Norton's theorem is verified, having a % error of 0.64 %.

Precautions :-

1. All the connection should be tight.
2. Proper care should be taken while connecting the terminal of ammeter and voltmeter.
3. All apparatus should be taken of suitable range and rating.
4. Reading should be taken correctly.

11/3/22