Basic Electrical and Electronics Engineering Lab (BEEE102P)

EXPERIMENT 1

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BEEE102P
Basic Electrical and Electronics Engineering Lab
List of Experiments

S.No	Experiment Title
Cycle-1 Software Experiments	
1	Verification of Mesh current analysis and node voltage analysis using ORCAD/Capture CIS
2	Verification of Thevenin's theorem using ORCAD/Capture CIS
3	Verification of Maximum power transfer theorem using ORCAD/Capture CIS
4	Verification of Resonance phenomenon in a series RLC circuit using ORCAD/Capture CIS using AC Parametric Sweep Analysis
5	Design of single-phase half-wave and full wave rectifier
Cycle-II Hardware Experiments	
6	Verification of Kirchhoff's current law
7	Wiring circuit for Single lamp and Fan with regulator/ Staircase wiring circuit layout of multi storage building
8	Design of half adder circuit using logic gates
9	Measurement of energy using single phase energy meter
10	Design of regulated power supply using Zener diode

Analysis of DC Circuit using Mesh Current and node voltage Analysis

Kcl and kvl

EXPERIMENT 1

Verification of Mesh current analysis (KVL) and node voltage analysis using ORCAD/Capture CIS (KCL)

Aim: To analyse a DC circuit using Mesh current Analysis.

S.No	Component/part in ORCAD	Value	Path in the directory
1	DC Voltage source	4 V and 10 V	PSPICE\SOURCE\VDC
2	Resistors	2 ohms	PSPICE\ANALOG\R
3		2.5ohms	
4		4 ohms	
5		1 ohms	
6		5 ohms	
7	Ground	0V	Place >> Ground

Analysis Type: Bias point

Theory:

- **Kirchhoff's Voltage Law – Mesh analysis**

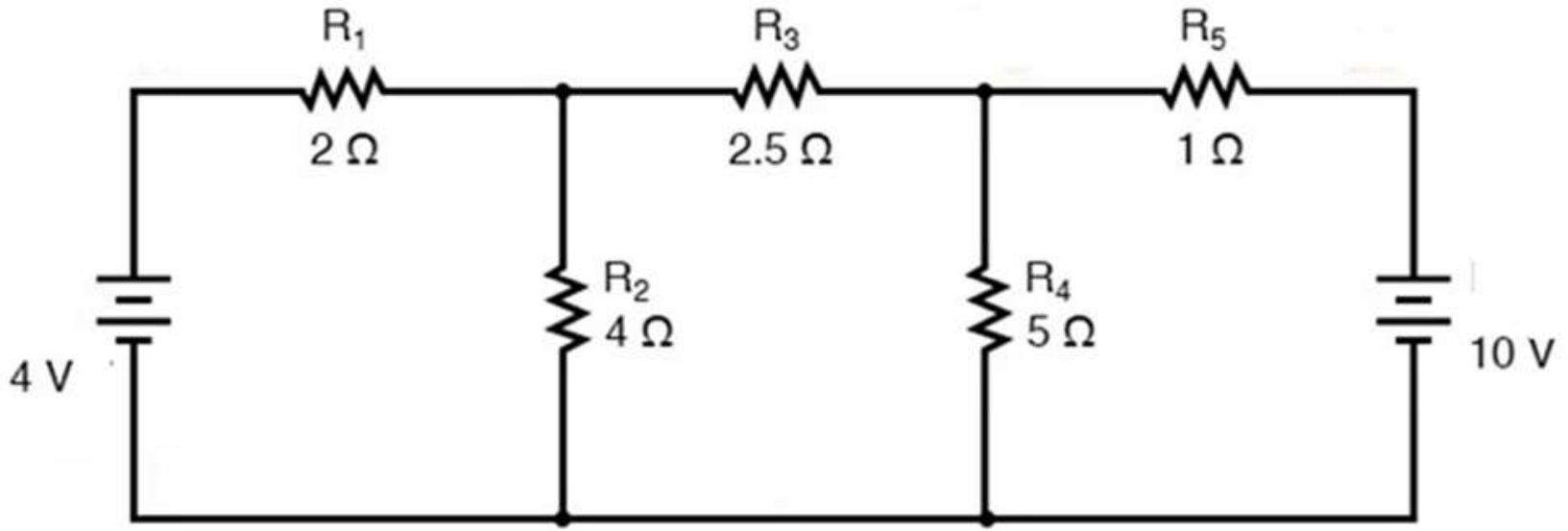
  In any closed loop in a network, the algebraic sum of the voltage drops (i.e. products of current and resistance) taken around the loop is equal to the resultant e.m.f. (voltage rise) acting in that loop.

Theory:

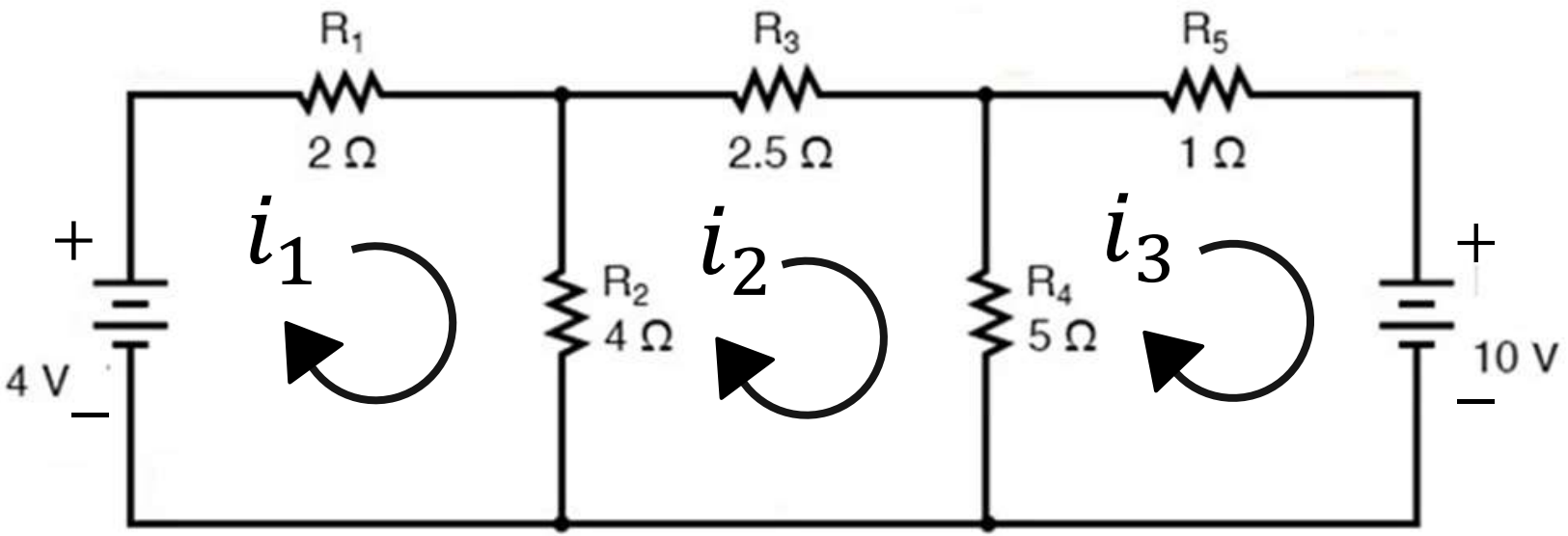
- **Kirchhoff's Current Law – Nodal analysis**

  At any node (junction) in an electric circuit the total current flowing towards that junction is equal to the total current flowing away from the junction.

Circuit diagram:



Calculation for Mesh currents



Mesh 1,

$$4 - 2i_1 - 4(i_1 - i_2) = 0$$

Mesh 2,

$$-2.5i_2 - 5(i_2 - i_3) - 4(i_2 - i_1) = 0$$

Mesh 3,

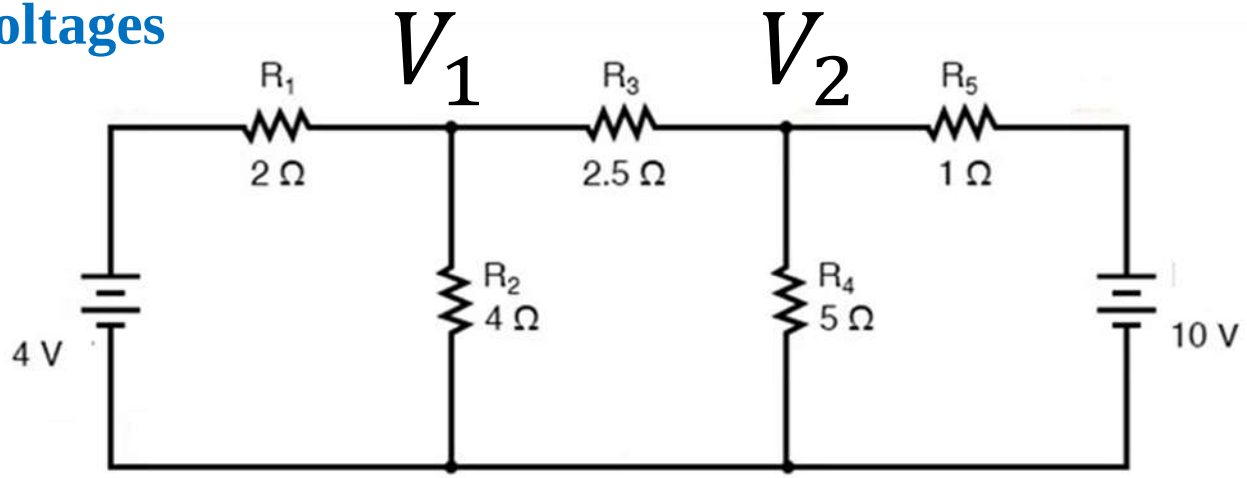
$$-i_3 - 10 - 5(i_3 - i_2) = 0$$

$$\boldsymbol{i_1 = -0.14\ A}$$

$$\boldsymbol{i_2 = -1.214\ A}$$

$$\boldsymbol{i_3 = -2.67\ A}$$

Calculation for Node Voltages



Node 1,

$$\frac{V_1 - V_2}{2.5} + \frac{V_1}{4} + \frac{V_1 - 4}{2} = 0$$

Node 2,

$$\frac{V_2 - V_1}{2.5} + \frac{V_2}{5} + \frac{V_1 - 10}{1} = 0$$

$$V_1 = 4.1712\ V$$

$$V_2 = 7.428\ V$$

Experiment Procedure:

1. Create the given circuit diagram in new project file using the general procedure.
2. Replace the default component value and source value as per given circuit diagram.
3. Create the New simulation profile and set analysis type as Bias point
4. Run the simulation and note down the readings in tabulation.
5. Compare the simulated results with theoretically analysed values.

Observations and Calculations:

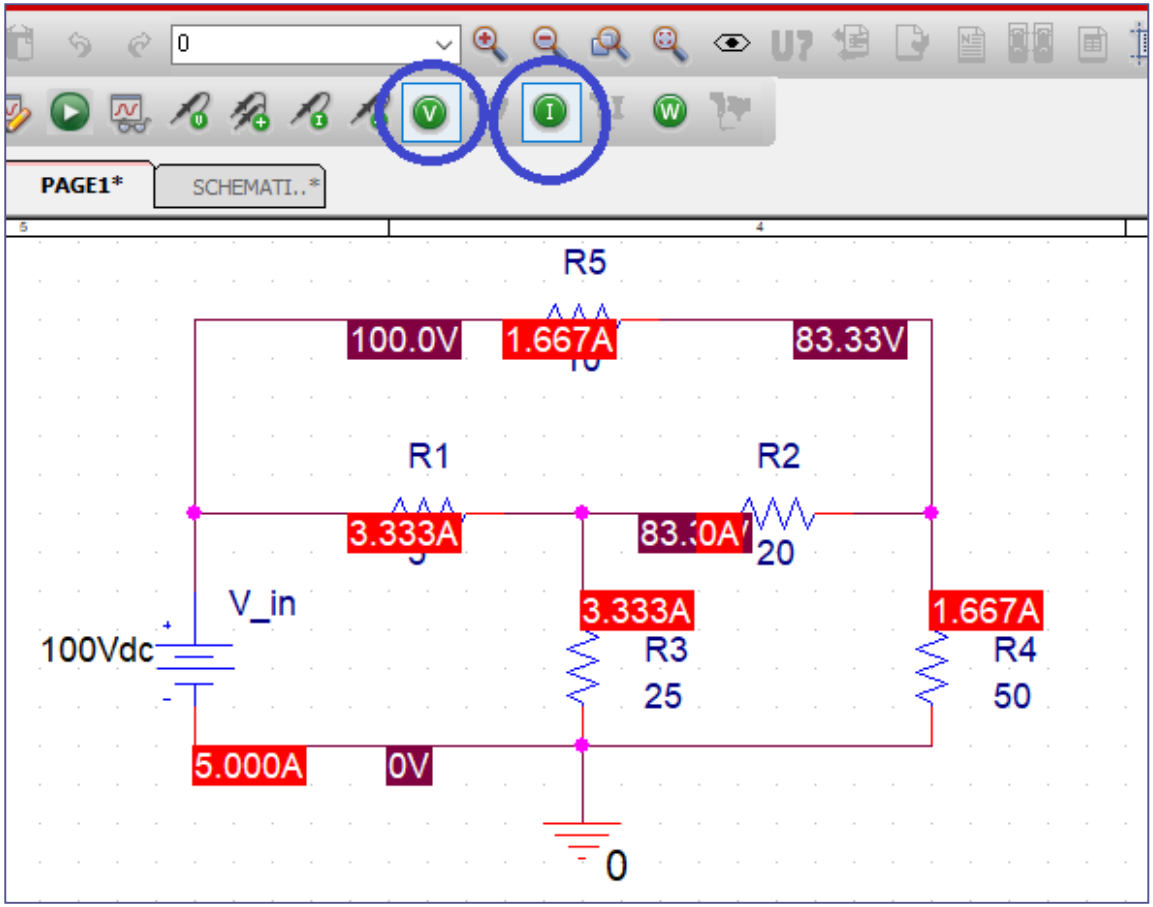
Calculate loop currents using the branch currents readings obtained from experiment

Calculate branch voltages using the voltage readings obtained from experiment

Tabulation:

Experiment Readings			
S.No	**Parameters**	**Theoretical analysis values**	**Experimental values**
1	**Loop Currents**		
2			
3			
4	**Node Voltages**		
5			

Bias Voltages and Bias Currents in simulation:



Conclusion:

- The given DC circuit is analysed using mesh current analysis
- The analysed values of loop currents are verified with experimental values.

THANK YOU