IARE
INSTITUTE OF AERONAUTICAL ENGINEERING
(An Autonomous Institute affiliated to JNTUH, Hyderabad)
Dundigal, Hyderabad - 500 043

(4)

LABORATORY WORK SHEET

Name of the Student: MADKI SAI CHARAN

Class: CSM - 'C' Semester: I st

Roll Number									
2	3	9	5	1	A	6	6	F	2

Course Code: AEE003 Course Name: Electrical and Electronics Engineering laboratory.

Name of the Course Faculty: M.S.M. VARA LAKSHMI Faculty ID: IARE 11057

Exercise Number: 06 Week Number: 06 Date: 03 December 2023

DAY TO DAY EVALUATION:

Marks	Aim / Preparation	Algorithm / Procedure / Performance in the Lab	Source Code / Calculations and Graphs	Program Execution / Results and Error Analysis	Viva - Voce	Total
Max. Marks	4	4	4	4	4	20
Obtained	4	4	4	4	4	20

10

Signature of Faculty

START WRITING FROM HERE :

Aim : To verify superposition theorem for an electrical circuit theoritically and practically.

Apparatus :

S.NO	Equipment	Range	Type	Quantity
01.	Resistor	47Ω, 82Ω, 100Ω	Carbon	03.
02.	Ammeter	(0-200mA)	Digital	01.
03.	R.P.S	(0-30V)	Digital	01.
04.	Bread Board	-	-	01.
05.	Connecting wire	-	-	As required.

Statement: In a linear, bilateral network the response in any element is equal to the sum of individual responses while all other sources are non-operative.

ROLL NUMBER : 23951A66F2

Circuit Diagram :

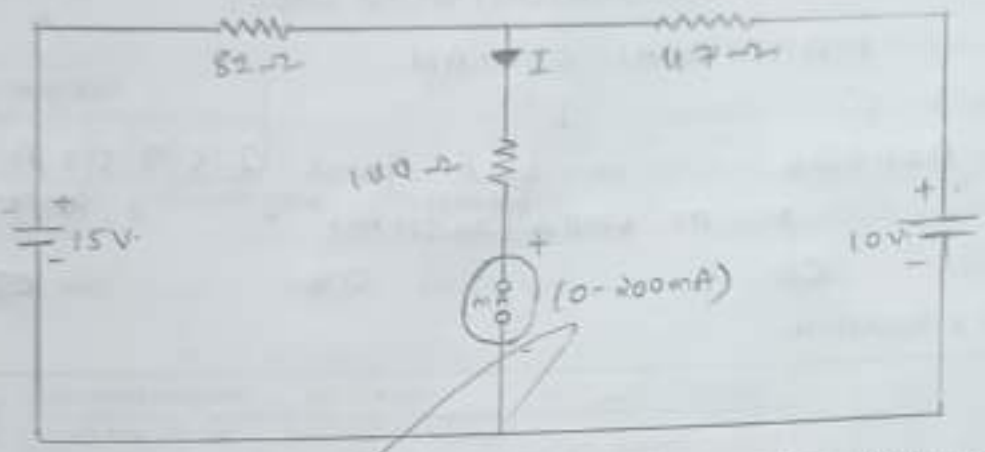

Fig (1) - Both voltage sources are acting (V_1 & V_2)

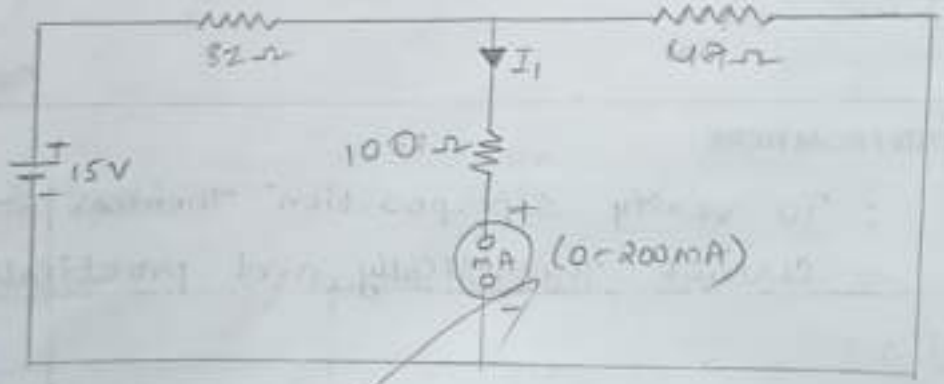

Fig (2) - Voltage source (V_1) is acting alone.

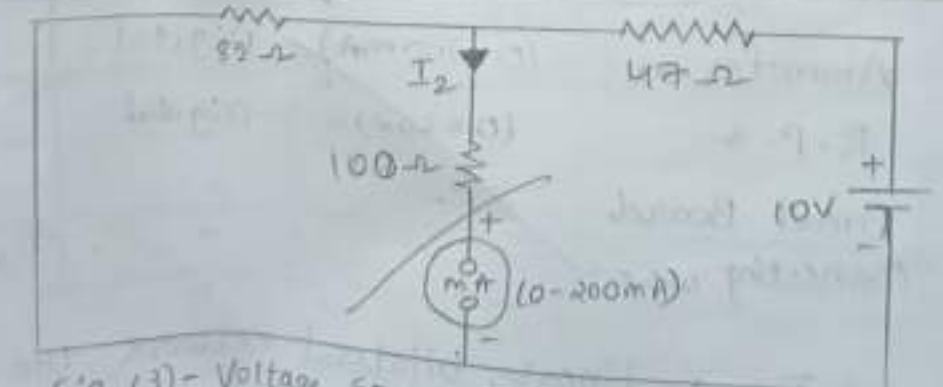

Fig (3) - Voltage source (V_2) is acting alone.

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Procedure : ① Connect the circuit as shown in fig (1) and note down the current flowing through R_3 and let it be 'I.'

② Connect the circuit as shown in fig (2) and note down the Ammeter Reading and let it be I_1.

③ Connect the circuit as shown in fig (3) and note down the Ammeter Reading and let it be I_2.

④ Verify for $I = I_1 + I_2$.

⑤ Compare the practical and theoritical currents.

Tabular Column :

Parameters	When Both v_1 and $v_2 \neq 0$ (I)	When $v_1 \neq 0$ and $v_2 = 0$ (I_1)	When $v_1 = 0$ and $v_2 \neq 0$ (I_2)
Current through R_3 (Theoritical values)	90.6 mA	42.07 mA	48.6 mA
Current through R_3 (Practical values)	94.5 mA	43 mA	50.7 mA

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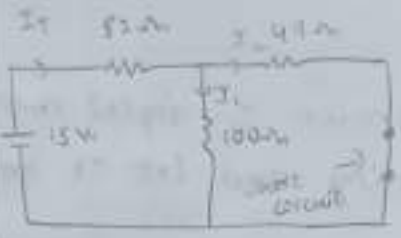
Calculations:

Case - 1 : Making 10V energy source short circuit.



$$R_T = 82 + \left(\frac{100 \times 47}{100 + 47}\right)$$

$$R_T = 82 + 31.97$$

$$R_T = 113.97\ \Omega$$

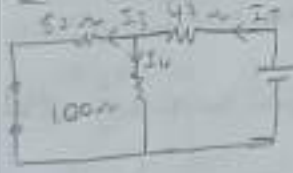
To find I_T is $I_T = \frac{V_T}{R_T} = \frac{15}{113.97} = 0.1316\ A$

By current division Rule

$$I_1 = I_T \times \frac{47}{100+47} = 0.1316 \times 0.3197 = 0.04207$$

$$I_1 = 42.07\ mA$$

Case - 2 : Making 15V energy source short circuit



$$R_T = 47 + \left(\frac{82 \times 100}{82 + 100}\right) = 47 + 45.05$$

$$R_T = 92.05\ \Omega$$

To find I_T ; $I_T = \frac{V_T}{R_T} = \frac{10}{92.05} = 0.1086\ A$

By current division rule

$$I_4 = I_T \times \frac{82}{82+100} = 0.1086 \times \frac{82}{82+100} = 0.0486\ A$$

$$I_4 = 48.6\ mA$$

Case - 3 : Finding I,

$$I = I_1 + I_4 = 42.07 + 48.6$$

$$I = 90.67\ mA$$

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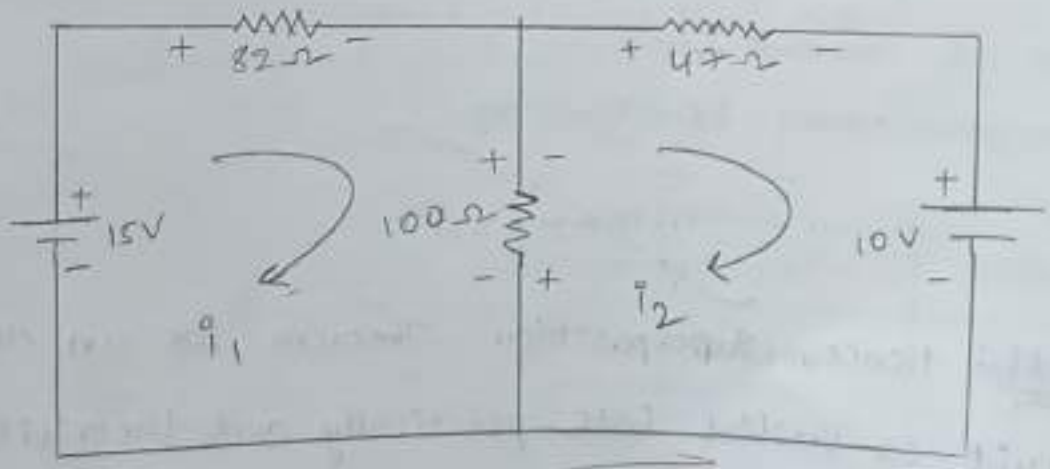

Applying KVL: $15 - 82i_1 - 100(i_1 - i_2) = 0$

$15 - 82i_1 - 100i_1 + 100i_2 = 0$

$-182i_1 + 100i_2 + 15 = 0$

$182i_1 - 100i_2 - 15 = 0$ — (1)

ROLL NUMBER : 2395IA66F2.

$-47i_2 - 10 - 100(i_2 - i_1) = 0$

$-47i_2 - 100i_2 + 100i_1 - 10 = 0$

$100i_1 - 147i_2 - 10 = 0$ — ②

$i_{100\Omega} = i_1 - i_2$ — ③

Solving ① & ②

$i_1 = 0.07193$

$i_2 = -0.01909$

from ③ $i_{100} = i_1 - i_2$

$i_{100\Omega} = 0.07193 - (-0.01909)$

$i_{100\Omega} = 0.07193 + 0.01909$

$i_{100\Omega} = 0.09102\,A$

$\boxed{i_{100\Omega} = 91.0\,mA}$

Result: Hence, superposition theorem for an electrical circuit is verified both practically and theoritically.