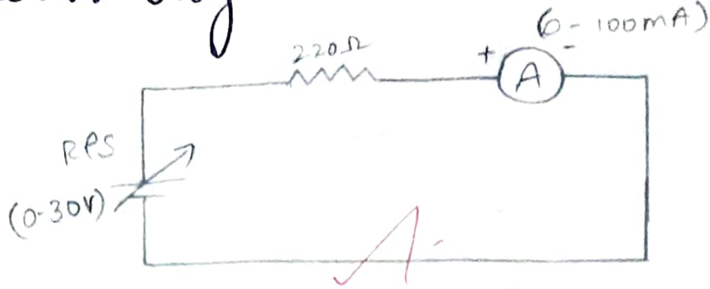
Circuit Diagram:-



Tabular column:-

S.No	Voltage (V)	Current (mA)	Exp values $R=V/I$	Theoretical values $R=V/I$.
1	6.0	28	214.2	220
2	5.0	23	217.3	220
3	4.5	21	214.2	220
4	2.2	10	220.	220
5	8.8	41	214.63	220

Model calculations:-

$$R = \frac{V}{I} = \frac{6.0}{28 \times 10^{-3}} = 214.2\Omega$$

$$R = \frac{V}{I} = \frac{5.0}{23 \times 10^{-3}} = 217.3\Omega$$

$$R = \frac{V}{I} = \frac{4.5}{21 \times 10^{-3}} = 214.2\Omega$$

$$R = \frac{V}{I} = \frac{2.2}{10 \times 10^{-3}} = 220\Omega$$

$$R = \frac{V}{I} = \frac{8.8}{10^{-3} \times 41} = 214.63\Omega$$

6-11-24 Exp 1 - Verification of ohm's & kirchhoff's law.

Expt-01(a)

Aim:- To verify ohm's law for a given resistive network.

Apparatus:-

S.NO	Apparatus	Range	Quantity
1	RPS	(0-30)V	1
2	Ammeter	(0-200)mA	1
3	Voltmeter	(0-30)V	1
4	Resistor	1KΩ	1
5	Rheostat	300Ω 2A.	1
6	Bread board & connecting wires.	-	Required.

Theory:- Ohms law states that the voltage accross the conductors is directly proportional to the current flowing through it at constant temperature.

$\boxed{V=IR}$

Procedure:-

→ Make the connections as per circuit diagram.

→ Switch on the power supply to RPS and apply a voltage & take readings & also adjust the rheostat and take readings.

→ Plot a graph with V along x-axis & I along y-axis.

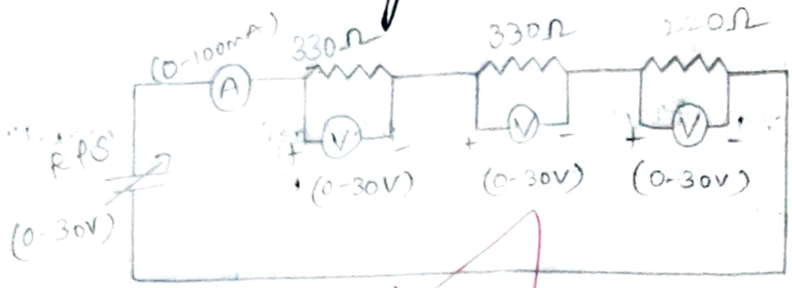
→ The graph will be straight line which verifies ohm's law.

Result:- Thus the ohm's law is verified for the given circuit.

6/11/24

Circuit Diagram:-

Kirchhoff's voltage law:



Tabular column:-

Parameter	Experimental value				Theoretical value			
Supply voltage	Voltage across R_1	R_2	R_3	Loop current (mA)	Voltage Across R_1	R_2	R_3	Loop current (mA).
16.9	5	5	3	17	5.57	5.57	3.71	16.9

Model calculations:-

$$I = \frac{V}{R} = \frac{16.9}{880}$$

$$I = 16.9\, mA.$$

$$V_1 = 16.9 \times 330 \times 10^{-3} = 5.577\, V$$

$$V_2 = 16.9 \times 330 \times 10^{-3} = 5.577\, V.$$

$$V_3 = 16.9 \times 220 \times 10^{-3} = 3.718\, V.$$

Exp: 01(b):-

Aim:-

1) To verify Kirchoff's voltage law.

2) To verify Kirchoff's current law.

Apparatus required:-

S.NO	Equipment	Type	Range	Qty.
1)	RPS	-	(0-15)V	1
2)	Bread board	-	-	1
3)	Ammeter	MC MC	(0-10)mA (0-5)mA	1 2
4)	Voltmeter	MC MC	(0-10)V (0-15)V	1 1
5)	Resistor	-	470Ω, 330Ω 4KΩ, 4.7KΩ	Each 1
6)	connecting wires	-	-	AS required

Theory:

Kirchhoff's Voltage law:-

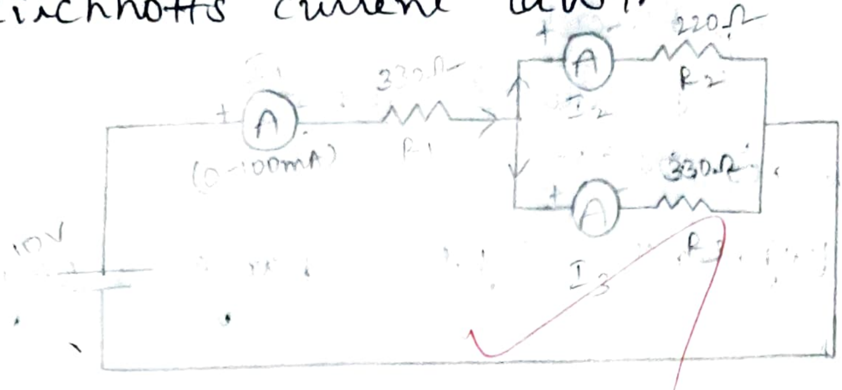
In any network the algebraic sum of the voltage drops accross the circuit elements of any closed path is equal to the algebraic sum of the emfs in path.

Kirchhoff's current law:

Kirchhoff's current law states that the algebraic sum of current entering any node is zero. In other words the sum of current going into a node must be equal to current going out from the node.

Circuit Diagram:-

Kirchhoff's current law:-



Tabular column:-

Parameter	Experimental values				Theoretical values			
supply voltage	current I_1 (mA)	I_2 (mA)	I_3 (mA)	I_2+I_3 (mA)	current I_1 (mA)	I_2 (mA)	I_3 (mA)	I_2+I_3 (mA).
15.0	33	16.5	16.5	33	32.46	19.49	12.99	32.48

Model calculation:-

$R_{eq} = R_1 + R_2 \| R_3$

$= 330 + 220 \| 330$

$= 330 + \frac{220 \times 330}{220+330}$

$R_{eq} = 462\,\Omega$

$V = 15V$

$I_1 = \frac{V}{R} = \frac{15}{462} = 32.46\,mA$ (series).

since R_2 & R_3 are series,

$V = V_1 + V_2$.

$V_1 = I_1 R_1$

$= 0.03246 \times 330$

$V_1 = 10.711V$

$V_2 = 15 - 10.7114$

$V_2 = 4.2897V$.

$\therefore V_2 = V_3$ (R_2 & R_3 are parallel)

$I_2 = \frac{V_2}{R_2} = \frac{4.289}{220}$

$I_2 = 19.49mA$.

$I_3 = \frac{V_3}{R_3} = \frac{4.289}{330}$

$I_3 = 12.996mA$.

Procedure :-

→ connections are given as per circuit diagram

→ Apply d.c. voltage to the circuit from the given RPS.

→ Tabulate the voltmeters and ammeters readings for the corresponding experiment.

→ Increase the voltage step by step to get different readings till the voltage reached upto 15V.

→ Repeat step 3, for different values.

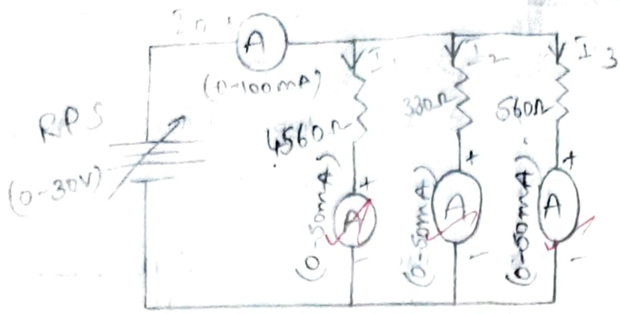
Marks obtained :-

Theoretical calculations	20	20
Observation	20	20
Execution of practice examples	30	30.
viva & Record	10+20	25
Total score	100	95
Date of Experiment	6/11/24.	
Date of Record Submission.	6/11/24.	Afina

Result :- Thus the kirchhoff's voltage and current law is verified for the given circuit.

Circuit Diagram:-

Current Division current Diagram:-



Tabular column:-

S.NO	voltage	current (mA)			
		I_1	I_2	I_3	I_0
1	10	11	26	18	48

Theoretical calculations:-

$I_1 = \frac{V}{R_1} = \frac{10}{4560} = 2.1929\,A.$

$I_2 = \frac{V}{R_2} = \frac{10}{330} = 30.30\,A.$

$I_3 = \frac{V}{R_3} = \frac{10}{560} = 17.857\,A.$

7-11-24

Exp:02- Voltage Division and Current Division.

Aim:- To calculate the individual branch currents and total current drawn from the power supply using current and voltage division rules.

Apparatus Required:

SNO	Apparatus Name	Range	Quantity
1	DC regulated power supply	(0-30)V.	1
2	Ammeter	(0-200)mA.	4
3	Resistor	1KΩ, 220Ω	Each Two
4	Bread board & connecting wires.	–	Required.

Theory:-

Voltage Division:- Voltage Division is a principle used in electrical circuits to determine the voltage across each resistor in a series circuit.

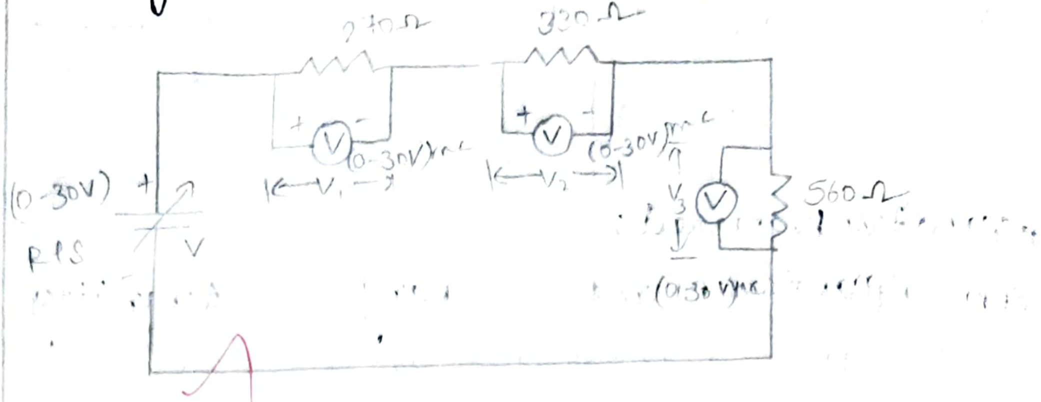
$$\boxed{V_n = V_{total} \cdot \frac{R_n}{R_{total}}}$$

Current Division Theory:-

Current division is used to calculate the current flowing through individual resistors connected in parallel. In a parallel circuit, the total current entering the node splits accross the branches inversely proportional to their resistances.

$$\boxed{I_n = I_{total} \cdot \frac{R_{total}}{R_n}}$$

Voltage Division Circuit Diagram :-



Tabular Column :-

S.No	RPS voltage (V)	Voltage across Resistors (V_i)			$V_1+V_2+V_3$ (V)
		V_1	V_2	V_3	
1	10	3	2.5	4.5	10.

Model calculation -

$R_1 - 270\Omega$

$V_1 = 10 \times (270/1160) = 2.33V$

$R_2 - 330\Omega$

$V_2 = 10 \times (330/1160) = 2.84V$

$R_3 - 560\Omega$

$V_3 = 10 \times (560/1160) = 4.83V$

check $V_1 + V_2 + V_3 = 2.33 + 2.84 + 4.83 = 10.00V$

Procedure:-

→ Give the connections as per the circuit diagram.

→ set a particular value in RPS.

→ Note down the corresponding ammeter reading.

→ Repeat the same for different voltages.

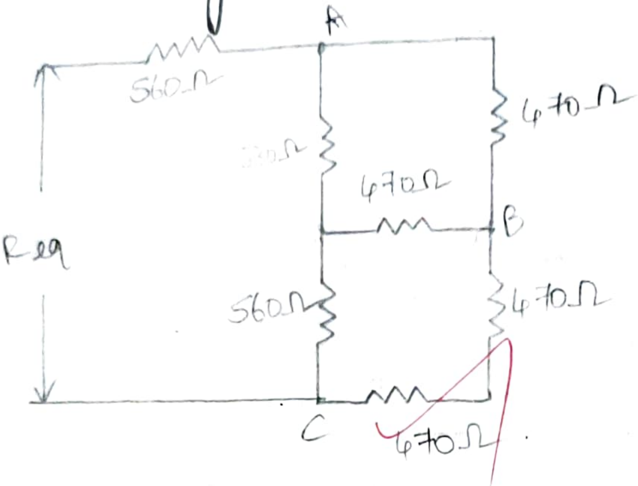
Theoretical calculations	20	20
observation	20	20
Execution of practice examples	30	30
viva	10	28
Record	20	
Total score	100	98
Date of Experiment	7/11/24	
Date of Record submission.	8/11/24	Aruna

Result:- Thus the individual currents & total current drawn from the power supply are calculated using current & voltage division rules.

Tabular column:-

S.NO	Theoretical value (R_{EQ}) in ohm	Measured value (R_{EQ}) in ohm.
1	1.1 KΩ	1.2 KΩ.

Circuit Diagram:-



Model calculations:-

$$R_{AB} = \frac{R_A R_B + R_B R_C + R_C R_A}{R_C}$$

$$= \frac{330 \times 470 + 470 \times 560 + 560 \times 330}{560}$$

$$= \frac{603100}{560}$$

$R_{AB} = 1076.9\,\Omega$

$R_{AB} \simeq 1077\,\Omega$

$$R_{BC} = \frac{R_A R_B + R_B R_C + R_C R_A}{R_A} = \frac{603100}{330} = 1828\,\Omega$$

$$R_{CA} = \frac{603100}{470} = 1283\,\Omega.$$

07-11-24.

Exp-03 :- Star Delta Transformation.

Aim :- To calculate the equivalent circuit resistance using star Delta transformation technique.

Apparatus Required :-

SNO	Apparatus Name	Range	Quantity.
1	Resistor		
2	Bread board & connecting wires	-	Required.

Theory :-

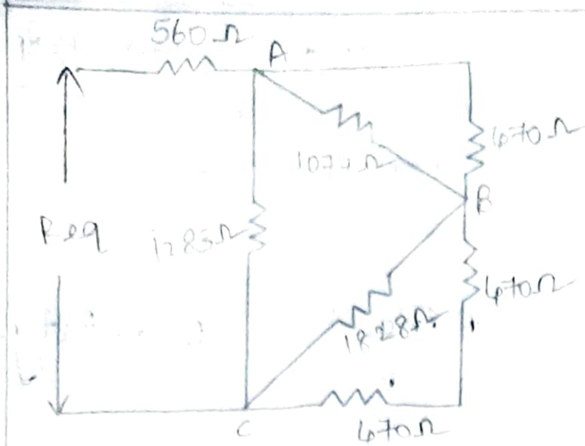
The star-Delta transformation is a mathematical method used to in electrical engineering to convert a network of resistors from a star(Y) configuration to a delta (Δ) configuation, or vice versa.

Procedure :-

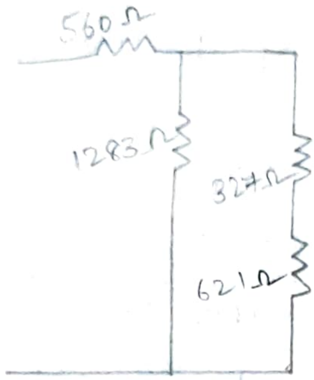
→ Give the connections as per the circuit diagram.

→ Determine the equivalent resistance of the circuit between P and Q using star-delta transformation technique.

→ Verify the same by connecting the multimeter across PQ.

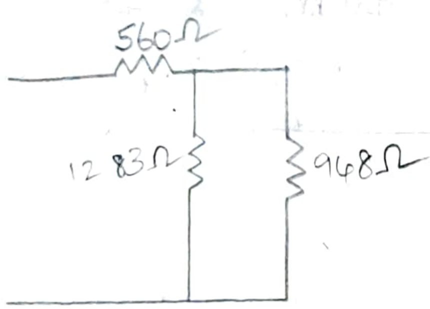


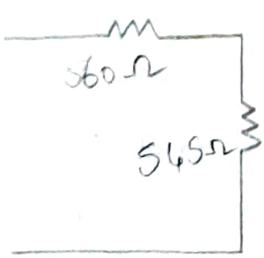
$$\frac{1077 \times 670}{1077 + 670} = 327\,\Omega$$



$$\frac{1077 \times 670}{1077 + 670} = 327\,\Omega$$

$$\frac{1828 \times 940}{1828 + 940} = 621\,\Omega.$$





$$\frac{1283 \times 968}{1283 + 968} = 545\,\Omega.$$

$$R_{eq} = 560 + 545$$
$$= 1105\,\Omega$$

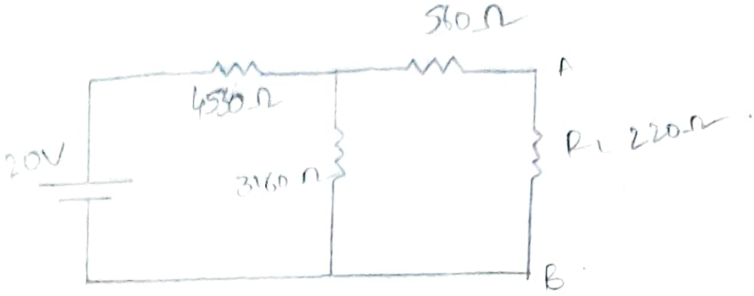
$$\boxed{R_{eq} = 1.1\,k\Omega}$$

Theoretical calculations	20	20
observation	20	20
Execution of practice examples	30	30
viva	10	28
Record	20	
Total score	100	98
Date of expirement	7/11/24	
Date of record submission	8/11/24	

Result:- Thus the equivalent circuit resistance is obtained by using star delta transformation technique.

Circuit Diagram:-

Thevenin's Theorem:-



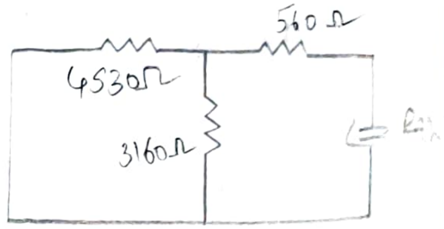
Tabular column:-

SNO	supply voltage(V)	Theoretical values			Measured values		
		$R_{th}(\Omega)$	$V_{th}(V)$	$I_L(mA)$	$R_{th}(\Omega)$	$V_{th}(V)$	$I_L(mA)$
1	20	2421.48 Ω	8.21V	3.1mA	2421.45 Ω	7.5V	3.1mA

Model calculations:-

$$R_{th} = 560 + \frac{4530 \times 3160}{4530 + 3160}$$

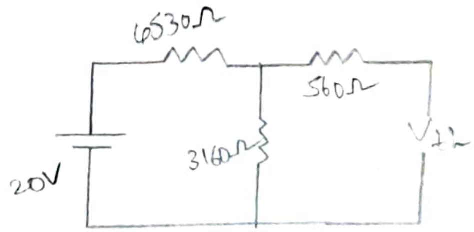
$$\boxed{R_{th} = 2421.48\Omega}$$



$$V_{th} = \frac{20 \times 3160}{4530 + 3160}$$

$$= \frac{63200}{7690}$$

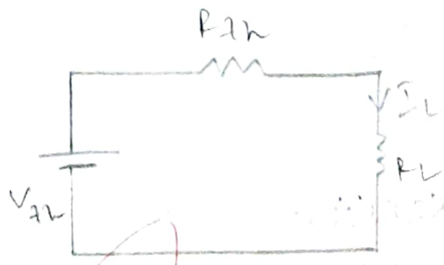
$$\boxed{V_{th} = 8.21V}$$



$$I_L = \frac{2421.48}{}$$

$$I_L = \frac{8.21}{2421.48 + 220}$$

$$\boxed{I_L = 0.003A}$$



08-11-24

Ep:04 : Verification of Thevenin's and Norton's Theorem

Aim:- To verify the equivalent circuit parameters of Thevenin's and Norton's theorem theoretically and practically.

Apparatus Required:-

S.No	Apparatus Name	Range	Quantity.
1	DC regulated power supply	(0-30)V	1
2	Voltmeter	(0-30)V	1
3	Ammeter	(0-200)mA	1
4	Resistor	330Ω, 220Ω, 470Ω, 560Ω, 100Ω	As required
5	Multimeter	-	1
6	Bread board & Connecting wires	-	As required

Theory:-

Thevenin's theorem:-

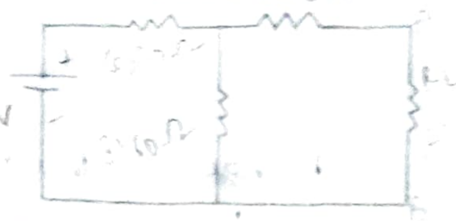
It is a method used in electrical engineering to simplify complex linear circuits. According to this theorem, any linear two terminal network of resistance and sources can be reduced to an equivalent circuit with a single voltage source.

Norton's Theorem:-

Norton's theorem is a method in electrical engineering used to simplify complex linear circuits, similar to Thevenin's Theorem. It states that any two-terminal linear circuit with resistors and sources can be reduced to an equivalent circuit.

Circuit Diagram:-

Nortons Current:-



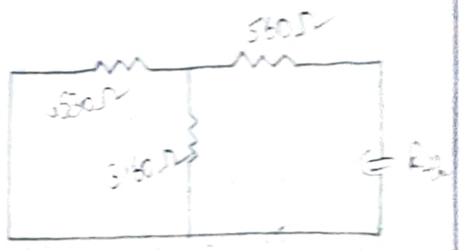
Tabular column:-

S.NO	supply voltage (V)	Theoretical values			Measured values		
		$R_{th}(\Omega)$	$I_{sc}(mA)$	$I_L(mA)$	$R_{th}(\Omega)$	$I_{sc}(mA)$	$I_L(mA)$
1	20V	2621.68 Ω	3.31 mA	3.03 mA	2621.68 Ω	3.3 mA	3.1 mA

Model calculations:-

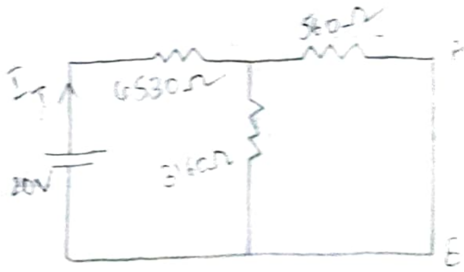
$$R_{th} = 560 + \frac{6530 \times 3160}{6530 + 3160}$$

$$R_{th} = 2621.68\Omega$$



$$R_{eq} = 6530 + \frac{560 \times 3160}{560 + 3160}$$

$$\boxed{R_{eq} = 5005.69\Omega}$$

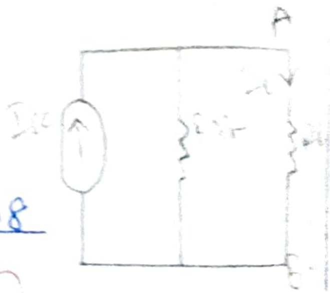


$$I_T = \frac{20}{5005.69}$$

$$\boxed{I_T = 0.0039A}$$

$$I_{sc} = \frac{I_T \times 3160}{560 + 3160} = \frac{0.0039 \times 3160}{3720}$$

$$\boxed{I_{sc} = 0.003312A}$$



$$I_L = \frac{I_{sc} \times R_{th}}{R_{th} + R_L} = \frac{0.003312 \times 2621.68}{2621.68 + 220}$$

$$\boxed{I_L = 0.00303A}$$

Procedure:- Thevenin's Theorem:-

→ Give the connections as per the circuit diagram.

→ Measure R_{th} using a multimeter by killing sources & open circuit R_L.

→ Measure V_{th} accross A & B.

→ Measure load current I_L through R_L.

$$I_L = \frac{V_{th}}{R_{th} + R_L}$$

→ Draw the Thevenin's equivalent circuit.

Norton's Theorem:-

→ Give the connections as per the circuit diagram.

→ Measure R_{th} using a multimeter by killing sources & open circuit R_L.

→ Measure I_N through A & B.

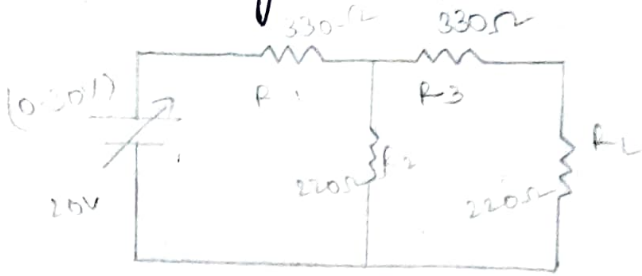
→ Measure load current I_L through R_L.

→ Draw the Norton's equivalent circuit.

Theoretical calculations.	20	20
observation	20	20
Execution of practice examples.	30	30
Viva & Record.	10+20.	29.
Total score	100	99
Date of experiment.	8/11/24	
Date of record submission.	11/11/24	

Result:- Thus the equivalent parameter circuit are obtained using Thevenin's and Norton's Theorem.

Circuit Diagram:-

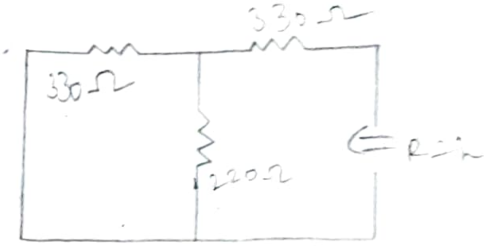


observations:-

S.NO	supply voltage	Theoretical values			Measured values			Maximum
		R_{th} (Ω)	V_{th} (V)	I_L (mA)	R_{th}	V_{th}	I_L (mA)	Power = $I_L^2 R$
1	20V	462Ω	8V	12mA	648Ω	7.5V	11.8mA	31.66KW

Model calculations:-

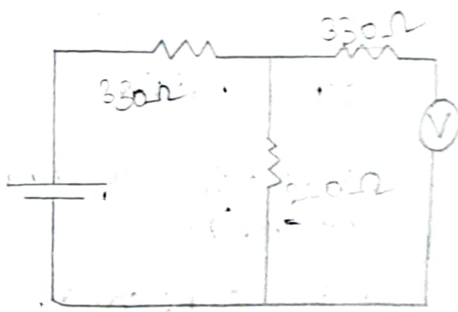
R_{th} calculation:-



$$330 + \frac{330 \times 220}{330 + 220}$$

$$\boxed{R_{th} = 462\,\Omega}$$

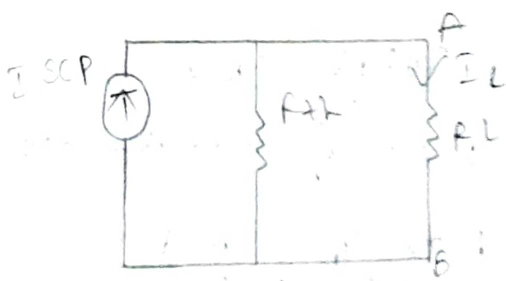
V_{th} calculations:-



$$= \frac{20 \times 220}{330 + 220}$$

$$\boxed{V_{th} = 8V}$$

I_L calculation:-



$$I_L = \frac{V_{th}}{R_{th} + R_L}$$

$$\boxed{I_L = 12mA}$$

Pmax calculation:-

$$\frac{V_{th}^2}{4R_{th}} = \frac{8^2}{4(462)}$$

$$\boxed{P_{max} = 0.0346W}$$

Exp-05 - Maximum Power Transfer theorem & Superposition Theorem.
09-11-24

a) Aim:- To verify maximum power Transfer theorem.

Apparatus Required:-

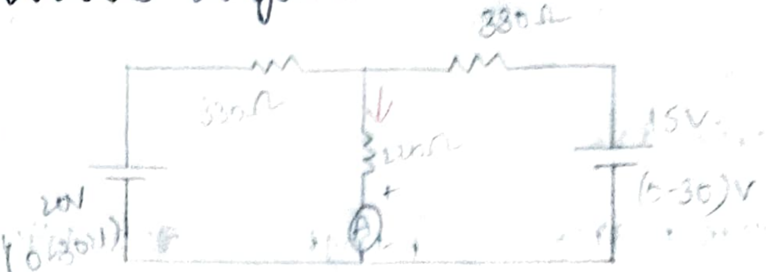
SNO	Apparatus Name	Range	Quantity.
1	DC Regulated power supply	(0-30)V	1
2	Voltmeter	(0-30)V	1
3	Ammeter	(0-200)mA	1
4	Resistor	330Ω, 220Ω	Each two
5	Multimeter	-	1
6	Bread board & connecting wires	-	Required.

Theory:-
The maximum power transfer theorem states that to transfer the maximum amount of power from a source to a load, the load resistance (R_L) must be equal to the internal resistance (R_S) of the source network.

Procedure:-
→ Give the connections asper the circuit diagram.
→ Measure R_{th} using a multimeter.
→ Measure V_{th} accross 220Ω
→ Measure load current I_L through R_L.
→ calculate the maximum power transfered to the load.

Result:- Thus the maximum power supply theorem is verified.

Circuit Diagram:-



Observations:-

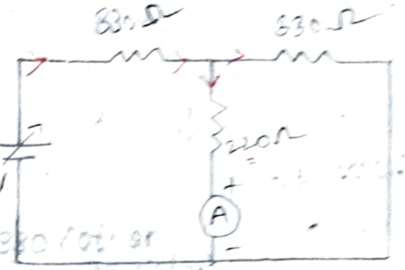
S.No	Measured current (mA) through 330 Ω	Calculated current through 1kΩ		Measured current through 1kΩ		Net current (mA)
		V = 20V	V = 13V	V = 20V	V = 15V	
1	45.2mA	25.8mA	19.6mA	27.2mA	19.5mA	46.7mA

V = 20V

330 + 132 = 462

$I = \frac{20}{462} = 43mA.$

$\boxed{I_L' = 25.8mA}$

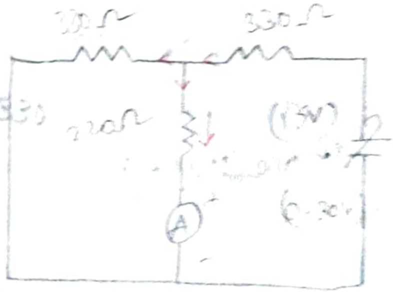


V = 15V

2) 132 + 330 = 462

$I = \frac{15}{462} = 32.4mA.$

$\boxed{I_L'' = 19.6mA}$



$I_L = I_L' + I_L'' = 25.8 + 19.6$

$\boxed{I_L = 45.2mA}$

b) Aim:- To determine the current flow through the load resistor using superposition Theorem.

Apparatus Required:-

SNO	Apparatus Name	Range	Quantity
1	DC regulated power supply	(0-30)V	2
2	Voltmeter	(0-30)V	1
3	Ammeter	(0-200)mA.	1
4	Resistor	1KΩ, 220Ω, 330Ω	Each one
5	Multimeter	-	1
6	Bread board & connecting wires.	-	Required.

Theorem:-

The current flow through a load resistor in a circuit depends on several factors, such as the total voltage across the circuit, the value of the load resistor, and whether other components are connected in series or parallel.

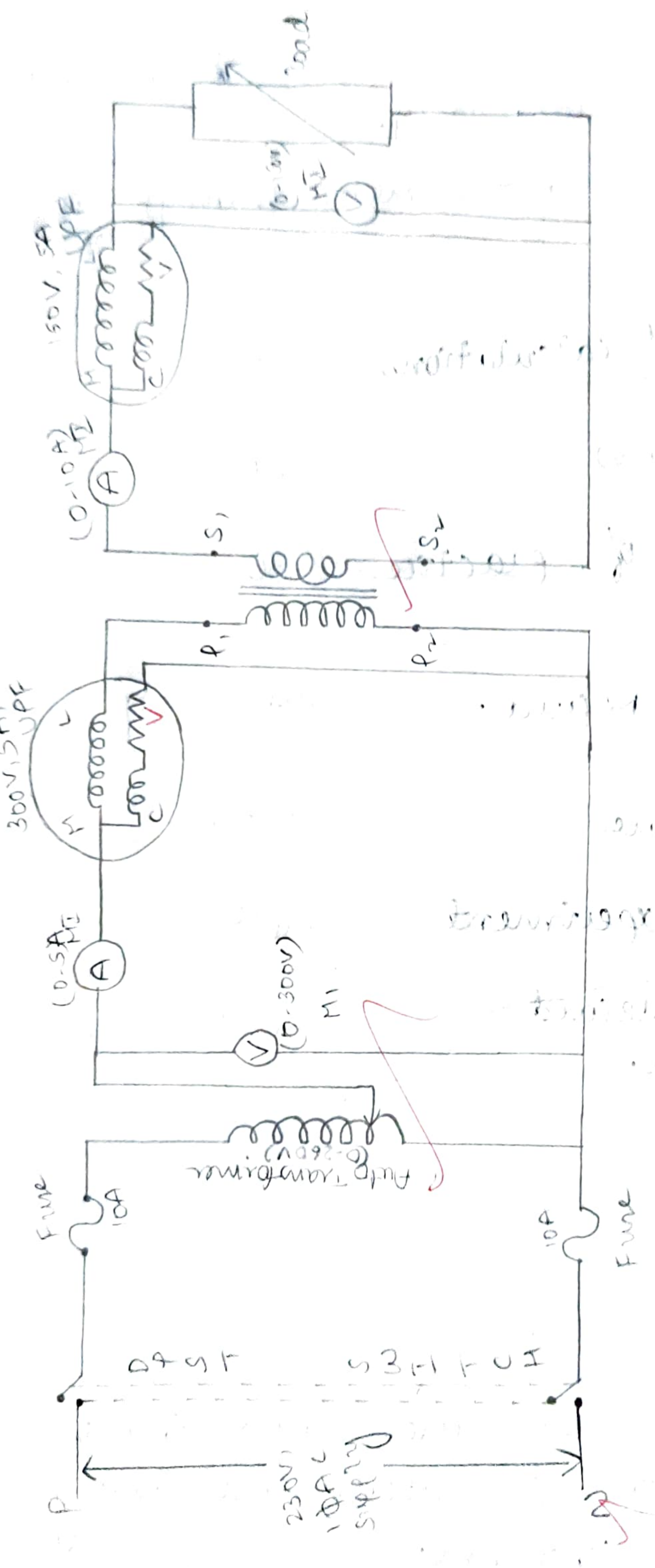
Procedure:-

→ Give the connections as per the circuit diagram.

→ Measure current flow through 1kΩ by connecting both the supplies.

→ Short circuit 15V source.

Circuit Diagram:-



11-11-24 Exp-6 : Load Test on single phase Transformer.

Aim:- A load test on a single phase transformer is conducted to evaluate the transformer's performance under full load conditions.

Apparatus Required:-

SNO	Apparatus Required	Range	Quantity.
1	Single-phase transformer	1ϕ (0-260)V	1
2	Voltmeter	(0-150V) (0-300)V	1 Each
3	Ammeter	(0-10)A (0-5)A.	1 Each
4	Wattmeter	(300V,5A) (150V,5A)	1 Each.
5	Supply source	-	
6	Variable resistive load or a load bank	5kW,230W	1.
7	Connecting wires.		As required.

Theory:-

A load test on a single phase transformer is used to determine its efficiency and voltage regulation under various load conditions. The test measures parameters such as power loss, output voltage and current.

Procedure:-

→Setup:

a) connect the primary winding of the transformer to the AC power source.

b) connect the secondary winding to a variable resistive load or load bank.

Observation:-

S.No	Load current (I_2)	secondary voltage (V_2)	Primary voltage (V_1)	Primary current (I_1)	Power Input	Power output	Efficiency (P_o/P_i)(%)	Voltage Regulation (%).
1	0	230	230	0	0	0	0	$\frac{230-230}{230}=0$
2	0.3	220	228	1	212	200	94.3	$\frac{230-220}{220}=4.5\%$
3	0.8	216	228	1.8	500	480	96	$\frac{230-216}{216}=6.4\%$
4	2.1	212	224	2.6	740	720	97.2	$\frac{230-212}{212}=8.4\%$
5	3	208	224	3.4	960	940	98.9	$\frac{230-208}{208}=10.5\%$

c) Connect the voltmeter accross the secondary winding to measure the secondary voltage.

→ Adjust the load:-

a) Start the no load on the secondary side & gradually increase the load by adjusting the variable resistor or load bank.

b) Increase the load unit the rated current flows through the secondary winding.

→ Record Readings:-

a) Primary voltage (V_1)

b) Primary current (I_1)

c) secondary voltage (V_2)

d) secondary current (I_2)

e) Power consumed by the load (W).

→ calculate voltage Regulation:-

$$\boxed{\text{voltage Regulation}(\%) = \frac{V_{no\ load} - V_{full\ load}}{V_{full\ load}} \times 100}$$

→ calculate efficiency:-

$$\eta = \frac{P_{output}}{P_{input}} \times 100.$$

$P_{output} = V_{load} \times I_{load}.$

$P_{input} = P_{output} + P_{losses}$ where P_{loses} includes both copper and iron losses.

Model calculations:-

$$\text{Efficiency} = \frac{P_{output}}{P_{input}}$$

$$= \frac{200}{212}$$

$$\boxed{\Rightarrow 94.3\%}$$

$$\text{Voltage regulation} = \frac{V_{no\,load} - V_{full\,load}}{V_{full\,load}} \times 100$$

$$= \frac{230-220}{220} \times 100$$

$$= 0.045$$

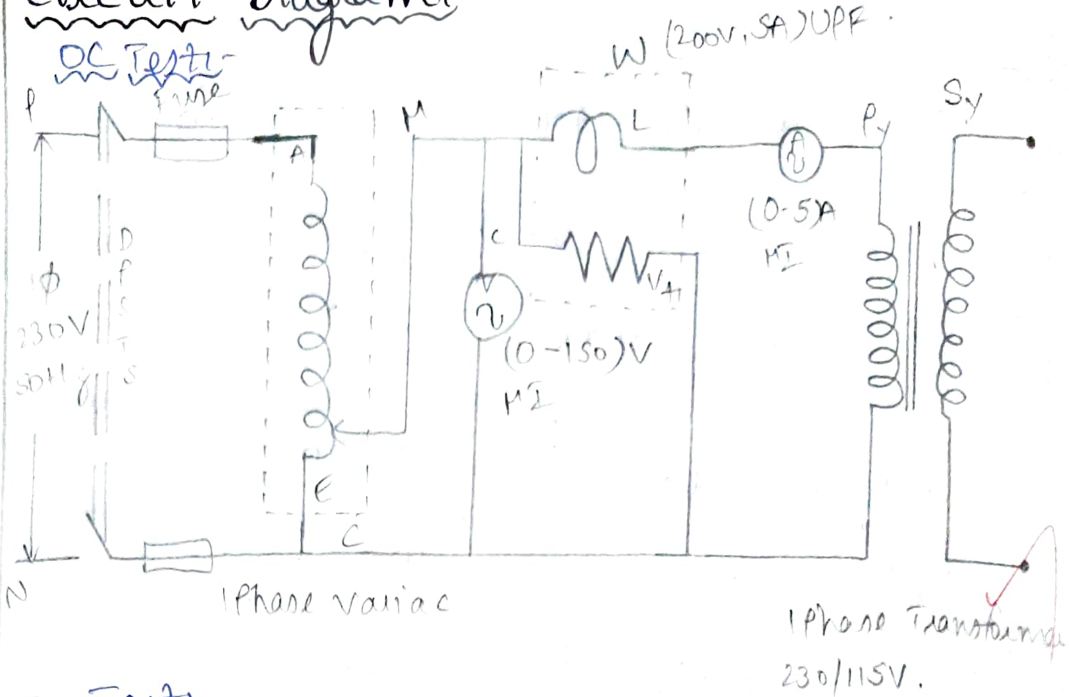
$$\boxed{\Rightarrow 4.5\%}$$

Theoretical calculations	20	20
Observations	20	20
Execution of practice examples	30	30
viva & Record.	10+20	29
Total score	100	99/100
Date of experiment	11/11/24	Ayesha
Date of record submission.	11/11/24	

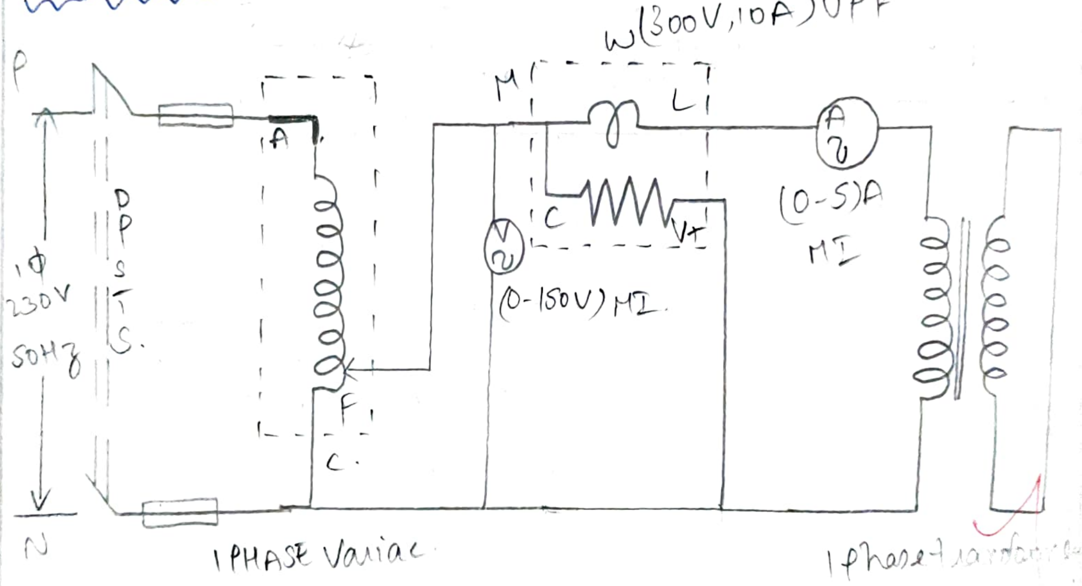
Result:- Thus the load test on single phase transformer is conducted.

Circuit Diagram:-

OC Test:-



SC Test:-



11-11-24 Exp-07 - OC and SC test on single Phase Transformer.

Aim:- To conduct load test on single phase transformer and to find efficiency and percentage regulation.

Apparatus Required:-

S.NO	Apparatus	Range	Type	Quantity
1	Ammeter	(0-10)A	MI	1
2	Voltmeter	(0-150)V	MI	1
3	Wattmeter	(300V, 5A)	Upf	1
4	Auto Transformer	1Φ, (0-260)V	-	1
5	Resistive load	5KW, 230V	-	1
6	Connecting wires	2.5sq.mm	copper	Few.

Theory:-

The open circuit and short circuit tests are essential tests on a single-phase transformer that help determine its core losses, copper losses and parameters like equivalent resistance.

Procedure:-

→ Connect a voltmeter, ammeter and wattmeter to the primary winding of the transformer.

→ Leave the secondary winding open.

→ Apply the rated voltage to the primary winding and record the readings from the voltmeter, ammeter, and wattmeter.

observation:-

Open circuit rated voltage :-

V	A	W Experimental.	W Theoretical.
230	0.3	64	69

Short circuit Rated voltage :-

V	A	W experimental	W Theoretical
26	4.2	76	100.8

calculations:-

$$\boxed{P = VI}$$

$$= 230 \times 0.3$$

$$\boxed{P = 69W}$$

$$\cancel{= 23}$$

$$\boxed{P = VI}$$

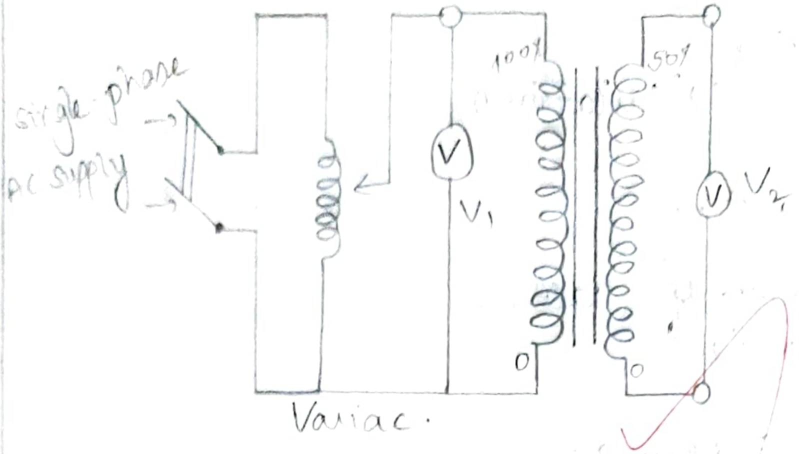
$$= 24 \times 4.2$$

$$\boxed{P = 100.8\,W}$$

Theoretical calculations	20	20
Observations	20	20
Execution of Practice examples	30	30
Viva & Record.	10+20	29
Total Score	100.	99
Date of experiment:	11/11/24	
Date of record submission.	12/11/24	Suna

Result:- Thus the OC and SC test on single phase transformer is conducted.

Circuit Diagram:-



Observations:- secondary voltage = 50% of primary voltage.

S.No.	Primary voltage	secondary voltage
1	40	20
2	60	31
3	80	41
4	100	51
5	120	61.

Exp-08- Calculation of secondary turns and current in a transformer.

Aim:- To evaluate the secondary turns & current in a transformer. The test helps determine the voltage regulation, efficiency, and overall behaviour of the transformer when it is delivering power to a load.

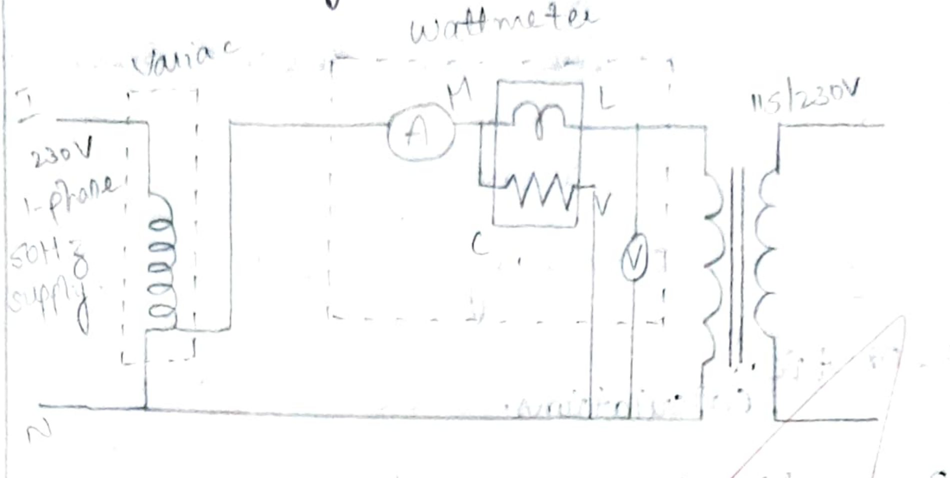
Apparatus Required:-

S.No	Apparatus Required	Range	Quantity.
1	Single-phase transformer	1ϕ, (0-260V)	1
2	Voltmeter	(0-150V) MI type	1 Each.
3	Ammeter	(0-10)A MI type	1 Each.
4	Wattmeter	(300V, 5A) UPF.	1 Each.
5	Supply source		
6	Variable resistive load or a load bank.	5kW, 230W.	1.
7	Connecting wires.		As required.

Theory:-

A transformer operates on the principle of electromagnetic induction and consists of two coils, primary and secondary, wound around a common core. When an AC voltage is applied to the primary coil.

Circuit Diagram:-



Observations:-

S.No	Voltage (V_L)	Ampere (I_L)	Watt (W_1)	Watt 2 (W_2)	Total power $W = W_1 + W_2$
1	415	2.4	688	0	688
2	415	2.5	944	0	944
3	415	2.9	1112	400	1512
4	415	3	1200	480	1680
5	415	3.5	1440	880	2320

Calculations:-

$W = W_1 + W_2$

$= 688 + 0$

$\boxed{W = 688W}$

...24 Exp-09 - Power measurement using two wattmeter methods.

Aim:- To evaluate no load parameters in a circuit with open circuit test using single phase transformer and hence find its equivalent circuit.

Apparatus required:-

S.NO	Equipment	Type	Range	Quantity
1	Voltmeter	MI	(0-30)V & (0-150)V	1
2	Ammeter	MI	(0-2)A & (0-20)A.	1
3	Wattmeter	Dynamo	(0-270)V, 50Hz. 10A.	1
4	Auto-Transformer	-	(0-150)UPF, (0-2.5)A.	1
5	Transformer	Shell	LV-115V, 1.78A.	1
6	Connecting wires.	-	-	As req.

Theory:-

It is popular technique for measuring power in three phase, three-wire measuring system, especially when dealing with balanced or unbalanced loads.

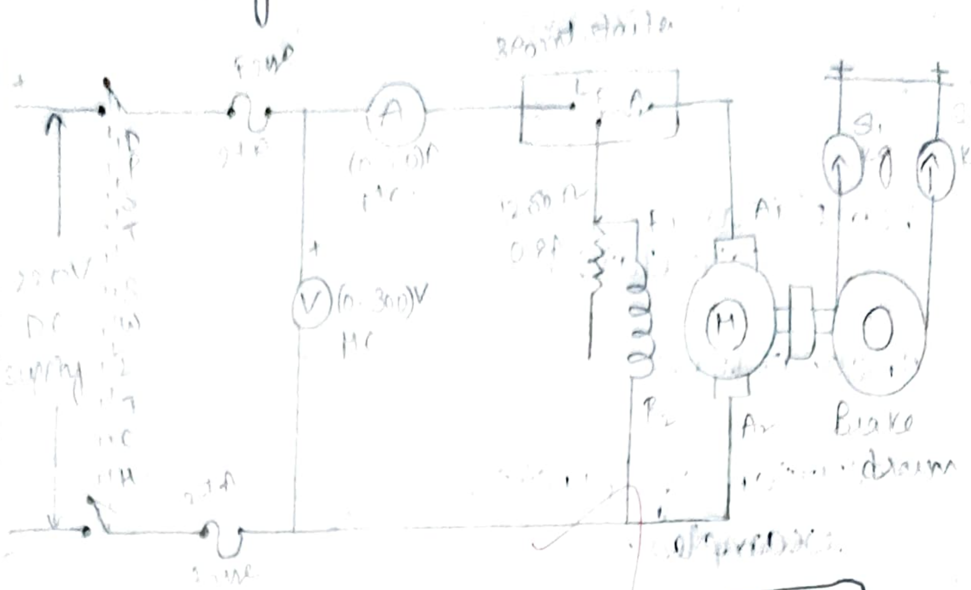
Procedure:-

→ Make the connections as per the circuit diagram.

→ By using 1-phase VARIAC apply rated voltage.

12-12-2

Circuit Diagram:-



$\boxed{r=0.09}$

Observations:-

S.No	Voltage (V_L)	current (I_L)	speed in rpm (N)	Spring Balance S_1	S_2	$f=(S_1-S_2)\times 9.81\times R.$ ⇒	Torque (T)	Input Power $V_L I_L$	output power $\frac{2\pi NT}{60}$	Efficiency (%). opt/inp.
1	220	1.6	1450	0	0	0	0	352	0	0%
2	220	4	1622	0.6	2.2	1.412	1.412	880	210.15	23.8%
3	220	6	1400	0.8	5.2	3.884	3.884	1320	569.135	43.1%
4	220	8	1382	1	8	6.1803	6.1803	1760	893.97	50.7%
5	218	10	1378	1.2	10.2	7.946	7.946	2180	1146.05	52.5%
6.	217	12	1359	1.8	13.	9.888	9.888	2604	1406.4	54%

12-11-24 Exp-10- Load test on DC shunt Motor.

Aim- To conduct the brake load test on DC shut motor and determine its Performence characteristics.

Apparatus Required:-

S.No	Name of the Apparatus	Range	Type	Quantity
1	Ammeter	(0-20)A	Digital	1
2	Voltmeter	(0-300)V	Digital.	1
3	Rheostat	370 /1.7A.	Wire wound	1
4	RPM meter	(0-9999)rpm.	Digital	1
5.	connecting wires.	-	-	As required.

Theory:-

It is a direct method in which a braking force is applied to a pulley mounted on the motor shaft. A belt is wound round the pulley and its two ends are attached to the frame through two spring balances S_1 and S_2.

Procedure:-

→ Make the connections as shown in the circuit diagram.

→ Keeping the field rheostat at the minimum position, swith on the supply and start the motor.

→ Adjust the speed of the motor on no

Model calculations:-

$T = (S_1 - S_2) \times 9.81 \times 0.09$

$= (0.6 - 2.2) \times 9.81 \times 0.09$

$\boxed{T = 1.612}$ N-m

Input power $= V_L I_L$

$= 220 \times 4$

$\boxed{P_i = 880 \text{ W}}$

Output power $= \dfrac{2\pi N T}{60}$

$= \dfrac{2 \times 3.14 \times 1622 \times 1.612}{60}$

$\boxed{P_O = 210.15 \text{ W}}$

$\boxed{\text{Efficiency} = O/p = 23.8\%}$

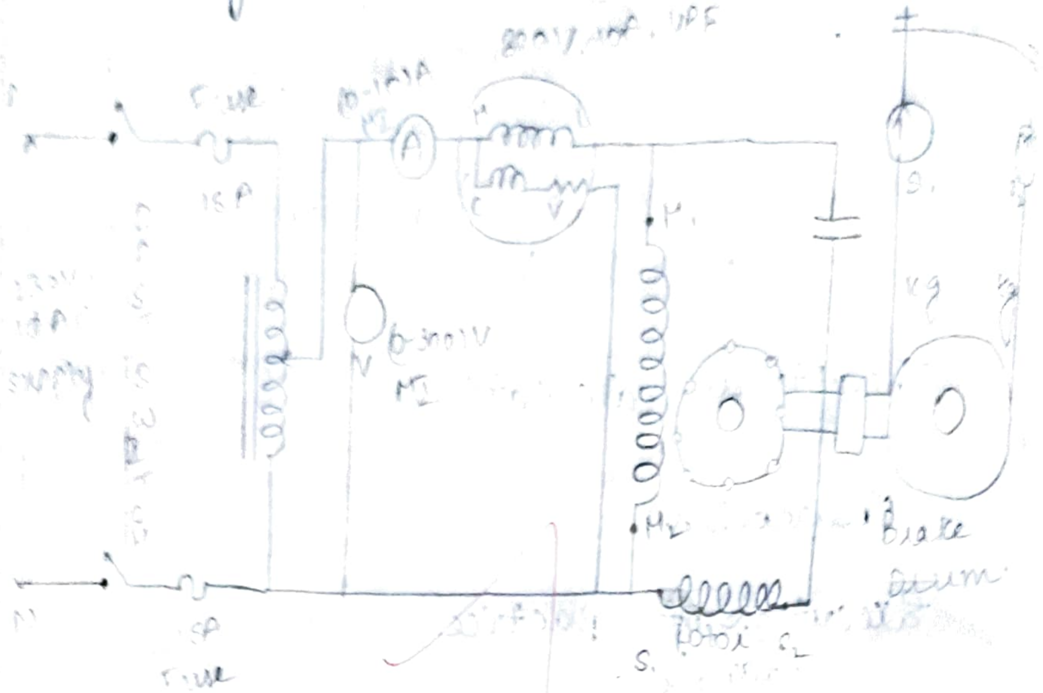
load to its rated value by means of the field rheostat. Do not disturb the position of the rheostat throughout the test.

→ Put on the load by tightening the screws of the spring balances.

Theoretical calculations	20	20
Observations	20	20
Execution of practice examples.	30	30
Viva & Record.	10+20.	29
Total score.	100.	99
Date of experiment.	12/11/24	
Date of record submission.	12/11/24	

Result - Thus the performance characteristics of DC shunt motor was obtained by conducting brake test.

Circuit Diagram-



12-11 Exp-11 - Load Test on Single phase Induction Motor.

Aim:- To conduct load test on the given single phase induction motor and to plot its performance characteristics.

Apparatus Required:-

SNO	Apparatus	specifications	Quantity.
1	Voltmeter	(0-300V)MI	1
2	Ammeter	(0-10A)MI	1
3	Wattmeter	(300V, 10A, UPF)	1
6	Tachometer.	(0-10000 RPM)	1.

Theory:- A load test on a single-phase induction motor is performed to evaluate its performence under diffierent load conditions.

Procedure:-

→ connections are as per circuit diagram.

→ The DPST swith is closed and the single phase supply is given.

→ By adjusting the variac the rated voltage is applied and the corresponding no load values of speed, spring balance and meter readings are noted down.

→ The procedure is repeated till rated current of the machine.

Observations:-

S.N	Volts (V_L)	Amps (I_L)	Speed (N) (RPM)	Wattmeter Readings (W)	Spring Balance Readings S_1	S_2	$S_1 \sim S_2$	Torque $(T) = 9.81 \times R \times (S_1 - S_2)$	Inp ($V_L I_L$)	OUT $\frac{2\pi NT}{60}$	Power Factor $\frac{W}{VI}$	Efficiency $\eta = O/P \div I/P$ (%)	Slip => $S = \frac{N_S - N}{N_S}$
1	230	3.2	1490	300	0	0	0	0	736	0	0.607	0	0.0066
2	230	3.5	1480	540	0.8	1	0.2	0.1962	805	30.392	0.670	3.77	0.013
3	228	4	1460	760	1.6	2	0.4	0.3924	912	59.963	0.833	6.57	0.026
4	226	4.5	1450	900	2	2.8	0.8	0.7848	1017	119.106	0.864	11.71	0.033

Model calculation:-

$\boxed{R = 0.1}$

$T = 9.81 \times 0.1 \times 0.2$

$\boxed{T = 0.1962}$ N-m

Input power

$Inp = 230 \times 3.5$

$\boxed{Inp = 805 W}$

o/p power

$$Out = \frac{2 \times 3.14 \times 1480 \times 0.1962}{60}$$

$\boxed{out = 30.392 W}$

$$PF = \frac{540}{230 \times 3.5}$$

$\boxed{PF = 0.670}$

$$\eta = O/I = \frac{30.392}{805}$$

$\boxed{\eta = 3.77\%}$

$$Slip = \frac{1500 - 1480}{1500}$$

$\boxed{Slip = 0.013}$

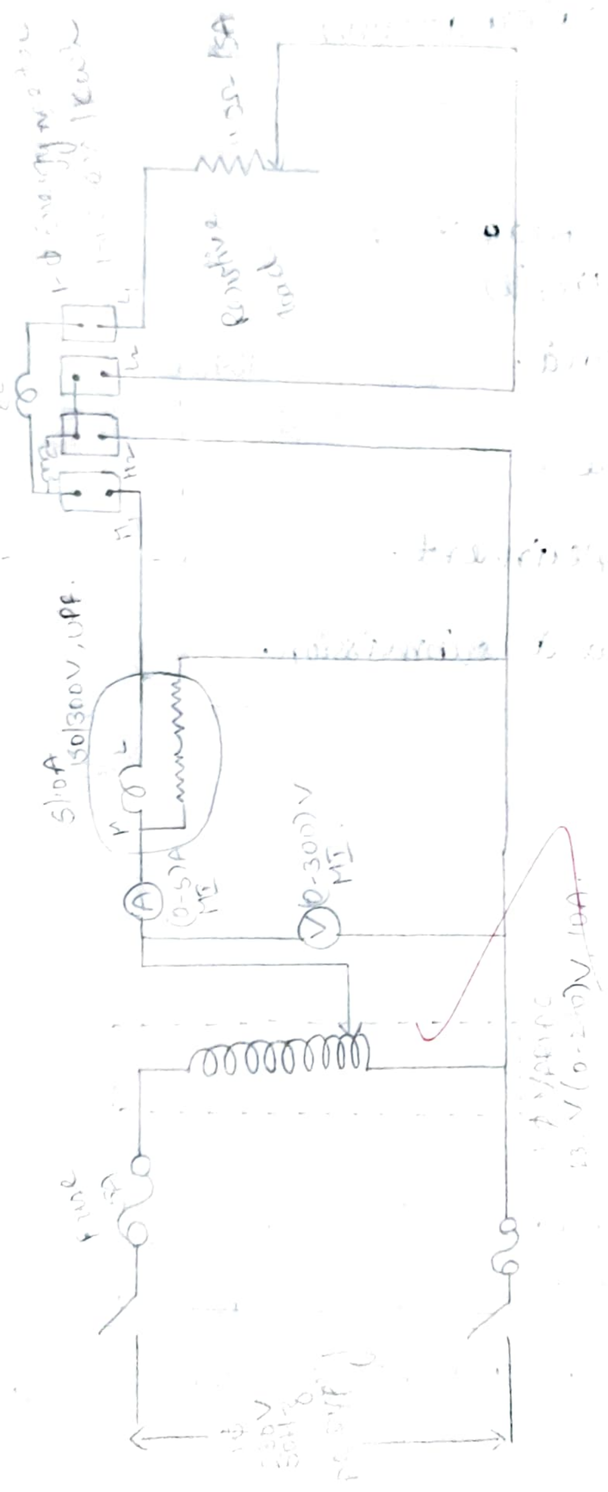
→ The motor is unloaded, the auto transformer is bought to the minimum voltage position & the DPSTS is opened.

→ The radius of the brake drum is measured.

Theoretical calculations	20	20
Observations	20	20
Execution of practice examples.	30	30
viva & Record.	10+20	29
Total score.	100.	99
Date of experiment.	12/11/24	
Date of record submission.	12/11/24	

Result:- The load test was conducted on 1ϕ induction motor and the performence characteristics were drawn.

Circuit Diagram-



12-11-24 Exp-12- Calibration and Testing of single phase Energy Meter.

Aim:- To calibrate and test the given single phase energy meter by direct loading.

Apparatus:-

SNO	Name	Type	Range	Quantity
1	single phase energy meter	Induction	1500REV	1
2	Wattmeter	UPF	300V	1.
3	Voltmeter	MI	(0-5)A.	1
4	Ammeter	MI	(0-5)A	1.
5	single phase variac	1-ϕ	230V	1.
6	Rheostat	WW	110Ω/5A	1.
7	stop watch	Digital	-	1
8	connecting wires	-	-	Required.

Theory:-

Induction type of energy meters are universally used for measurement of energy in domestic and industrial a.c. circuits. Industrial type of meters possesses lower friction and higher torque/weight ratio.

Procedure:-

→ Connect the circuit as per the circuit diagram.

→ Keep the single phase variac at zero volt position.

→ Now switch on the power supply.

Observations:-

S.NO	Line voltage V_L (V)	Line current I_L (A)	Time taken for 10 revolutions (sec)	No. of revolutions (n)	Calculated energy (kwh)	Measured energy (kwh)
1	230	1	85 sec	10	5.43×10^{-3}	6.66×10^{-3} kwh
2	225	3	38 sec	10	7.125×10^{-3}	6.66×10^{-3} kwh.

Model calculations:-

$$\text{calculated energy} = W_a = \frac{V \times I \times t}{3600} = \frac{5.43}{1000}$$

$$= 5.43 \times 10^{-3} \text{ kwh.}$$

$$\text{Measured energy} = \frac{n}{1500 \text{ rev/kwh}}$$

$$= \frac{10 \text{ rev}}{1500 \text{ rev / kwh}}$$

$$= \frac{10}{1500 \text{ kwh}}$$

$$= 6.66 \times 10^{-3} \text{ kwh.}$$

→ Gradually vary the variac to apply the rated voltage.

→ Gradually vary the variac to minimum or zero volt position.

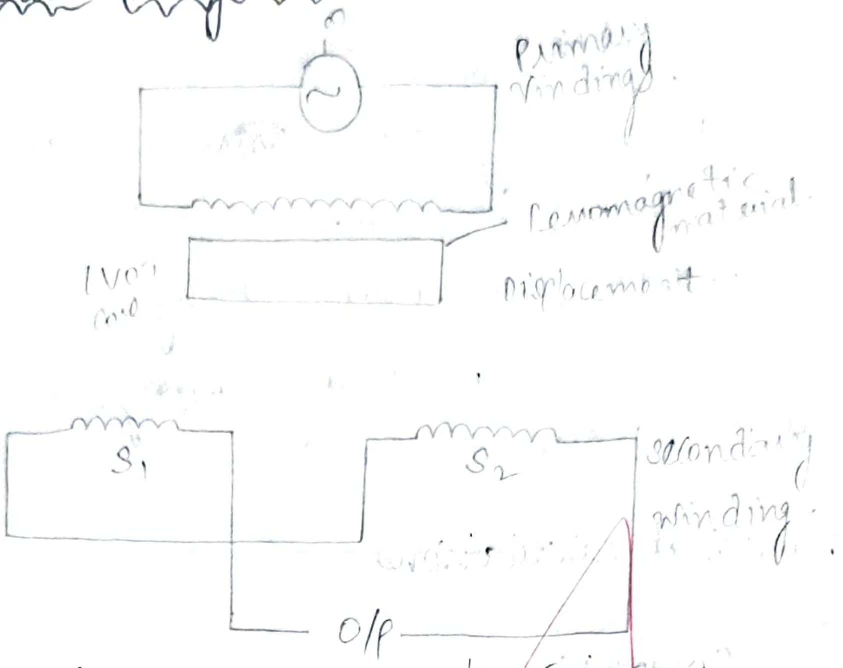
→ switch off the power supply.

→ calculate the observed readings, actual readings, % error, % correction.

Theoretical calculations	20	20
Observations	20	20
Execution of practice Examples.	30	30
viva & Record.	10+20	29
Total score.	100.	99
Date of Experiment	12/11/24	
Date of record submission.	13/11/24	

Result:- Hence calibrated the given single phase energy meter & tested at different loads and the graph is plotted for % Error correction factor Vs I_L & % correction Vs I_L

Circuit Diagram:-



$o/p = E_{s_1} - E_{s_2}$

Observation:-

S.NO	Displacement (mm)	Voltage (V).
1	0	5.55
2	1	5.01
3	2	4.42
4	3	3.79
5	4	3.14
6	5	2.54
7	6	1.83
8	7	1.19
9	8	0.53
10	9	-0.11
11.	10.	-0.78.

Exp-13 - Output characteristics of (LVDT).

Aim:- To plot the output characteristics of LVDT.

Apparatus Required:-

S.No	Apparatus	Quantity
1	LVDT kit	1
2	Multimeter	1
3	connecting wires	As required.

Theory:-

The linear variable Differential transformer (LVDT) is an electromechanical transducer used to convert linear displacement into an electrical signal.

Procedure:-

→ connect the circuit according to the circuit Diagram.

→ switch on the power supply.

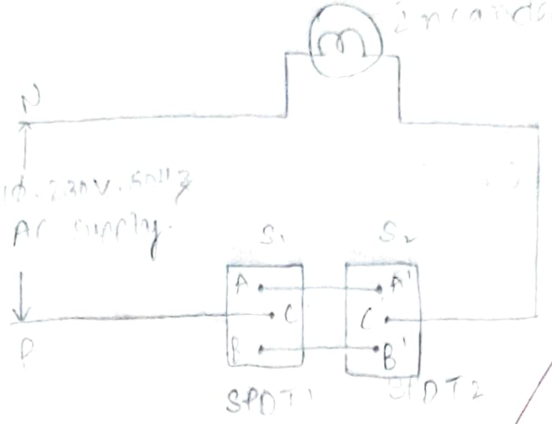
→ The core is initially brought to null position.

→ First turn the nut in clockwise direction to move core inwards.

→ Left of null position & take the respective voltage readings on the voltmeter.

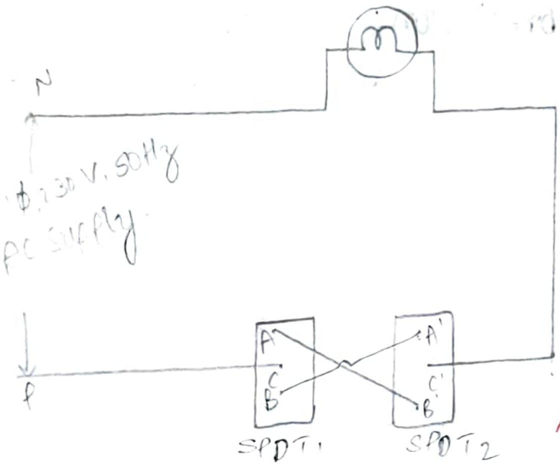
Circuit Diagram:-

Direct connection:-



Indirect connection:-

Incandescent lamp (60W/80W)



13-11-24 Ex-14- Staircase Wiring.

14(a). Aim:- To control the status of the given lamp using two way switches.

Apparatus Required:-

S.No	Apparatus	Range/Type	Quantity.
1	Incandescent lamp	60W, 40W.	1
2	SPDT.	5A, 230V	2
3	Lamp holder	pendant type	1
4	Line Tester	500V	1
5	3 pin plug	5A, 230V	1
6	wire stripper cum cutter	Pye 950	1
7	connecting wires.	12A.	As per Required.

Theory:-

staircase wiring is a common multi-way switching or two way light switching connection; one light two switches wiring. one lamp is controlled by two switches from two different positions.

Procedure:-

-> A ~~B~~ piece of wire is connected to the phase side and other end to the middle point of SPDT switch 1.

-> Another point of lamp holder is connected to neutral line.

Observation :

Direct connections:-

S.No	S_1	S_2	Lamp status
1	CA	C'A'	on
2	CB	C'B'	on
3	CA	C'B'	off
4	CB	C'A'	off

Indirect Connections:-

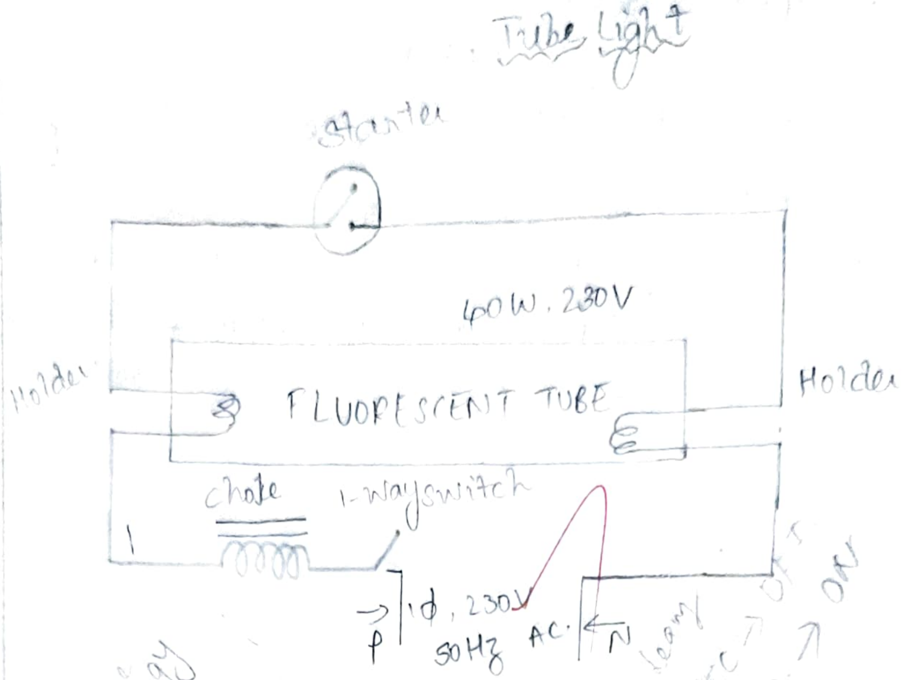
S.No	S_1	S_2	Lamp status
1	CA	C'A'	off
2	CB	C'B'	off
3	CA	C'B'	ON
4	CB	C'A'	ON.

→ upper point of SDPT switch 1 is connected to the upper point of SDPT switch 2. lower point of SPDT switch 1 is connected to the lower point of switch 2.

→ circuit is tested that all the combinations of switch connections.

Result:- Thus the status of the given lamp was controlled and tested under direct and indirect connecting using two way switches.

Circuit Diagram :-



14b) Aim:- To prepare wiring for a fluorescent tube light with switch control.

Apparatus Required:-

S.NO	Apparatus	Range	Quantity.
1	Tube light with fitting	-	1
2	Joint clips	-	As required
3	Switch	-	1
4	wires	-	As required.
5	screws	-	As required.
6	switch board.	-	1.

Theory:-

The fluorescent lamp circuit consists of a choke, a starter, a fluorescent tube & a frame. The length of the commonly used fluorescents tube is 100cm; its power rating is 40W & 230V.

Procedure:-

→ Mark the switch and tube light location points and draw lines for writing on the wooden board.

→ Place wires along the lines and fix them with the help of clips.

→ Fix the switch and tube light fitting in the marked position.

→ Test the working of the tube light by giving electric supply to the circuit.

Theoretical calculations	20	20
Observation.	20	20
Execution of practice Examples	30	30
Viva & Record.	10+20	28
Total score	100.	98
Date of Experiment	13/11/24	
Date of record submission.	13/11/24	

Result:- Thus the wiring for the tube light is completed and tested.