Date ....

Expt. No. 01 Page No. ....

Load test on Single phase induction Transformer

AIM:

Load test on a single phase transformer is conducted to evaluvate the transformers performance under full load container.

Apparatus Required:

S.No	Apparatus	Range	Quantity.
1	Single phase transform	1 ϕ (0 - 260v)	1
2.	Voltmeter	(0 - 150), (0-300) MI - type	1each
3.	Ammeter	(0-10)v (0-5v) MI - TYPE	1each
4.	Wattmeter	~~300V~~, 5A 150V, 5A; UPF	1each
5.	AC Power Source		
6	Variable resitive load	5KaP, 2 50v	1
7.	Connecting wires	—	As required.

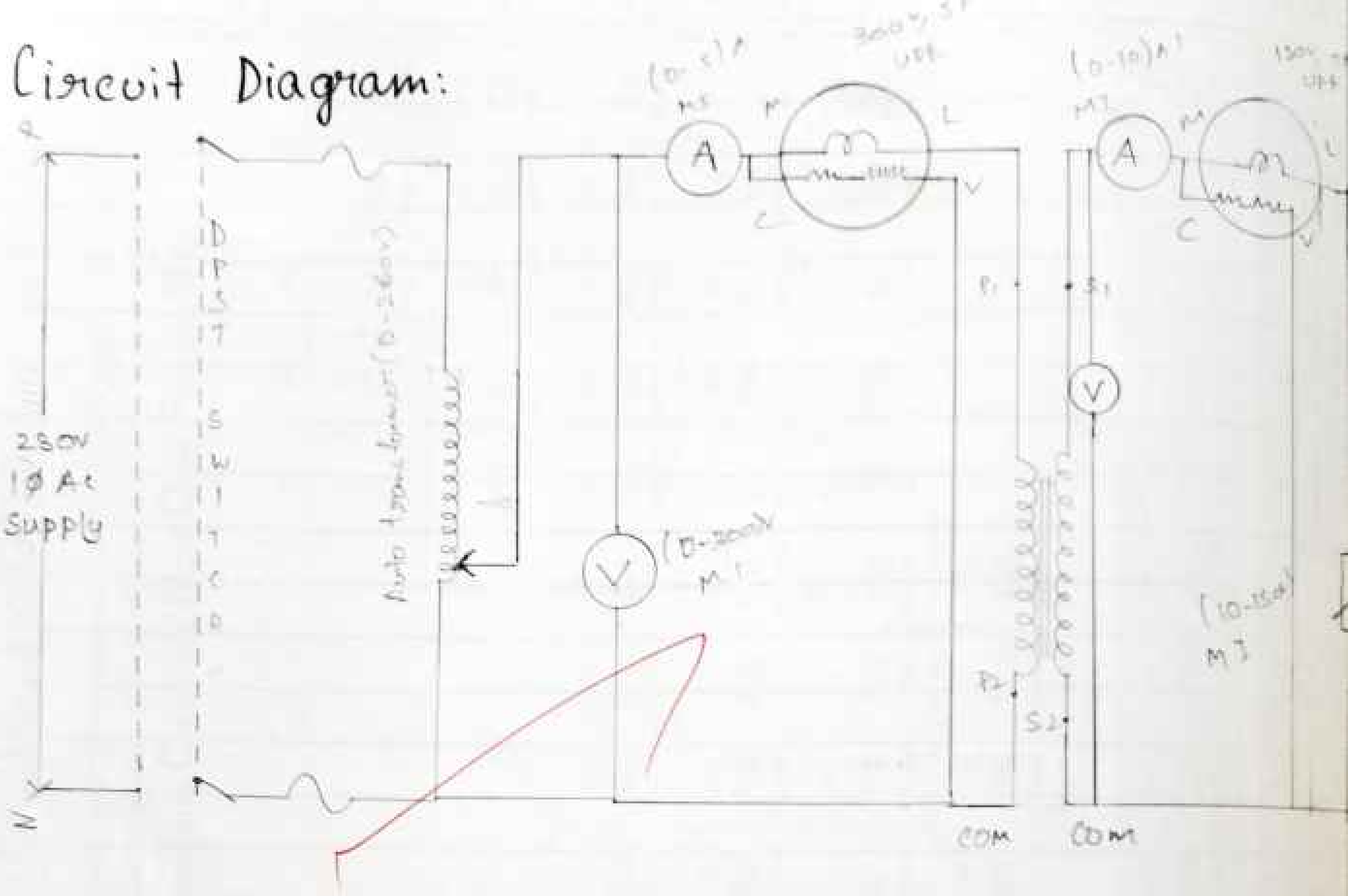
PROCEDURE:

→ Connect the circuit as per required

→ Supply the rated voltage to primarly winding usin auto transformer

Teacher's Signature : ____________

Circuit Diagram:



TABULATION:

MF = 2

S.No	Load Current (I_2)	Secondary Voltage (V_2)	Primary current (I_1)	Primary Voltage (V_1)	W, Power W1 OBs	W1 in	W2 OBs	W out	efficiency (η)	voltage regulation
1	0.2 A	220	0.21	220	60	120	0	0	0%	0%
2	0.4 A	218	0.42	220	108	216	18	36	16.67%	0.92%
3	0.6 A	216	0.63	220	125	250	30	120	48%	1.80%
4	0.8 A	214	0.84	220	160	320	55	220	68.75%	2.81%
5	1.0 A	212	1.05	220	210	420	86	344	81.90%	3.78%

Date ....

Expt. No. ....

Page No. ....

-> Adjust the Load
-> Note the readings of primary voltage(V_1) Primary Current(I_1) Secondary voltage(V_2) Secondary current (I_2), power consumed by the load (W)
-> Calculate the voltage regulation (%) = $\frac{V_2 - V_1}{V_1} \times 100$
-> Calculate the efficiency (η) = $\frac{\text{Output}}{\text{Input}} \times 100$
-> Analyse the results.

10/10

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

Teacher's Signature : ____________

ficiency:

$\eta = \frac{Output}{Input} \times 100$

$\eta = \frac{0}{120} \times 100 = 0\%$

$\eta = \frac{36}{216} \times 100 = 16.67\%$

$\eta = \frac{120}{250} \times 100 = 48\%$

$\eta = \frac{220}{320} \times 100 = 68.75\%$

$\frac{344}{420} \times 100 = 81.90\%$

Voltage (%) $= \frac{V_1 - V_2}{V_2} \times 100$

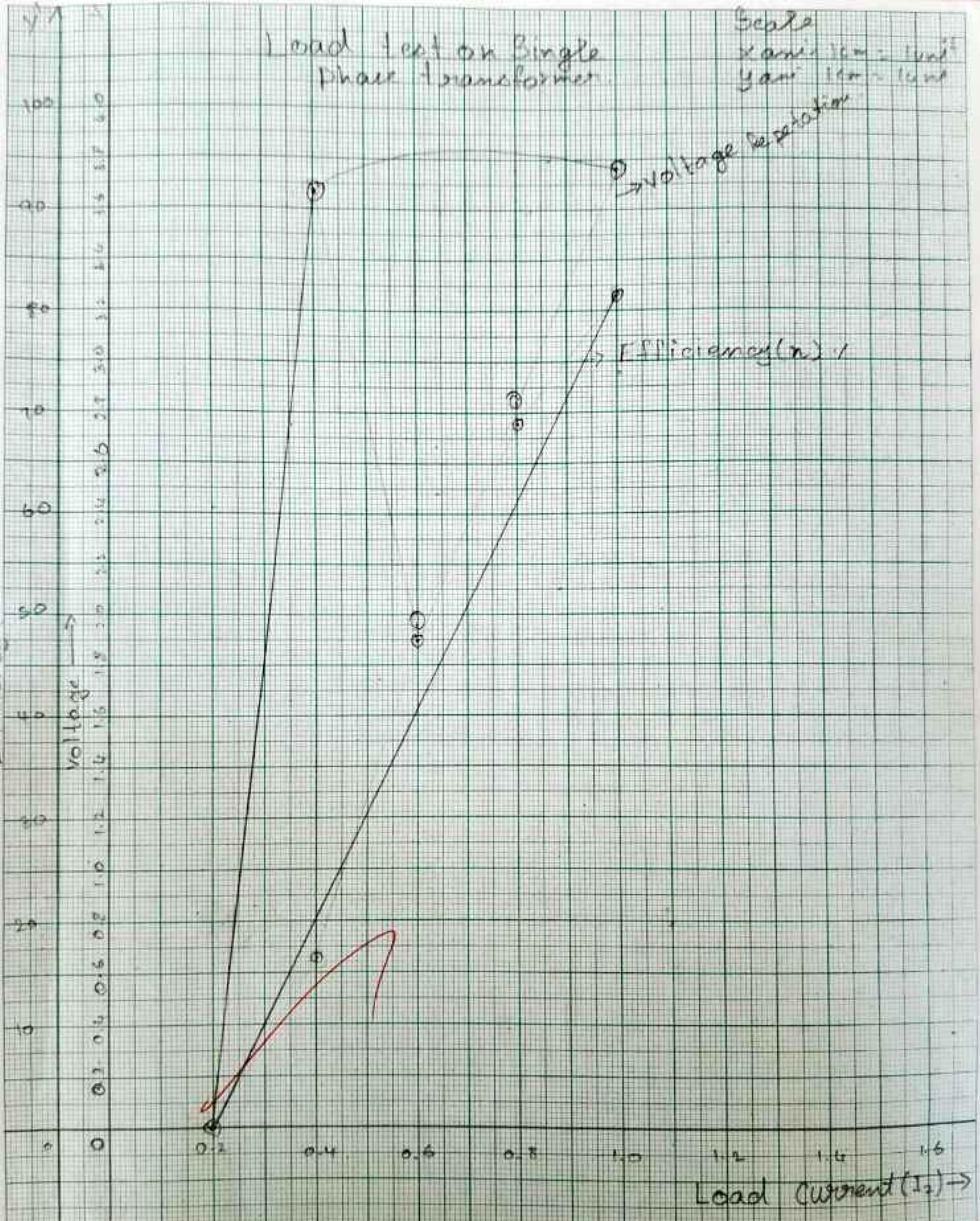
1) $\% = \frac{220-220}{220} \times 100 = 0$

2) $\frac{220-218}{218} \times 100 = 0.92\%$

3) $\frac{220-216}{216} \times 100 = 1.85\%$

4) $\frac{220-214}{214} \times 100 = 2.81\%$

5) $\frac{220-212}{212} \times 100 = 3.78\%$


Load test on Single Phase transformer
Scale
X axis 1cm = 1unit
Y axis 1cm = 1unit
voltage Regulation
Efficiency (η) %
Efficiency (%)
voltage
Load Current (I_2)
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
10
20
30
40
50
60
70
80
90
100

Date ....

Expt. No. 2   Page No. ....

OC & SC test on Single Phase tranformer.

AIM: To Conduct load test on single phase transformer & to find efficiency & percentage regulation.

APPARATUS REQUIRED:

S.No	APPARATUS	RANGE	TYPE	QUANTITY
1	Ammeter	(0-10)A	MI	1
		(0-5) A	MI	1
2	Voltmeter	(0-150)V	MI	1
		(0-300)V	MI	1
3	Wattmeter	(300V, 5A)	UPF	1
		(150V, 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

PROCEDURE:

→ Connect the primary winding to a variable AC Supply.

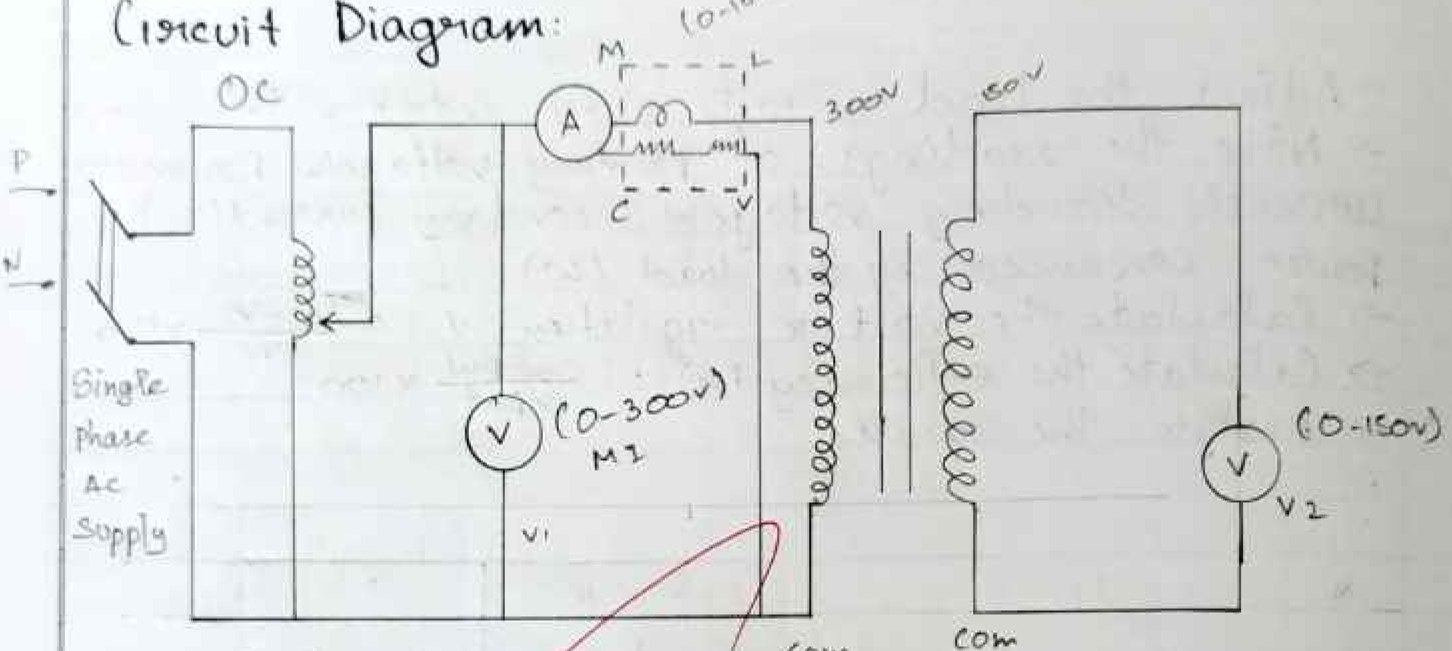
→ Run the tranformer with no load connected. Measure the Load secondary voltage.

→ Gradually Increase the Load on the secondary

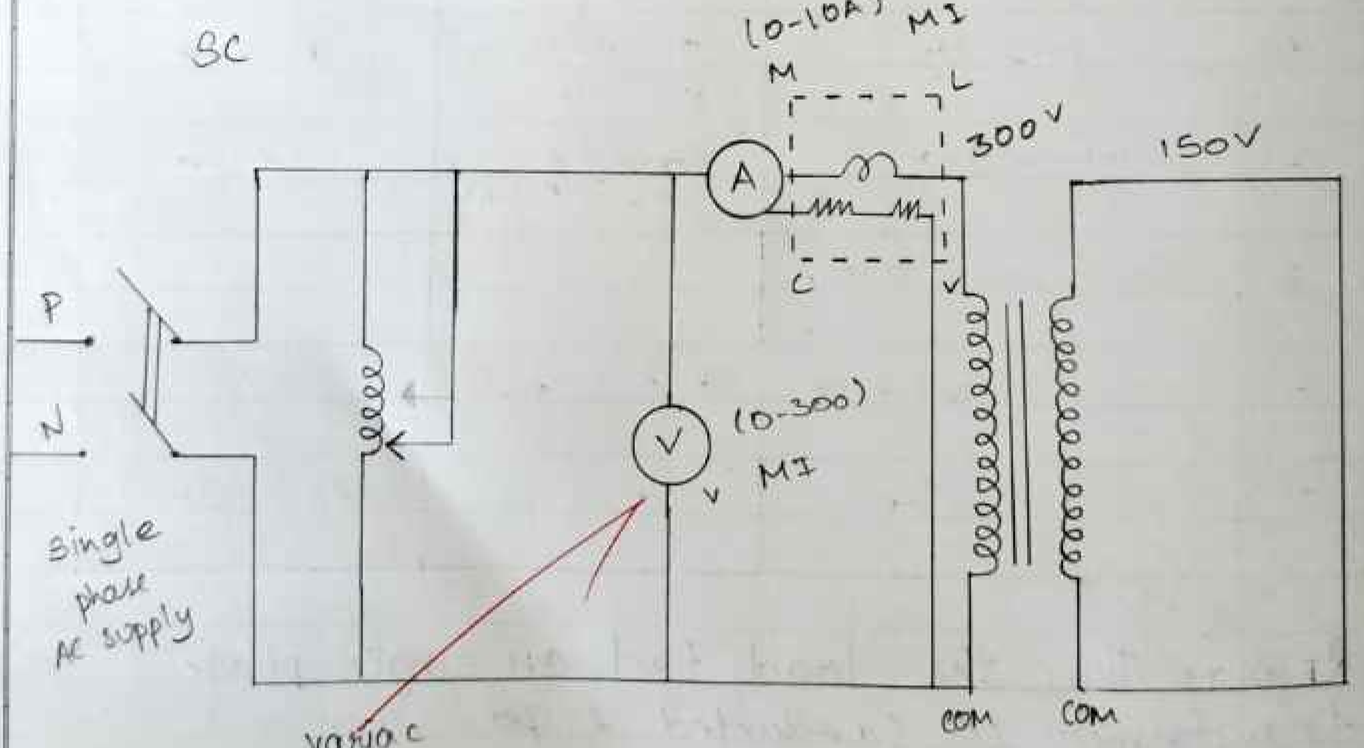
Teacher's Signature : ____________

Circuit Diagram:

OC



SC



Date

Expt. No.

Page No.

-> Calculate the voltage Regulation = $\frac{V_2 - V_1}{V_1} \times 100$

-> Calculate efficiency O.P/I.P × 100.

-> Analyse the results.

10/10

RESULT: Thus the OC & SC test on single phase transformer is conducted.

Teacher's Signature :

OC Test MF = 4

V_1	I_1	W_1		V_2
		OBS	ACT	
220 V	0.5 A	5	20	110 V

SC Test MF = 4

V_1	I_1	W_1		I_2
		OBS	ACT	
115	2 A	3	12	4 A

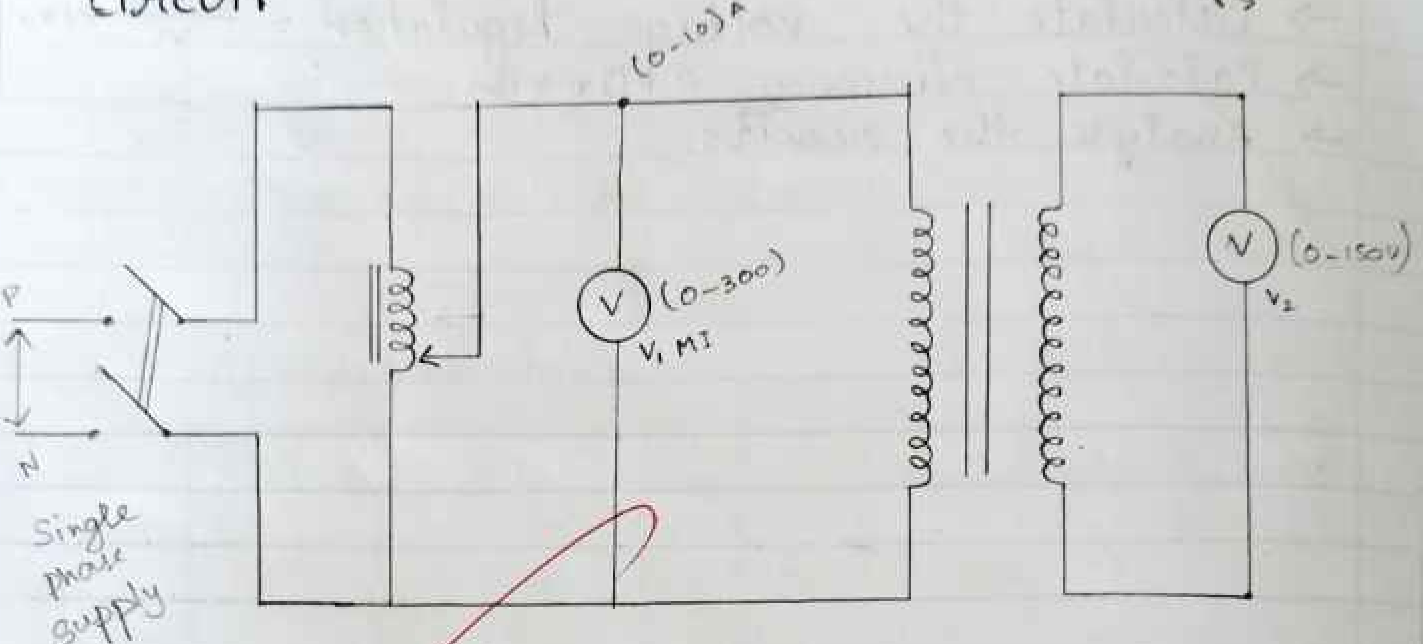
Calculation of Secondary turns and current in a transformer.

AIM: To evaluvate secondary turns & current in an transformer & to find voltage regulation efficiency & overall behaviour of transformer when it is delivering power to load.

APPARATUS REQUIRED:

S.NO	APPARATUS	RANGE	QUANTITY
1.	Single-phase transform	1Φ (0-260)V	1
2.	Voltmeter	(0-150V), (0-300V)V, MI	1 Each
3.	Ammeter	(0-10A); (0-5) A MI	1 Each.
4.	Wattmeter	(300V, 5A) (150V, 5A)	1 Each
5.	AC Power supply		
6.	Variable resitive load	5KW, 230V	1
7.	Connecting wires	As required.	

Circuit



$$\frac{V_2}{V_1} = K = \frac{N_2}{N_1} \quad = N_2 = N_1 \times K$$

$N_2 = 110$ $\quad N_2 = \frac{1}{2} \times 110$

$N_2 = 55.$

SO	V_1	V_2	K	N_1	N_2
1	60	30	$\frac{1}{2}$	110	55
2	80	40	1/2	110	55
3	120	60	1/2	110	55
4	140	70	1/2	110	55
5	160	80	1/2	110	55

Date ....

Expt. No. .... Page No. ....

PROCEDURE:

→ A transformer operates on the principle of electromagnetic induction & consists of primary winding & Secondary winding.

→ Before performing calculations, gather the required parameters like V_P, N_P, I_P, V_S.

→ Calculate Secondary turns $(N_S) = (V_S/V_P) \times N_P$

→ Calculate Secondary current $(I_S) = (N_P/N_S) \times I_P$

→ Analyse the result.

10/10

RESULT: By following, we can calculate the turns and current in a Transformer. This can be adopted for any set of input values.

Teacher's Signature : ____________

Calculations:

$$\frac{V_2}{V_1} = K = \frac{N_2}{N_1}$$

$$N_2 = N_1 \times K$$

$$N_1 = 110$$

$$N_2 = \frac{1}{2} \times 110$$

$$N_2 = 55$$

Expt. No. 04 Page No.

Load test on Single phase induction motor.

AIM: To conduct load test on the given single phase induction motor & to plot its performance characteristics, (ie) electrical characteristics - speed, torque, slip, power factor & efficiency v/s output power.

APPARATUS REQUIRED:

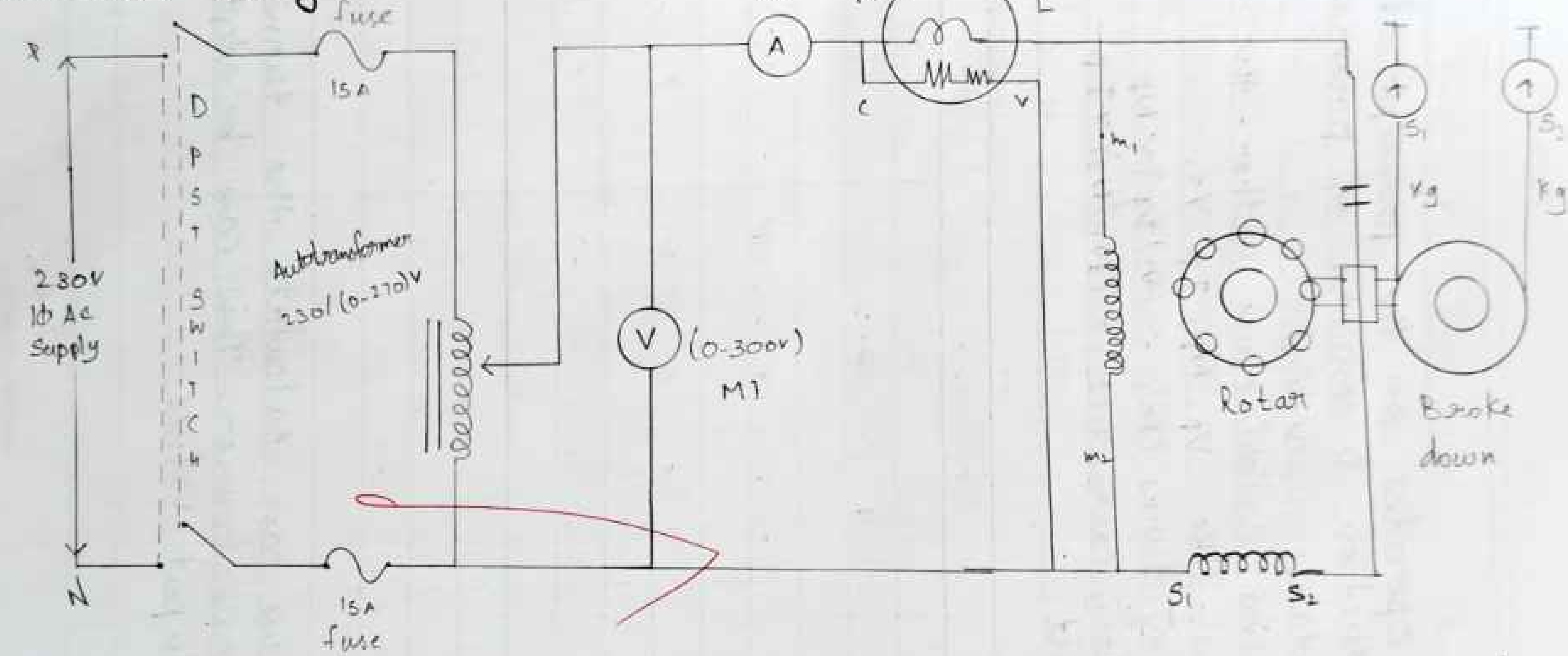
S.No	APPARATUS	SPECIFICATIONS	QUANTITY
1.	Voltmeter	(0-300V) MI	1
2.	Ammeter	(0-10A) MI	1
3.	Wattmeter	(300V, 10A) UPF	1
4.	Tachometer	(0-10000)RPM	1

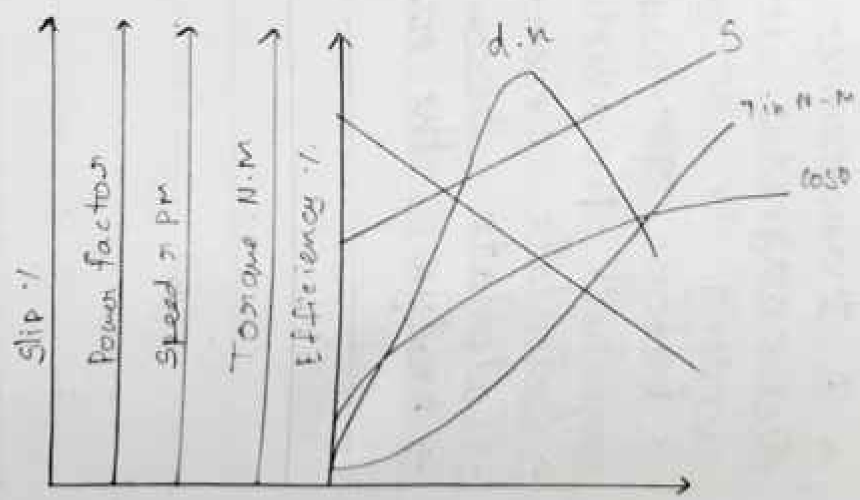
PROCEDURE:

→ Connections as Per circuit diagram.
→ The DPST switch is closed & single phase supply is given
→ Adjust the valiac to apply the voltage.
→ The procedure is repeated till rated current of the machine

Teacher's Signature :

Circuit Diagram:





→ The motor is unloaded, the auto transformer is brought to the min voltage.
→ The radius of the brake down is measured.

Formula:
→ circumference of brake drum = $2\pi R$
→ Input power watts (w)
→ Torque = $9.8 * R \times (S_1 - S_2)$ (N-m)
→ Output power = $\frac{2\pi NT}{60}$ (watts)
→ $(\eta) = O.P/I.P \times 100$
→ $\cos\phi = W/VI$
→ $S = \frac{N_S - N}{N_S} \times 100$

09/10

RESULT: Thus the load test was conducted on 1φ induction motor & be performance characteristics were down.

MF = 8

Volts (V)	I (Amps)	Speed N (rpm)	Wattmeter		Spring balance			Torque T(9.81xRxS)	O/P W Shaft	Power factor	% Efficiency
			Obs	Act	S_1	S_2	$S_1 \sim S_2$				
220	2.8	1425	60	240	0	0	0	0	0	0	0
220	3.0	1420	105	420	3	1	2	2.35	349.27	0.636	52.9
220	3.5	1415	150	600	6	2	4	4.70	696.08	0.779	90.4
220	4.0	1410	190	760	9	4	5	5.88	861.61	0.863	97.9
220	4.5	1400	220	880	10	5	5	5.88	861.61	0.888	87.0

Calculations:

Torque: T = 9.81 × R × (S_1 − S_2)

1) 9.81×0.12×0 = 0
2) 9.81×0.12×2 = 2.35
3) 9.81×0.12×4 = 4.70
4) 9.81×0.12×5 = 5.88
5) 9.81×0.12×5 = 5.88

Output power = 2π NT / 60

1) 2×3.14×1425×0/60 = 0
2) 2×3.14×1420×2.35/60 = 349.27
3) 2×3.14×1415×4.70/60 = 696.08
4) 2×3.14×1410×5.88/60 = 861.61
5) 2×3.14×1400×5.88/60 = 861.61

Power Output = W/VI = cos

1) 240/220×... = 0.~~636~~
2) 420/220×3.0 = 0.636
3) 600/220×3.5 = 0.779
4) 760/220×4.0 = 0.863
5) 880/220×4.5 = 0.888

Efficiency η = OP/IP

1) 0/220×2.8 = 0
2) 349.27/220×3.0 = 0.529×100 =
3) 696.08/220×3.5 = 0.904×100 =
4) 861.61/220×4.0 = 0.979×100 =
5) 861.61/220×4.5 = 0.870×100

Slip = $\frac{N_s - N}{N_s} \times 100$

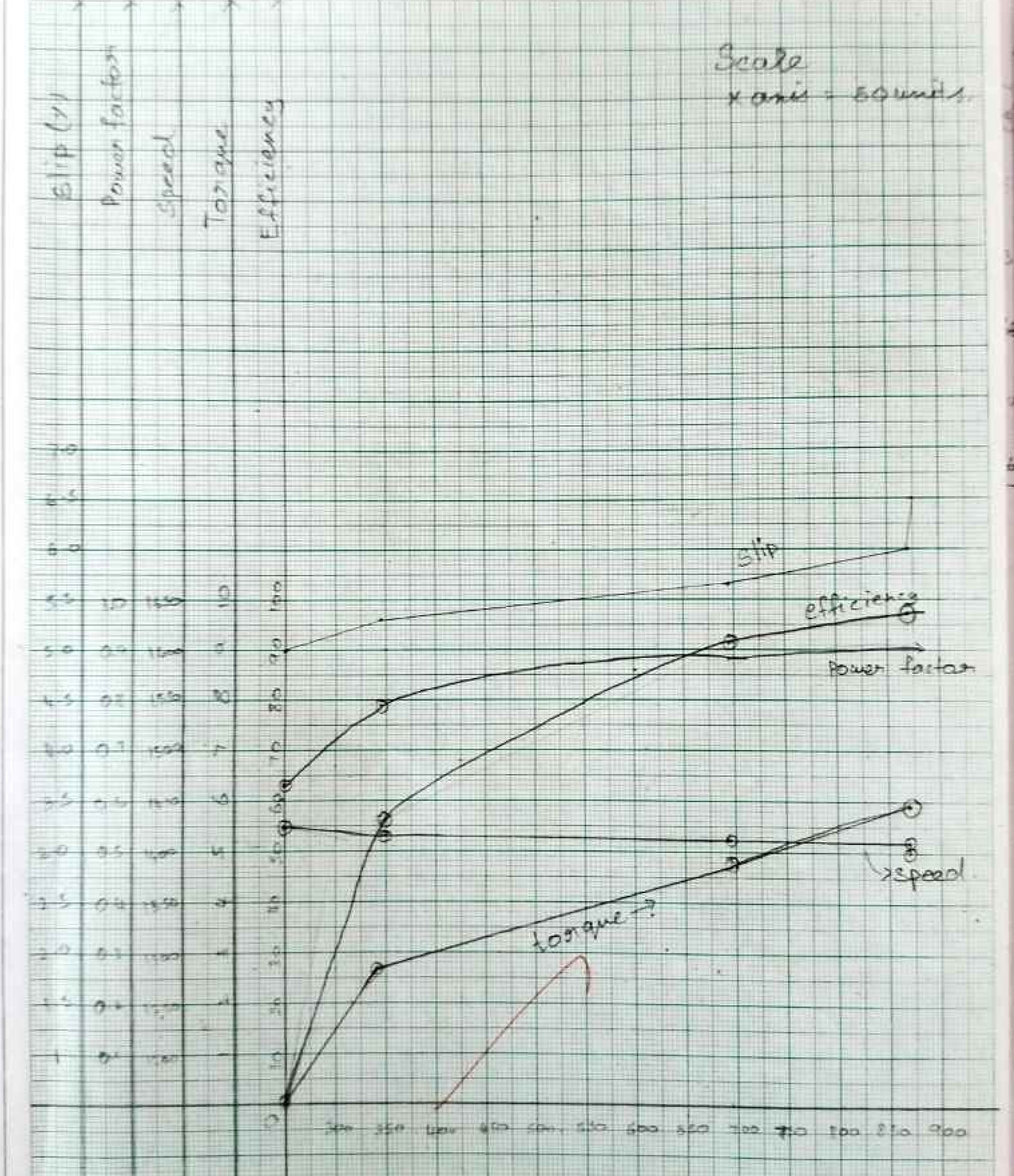
1) $\frac{1500-1425}{1500} \times 100$ = 0.05 = 5

2) $\frac{1500-1420}{1500} \times 100$ = 0.053×100 = 5.3

3) $\frac{1500-1415}{1500} \times 100$ = 5.66

4) $\frac{1500-1410}{1500} \times 100$ =

5) $\frac{1500-1400}{1500} \times 100$ = 6


Scale
x axis = 50 units
Slip (%)
Power factor
Speed
Torque
Efficiency
Slip
efficiency
Power factor
speed
torque

Measurement of power by two wattmeters Method.

AIM: 3 phase, three wire power measurement by using 2 wattmeter method for a balanced load in start connection.

PROCEDURE:

-> Watt meter UPF 600V, 1/2 Amps - 2 NOs.
-> Balanced resistive load 3phase, 3A - 1NOs
-> 3 phase variaac 415 V/470, 4A, 1NO's.
-> Digital AC Voltmeters 600V - 1no.

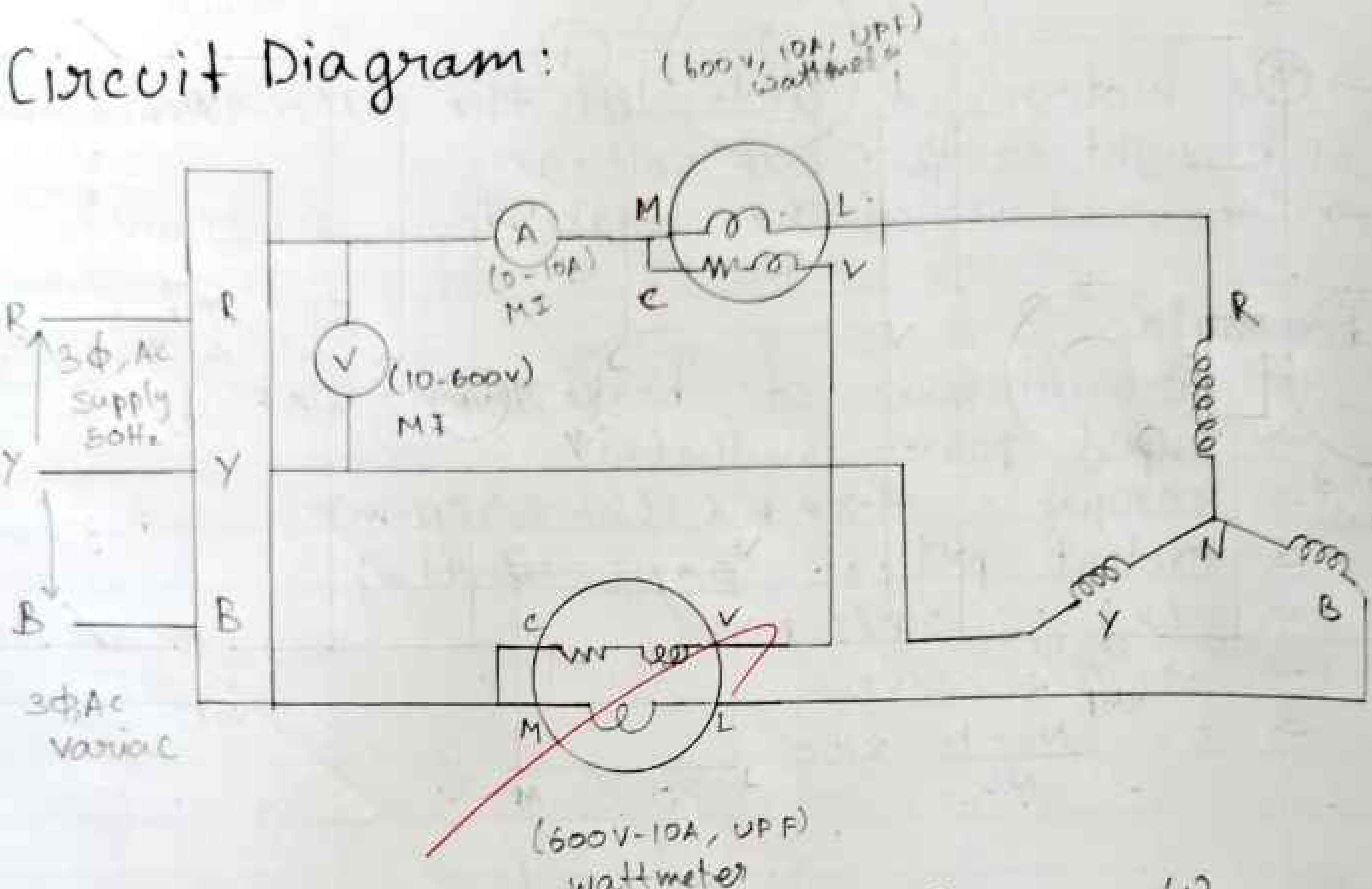
-> Connect. the load with help of switches & patch chords
-> Connect the 3 phase variac to the main supply
-> Connect the voltmeter across 2 phases.
-> Connect the circuit as shown below either in star connection.

10/10

RESULT: Hence, the power measured for a balanced load connected in star is the sum of both Watt meter.

Teacher's Signature :

Circuit Diagram:



$$\cos\phi = \frac{W}{V_L \times I_L}$$

MF = 8

S.No	VL	IL	W1 Obs	W1 Act	W2 Obs	W2 Act	P=W1+W2	Cosϕ	P=√3VLILcosϕ
1	415	2.5	110	880	0	0	880	0.84	871.5
2	415	3.0	155	1240	45	360	1600	1.28	1594
3	415	3.5	160	1280	50	400	1680	1.15	1670.37

1) $\frac{880}{415\times2.5} = 0.84$

2) $\frac{1600}{415\times3.0} = 1.28$

3) $\frac{1680}{415\times3.5} = 1.15$

1) $415\times2.5\times1\times0.84 = 871.5$

2) $415\times3.0\times1\times1.28 = 1594$

3) $415\times3.5\times1\times1.15 = 1670.37$

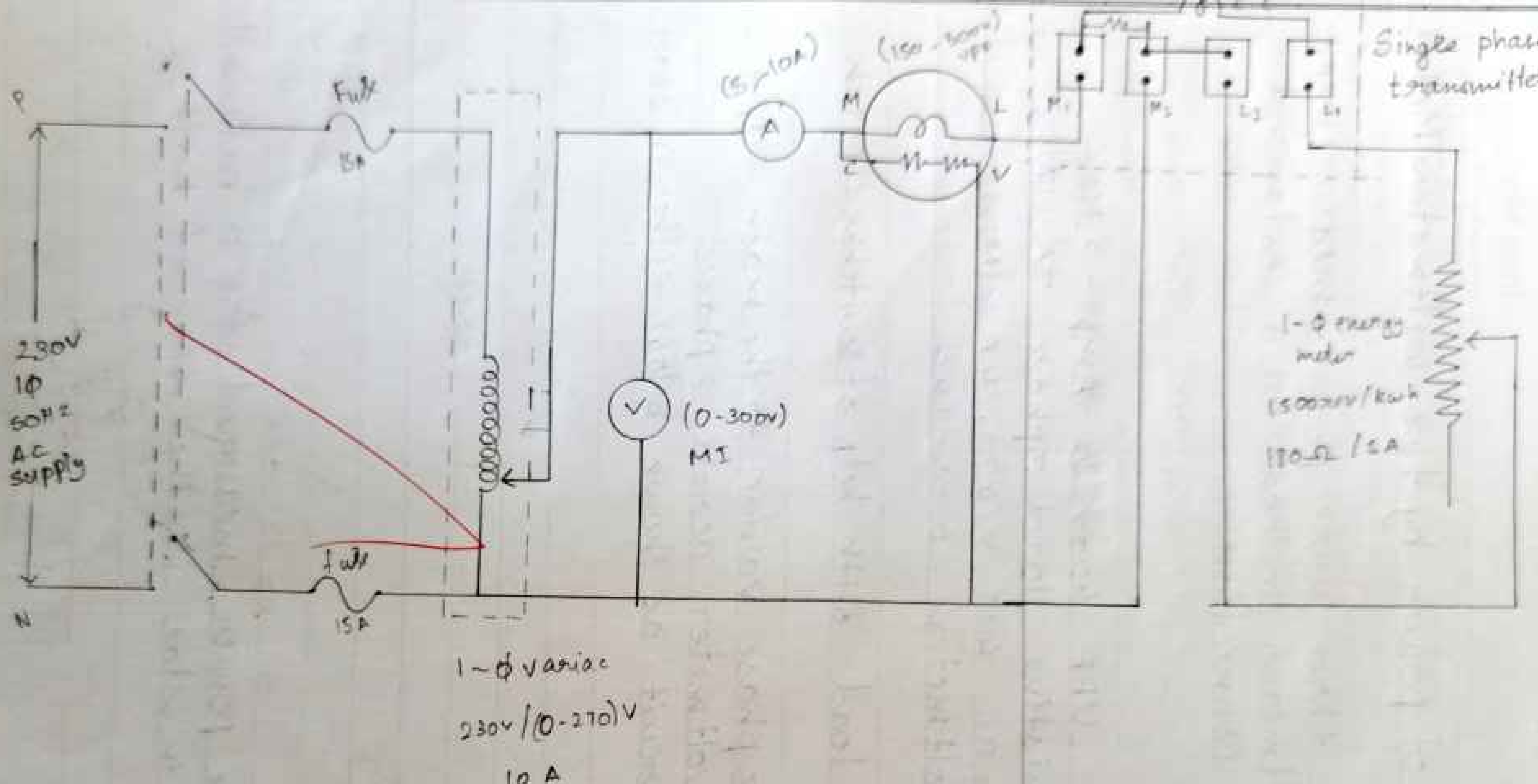
Calculate the energy consumption using the energy meter.

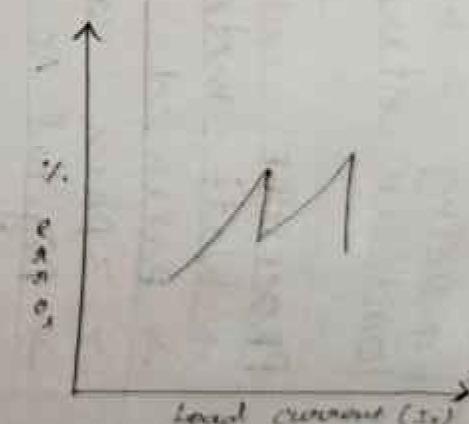
AIM: To calibrate & test the given single phase energy meter by direct loading.

APPARATUS REQUIRED:

S.No	Apparatus	Type	Range	Quantity.
1.	Single phase energymeter	Induction	1500 REV/KWH	1
2.	Wattmeter	UPR	300V/5A	1
3.	Voltmeter	MI	(0-300)V	1
4.	Ammeter	MI	(0-5)A	1
5.	Single phase variac	1-Φ	230V/(0-270)V, 10A	1
6.	Rheostat	WW	110Ω/5A	1
7.	Stopwatch	digital	-	1
8.	Connecting wires.	-	-	required.

Teacher's Signature :


P
N
230V
1Φ
50Hz
A.C supply
Fuse
15A
1-Φ variac
230V/(0-270)V
10 A
(0-300V)
MI
(5-10A)
(150-300V)
UPF
M
L
C
V
M1
M2
L1
L2
1-Φ energy meter
1500rev/kwh
170Ω/5A
Single phase transmitter


% error
Load current (I_L)

PROCEDURE:

→ Connect the circuit as per circuit diagram
→ keep the single phase variac at zero volt position
→ Now switch on the power supply.
→ Gradually vary the variac to apply the rated voltage (230v)
→ For diff values of load, notedown the readings of the ammeter, volt meter & time taken for 10 resolution
→ Gradually vary the variac, 10 minimum or zero volt position.
→ Switch of the supply.
→ Calculate observed reading, actual reading.
→ Draw the Graph.

10/10

RESULT: Hence the calibrate & test the sigle phase energy meter by direct loading is done.

TABULATION:

S.No	Voltmeter (V)	Ammeter (A)	Wattmeter (W)	Time for 5 rev	Theoretical Reading (E_1)	Practical Reading (E_2 kWh)	% Error $= \frac{E_2 - E_1}{E_1} \times 100$
1	230	0.5	20	41.63	13.87	0.231	-98%
2	230	1	40	38.38	12.79	0.426	-90%
3	220	2.0	65	25.60	8.53	0.462	-98%
4	220	2.5	70	24.07	8.02	0.468	-94%
5	220	3.0	85	17.64	5.88	0.416	-85%

CALCULATION:

Theoretical Reading

1) $E_1 = \frac{1200}{3600} \times 41.63 = 13.87$

2) $E_1 = \frac{1200}{3600} \times 38.38 = 12.79$

3) $E_1 = \frac{1200}{3600} \times 25.60 = 8.53$

4) $E_1 = \frac{1200}{3600} \times 24.07 = 8.02$

5) $E_1 = \frac{1200}{3600} \times 17.64 = 5.88$

Practical Reading

$E_2 = \frac{20 \times 41.63}{3600} = 0.231$

$E_2 = \frac{40 \times 38.38}{3600} = 0.426$

$E_2 = \frac{65 \times 25.60}{3600} = 0.462$

$E_2 = \frac{70 \times 24.07}{3600} = 0.468$

$E_2 = \frac{85 \times 17.64}{3600} \quad 0.4165$

Error(%)

1) $\frac{0.231 - 13.87}{13.87} \times 100 = -98\%$

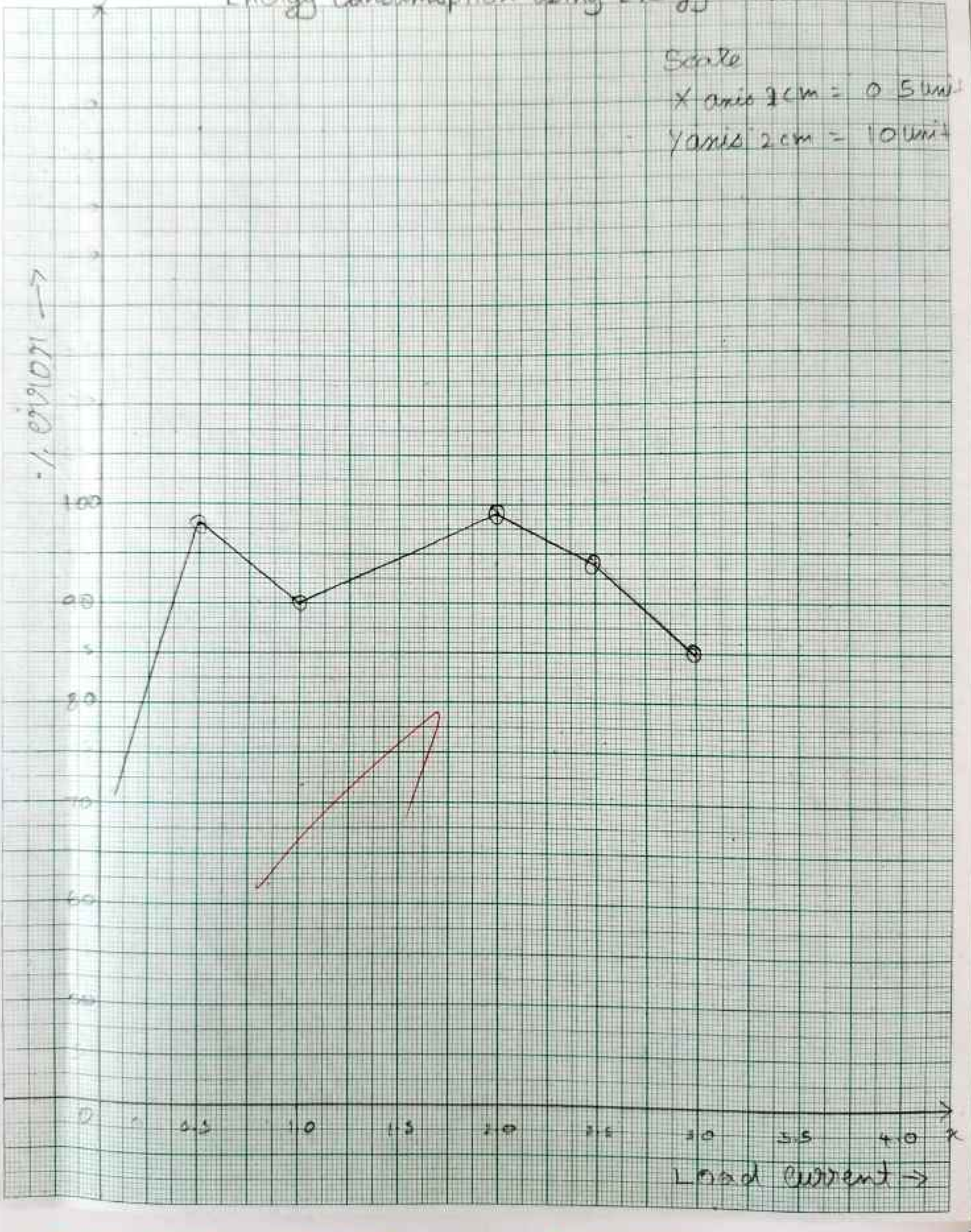
2) $\frac{0.426 - 12.79}{12.79} \times 100 = -90\%$

3) $\frac{0.462 - 8.53}{8.53} \times 100 = -98\%$

4) $\frac{0.468 - 8.02}{8.02} \times 100 = -94\%$

5) $\frac{0.916 - 5.88}{5.88} \times 100 = -85\%$

Energy Consumption using Energy Meter.



Load test on DC shunt motor.

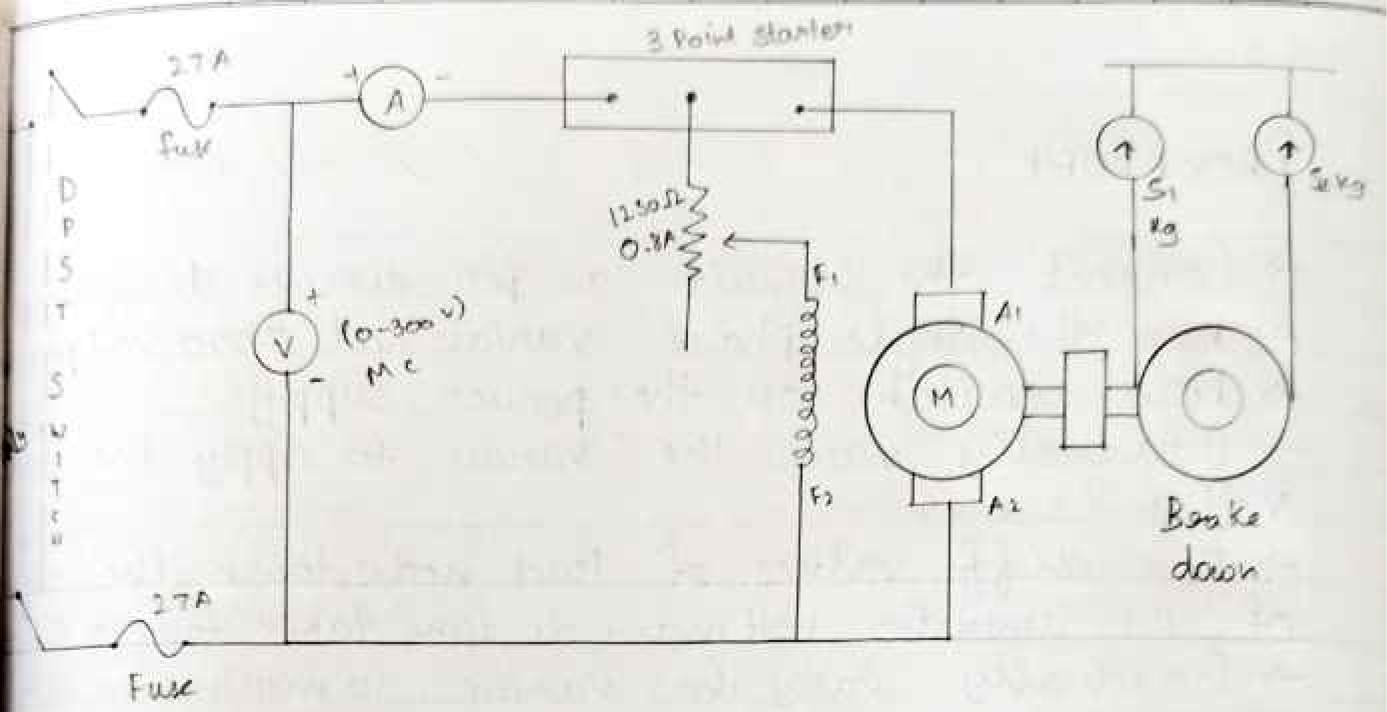
AIM: To conduct the brake load test on DC shunt motor and determine its performance characteristics.

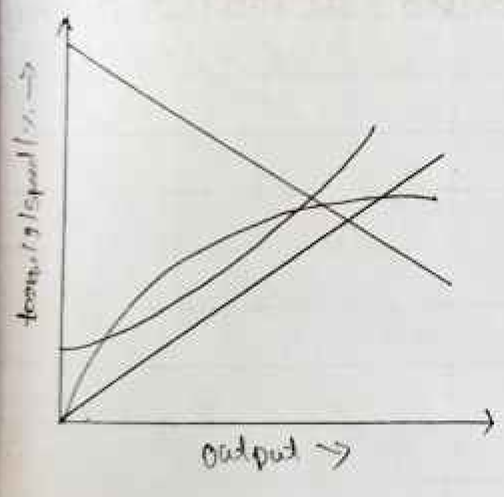
APPARATUS REQUIRED:

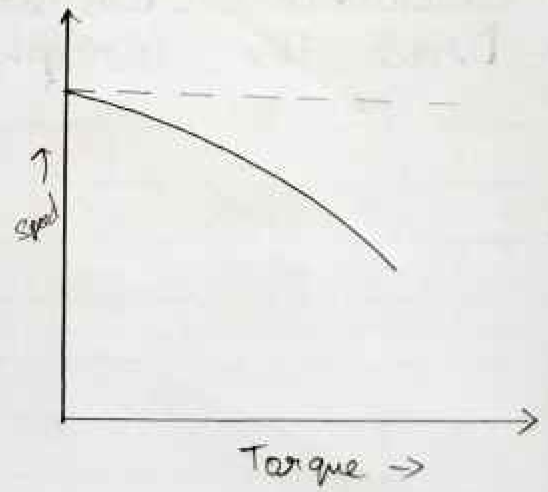
S.No	Apparatus	Range	Type	Quantity
1.	Ammeter	(0-20)A	Digital	1
2.	Voltmeter	(0-300)V	Digital	1
3.	Rheostar	370/1.7A	Wire wound	1
4	RPM meter	(0-9999) rpm	Digital	1
5	Connecting wires	-	-	As Required.

PROCEDURE:

→ Make the connections as shown in the circuit
→ Keeping the field rheostat at the minimum positions, switch on the supply and start the motor.
→ Adjust thee speed of the motor on no load to its rated value by means of the field.
→ Put the load by tightening the screws of the spring balances

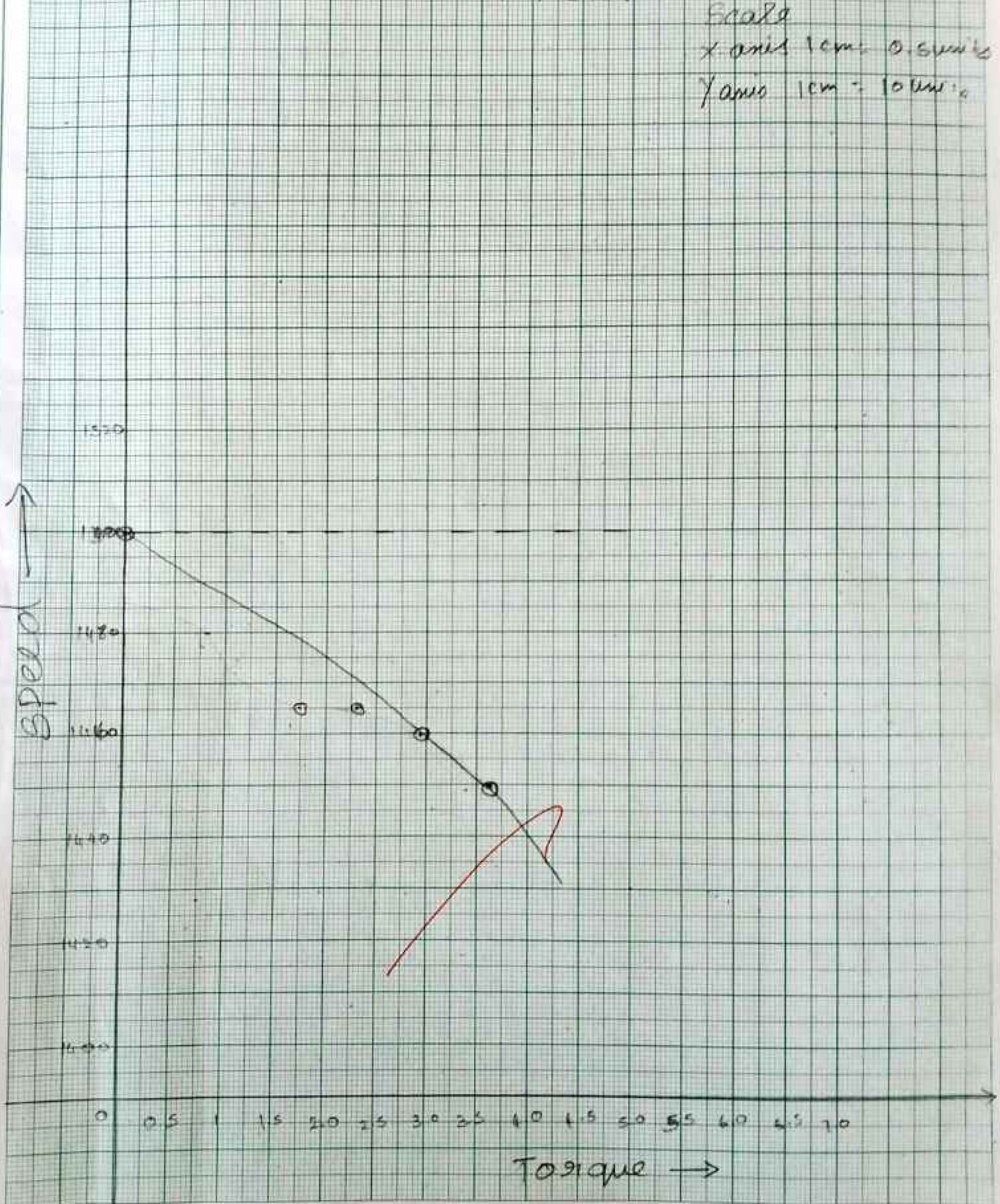


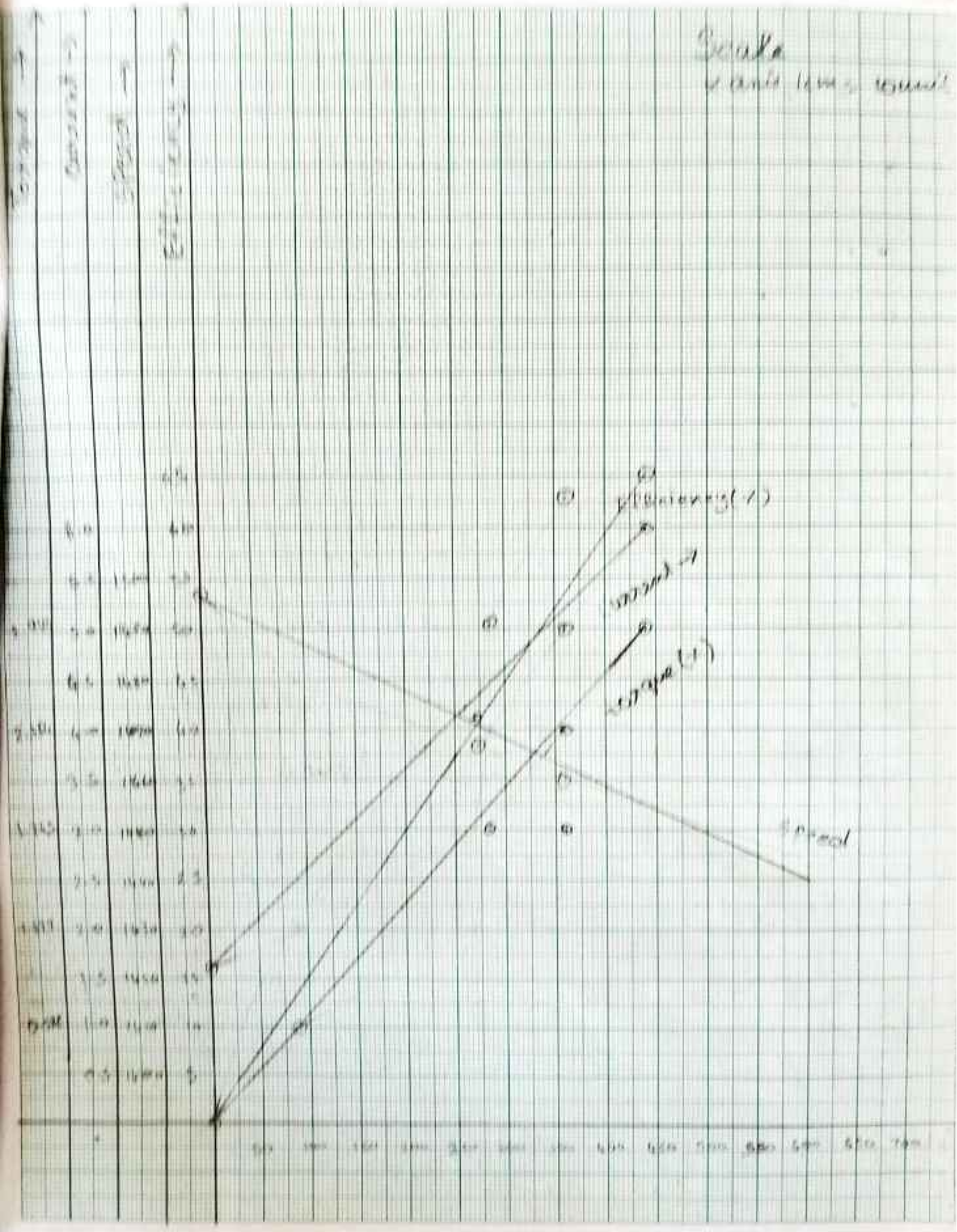




S.No	Voltage (V)	Current (I)	Speed rpm	Spring balance S1	S2	$S_1 - S_2$	F(S1-S2)×9.81	Torque (NM)	Output watt	Input watt	efficiency %
	225	1.6	1486	0	0	0	0	0	0	0	0
	223	2	1480	1	0.5	0.5	4.905	0.588	91.0	446	20.40
	221	3	1466	2	1	1	9.81	1.177	272.51	663	41.10
	220	4	1464	3	1.5	1.5	14.711	1.765	273.22	880	31.04
	218	5	1460	4	2	2	19.62	2.354	360.95	1090	33.11
	216	6	1455	5	2.5	2.5	24.52	2.942	449.57	1296	34.68

DC Shunt Motor





Scale
Speed

Date ....

Expt. No. .... Page No. ....

RESULT: Thus, the performance characteristics of DC shunt motor was obtained by connecting brake test.

10

Teacher's Signature :

Calculation:

$F = (S_1 - S_2) \times 9.81$

1) $0 \times 9.81 = 0$
2) $0.5 \times 9.81 = 4.905$
3) $1 \times 9.81 = 9.81$
4) $1.5 \times 9.81 = 14.71$
5) $2 \times 9.81 = 19.62$
6) $2.5 \times 9.81 = 24.52$

Torque $= 9.81 \times (S_1 - S_2) \times R$

1) $9.81 \times 0 \times 0.12 = 0$
2) $9.81 \times 0.5 \times 0.12 = 0.588$
3) $9.81 \times 1.0 \times 0.12 = 1.177$
4) $9.81 \times 1.5 \times 0.12 = 1.765$
5) $9.81 \times 2.0 \times 0.12 = 2.354$
6) $9.81 \times 2.5 \times 0.12 = 2.942$

Output power $= \dfrac{2\pi NT}{60}$

1) $2 \times 3.14 \times 1486 \times 0/60 = 0$
2) $2 \times 3.14 \times 1480 \times 0.588/60 = 91.0$
3) $2 \times 3.14 \times 1471 \times 1.177/60 = 272.51$
4) $2 \times 3.14 \times 1479 \times 1.765/60 = 273.22$
5) $2 \times 3.14 \times 1465 \times 2.354/60 = 360.95$
6) $2 \times 3.14 \times 1460 \times 2.942/60 = 449.57$

Input power $V.I$

1) $225 \times 1.6 = 0$
2) $223 \times 2 = 446$
3) $221 \times 3 = 663$
4) $220 \times 4 = 880$
5) $218 \times 5 = 1090$
6) $216 \times 6 = 1296$

Efficiency $n = \dfrac{\text{output}}{\text{input}}$

1) 0
2) $\dfrac{91.0}{446} = 20.40$
3) $\dfrac{272.51}{663} = 41.10$
4) $\dfrac{273.22}{880} = 31.04$
5) $\dfrac{360.95}{1090} = \cancel{0.3}\ 33.11$
6) $\dfrac{449.57}{1296} = 34.68.$

Find stability of a System using Routh Hurwitz Criterion.

AIM:

To determine the stability of the closed loop system using Routh Hurwitz criterion for the given polynomial characteristics

i) $S = s^4 + 2s^3 + 3s^2 + 4s + 5$

ii) $(S) = s^5 + 7s^4 + 6s^3 + 4s^2 + 8s + 56$.

TOOLS USED:

→ SciLab Software, PC

PROCEDURE:

→ Start the SCILAB software
→ Open Scinotes, Type the program
→ Save the file in current directory
→ Compile and run the program
→ Check the console window
→ stop the program.

PROGRAM:

```
clear;
clc;
xdel(winsid(1));
mode(0);
s = %s;
H = s^4 + 2s^3 + 3*s^2 + 4^s + 5
disp(H," The given :")
```

Teacher's Signature :

```
56 +8s +42s^2 +6s^3 +7s^4 +s^5
"The given characteristics equation 1-G(s)H(s)="
 1.         6.    8.
 7.         42.   56.
 28.        84.   0.
 21.        56.   0.
 9.3333333  0.    0.
 56.        0.    0.
"Rouths table="
From Rouths table, it is clear that the system is stable.
-->
```

```
5 +4s +3s^2 +2s^3 +s^4
"The given characteristics equation 1-G(s)H(s)="
 1.   3.   5.
 2.   4.   0.
 1.   5.   0.
-6.   0.   0.
 5.   0.   0.
"Rouths table="
From Rouths table, it is clear that the system is unstable.
-->
```

Date..............

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```
c = Coeff(H);
len = length(c);
r = routh_t(H);
disp(r, "Routh tables");
x=0;
for i=1;len
if(r(i,1)<0);
    x=x+1;
end
end
if(x>=1)
printf(" From Routh's table, stable);
else
 printf(" unstable");
```

10/10

6/1/2

RESULT:

Thus, the Stability of a system using routh's herwitz criterion is verified successfully.

Teacher's Signature :

Calculation:

$s^4 + 2s^3 + 3s^2 + 4s + 5$

s^4 :	1	3	5
s^3 :	2	4	0
s^2 :	1	5	0
s^1 :	-6	0	0
s^0 :	5	0	0

$$s^2 : \begin{vmatrix} 1 & 3 \\ 2 & 4 \end{vmatrix} = \frac{6-4}{2} = 1$$

$$s^1 \begin{vmatrix} 1 & 5 \\ 2 & 0 \end{vmatrix} = \frac{10-0}{2} = 5$$

$$s^1 \begin{vmatrix} 2 & 4 \\ 1 & 5 \end{vmatrix} = \frac{4-10}{1} = -6$$

$$s^0 = \begin{vmatrix} 1 & 5 \\ -6 & 0 \end{vmatrix} = \frac{0+30}{6} = 5$$

∴ The System is unstable (two sign changes)

$s^5 + 7s^4 + 6s^3 + 42s^2 + 8s + 56$

s^5 :	1	6	8
s^4 :	7	42	56
s^3 :	0	0	0
s^3	28	84	0
s^2	21	56	0
s^1 :	9.33	0	0
s^0 :	56	0	0

$7s^4 + 42s^2 + 56 = 28s^3 + 84s^2$

$$s^2 = \begin{vmatrix} 7 & 42 \\ 28 & 84 \end{vmatrix} = \frac{1176-588}{28} = 21$$

$$\begin{vmatrix} 7 & 56 \\ 28 & 0 \end{vmatrix} = \frac{1568-0}{28} = 56$$

$$s^1 : \begin{vmatrix} 28 & 84 \\ 21 & 56 \end{vmatrix} = \frac{1764-1568}{21} = 9.33$$

$$s^0 : \begin{vmatrix} 21 & 56 \\ 9.33 & 0 \end{vmatrix} = \frac{522.48-0}{9.33} = 56$$

∴ The System is stable.

Generation of common discrete time Signals.

AIM:
Generate & plot the unit impluse signal unit Step signal, unit Ramp Signal, exponential signal for each signal write the SCILAB CODE to generate the signal plot the signal and Label

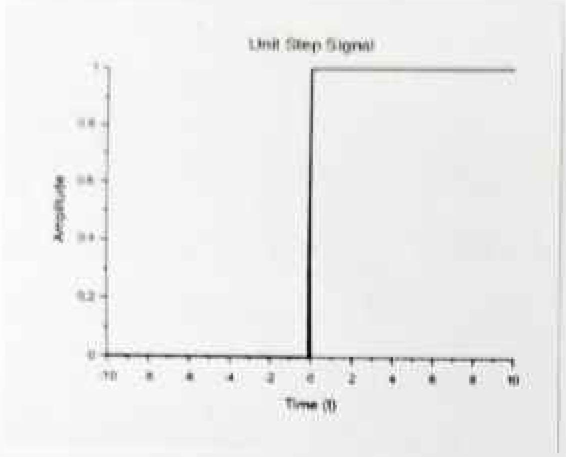
SOFTWARE REQUIRED:
-> Scilab 6.1.0

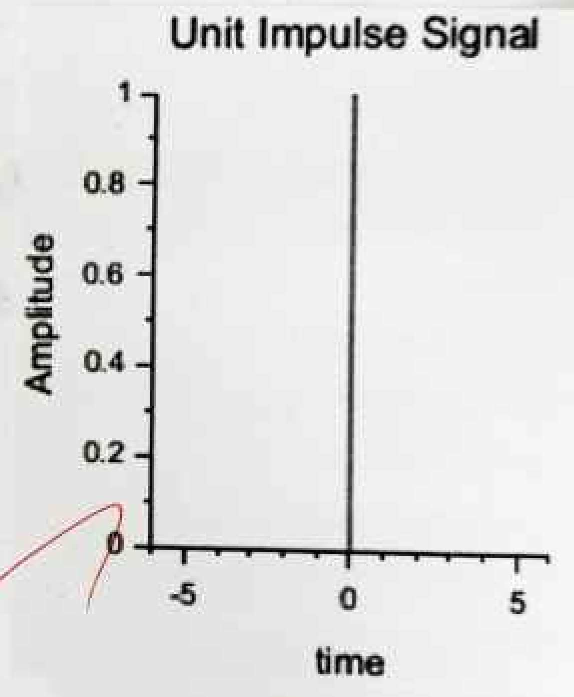
PROCEDURE:
-> Start the Scilab Program
-> Open scinotes type the program & save the Program in current directory.
-> Compile & run the program
-> If any error occurs in the Program, correct the error & run the program.
-> For the output see the console window
-> Stop the program

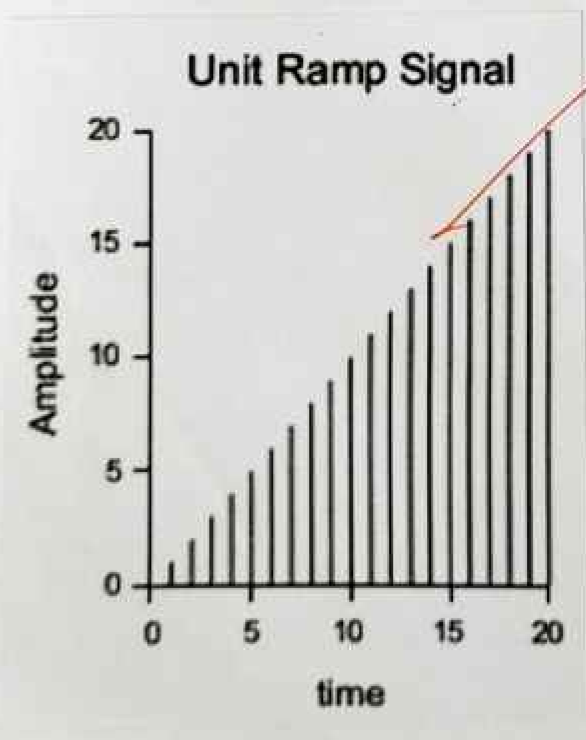
PROGRAM:

a) unit step signal	b) unit impulse signal
clear;	clear;
close;	close;
N = 5;	t1 = -5 : 5;
t1 = -5 : 51	x - Impulse = zeros(1, length (t1
x2 = [zeroes (1, N), ones(1, N+1)];	x - impulse (final (t1 = =d) = 1)
subplot (2, 4, 2);	subplot (2, 4, 6);

Teacher's Signature :


Unit Step Signal
Amplitude
Time (t)


Unit Impulse Signal
1
0.8
0.6
0.4
0.2
0
Amplitude
-5
0
5
time


Unit Ramp Signal
20
15
10
5
0
Amplitude
0
5
10
15
20
time

Date ....

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```
Plots 2d 3(t1,x2);
 xlabel ("time");
 Ylabel("Amplitude");
 title ("unit steps");
```

c) Unit Ramp Signal

```
clear;
close;
N= 5
t1= -5:5;
x1 = [zerose(1,length(t1)];
x-impulse(find(t1==d)=1;
  subplot (2,4,6);
   plot 2d3(t1,x-implux)
    xtabe ("time");
   ylabel("Amplitude");
  title ("unit impuls");
```

e) ~~Exponential~~ Signal

```
~~clear;~~
~~close;~~
t1= 0:10;
x-exponential = expt(-t1);
  Subplot (2,4,6);
```

```
plot 2d 3(t1, x-impulse);
 xlabel("time");
 ylabel("Amplitude");
title("unit impulse");
```

d) Unit ~~Ramp~~ sinosidal Signal

```
N = 5;
t1 = -5:5;
x1 = [zeroes(1,N],0:N]:
  subplot(2,4,4);
 Plot 2d3(t1,x4);
  xlabel ("time");
  ylabel ("Amplitude")
  title ("Ramp Signal");
```

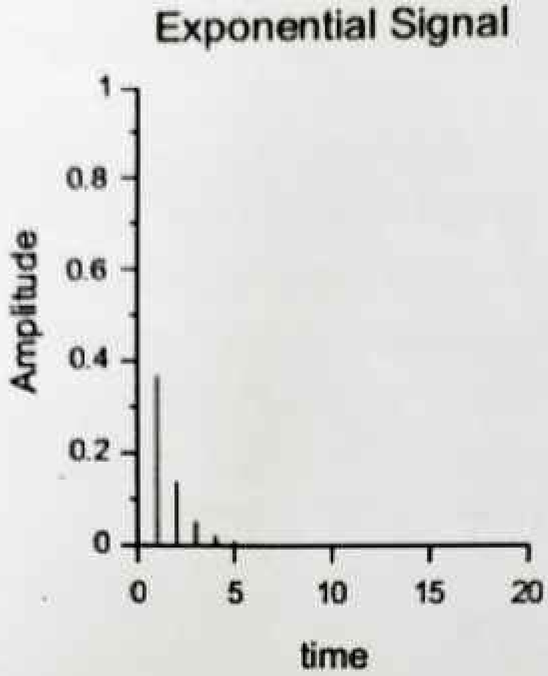
```
plot 2d3(t1,x-eponential);
x label ("time");
y label ("Amplitude);
 title ("Exponential Signal");
```

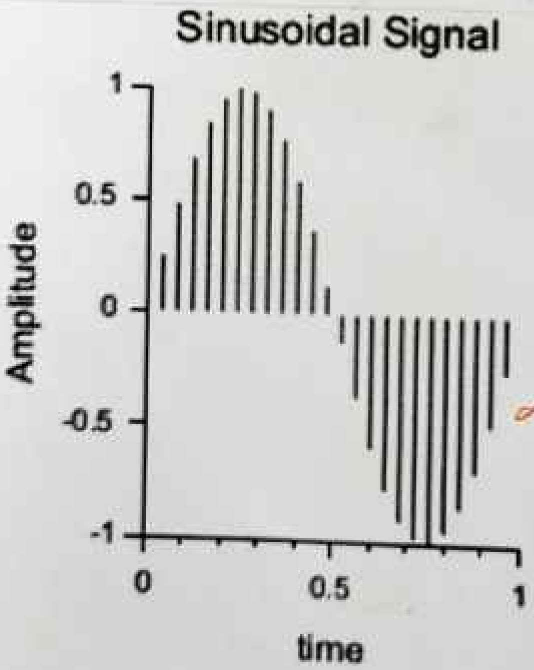
9/10

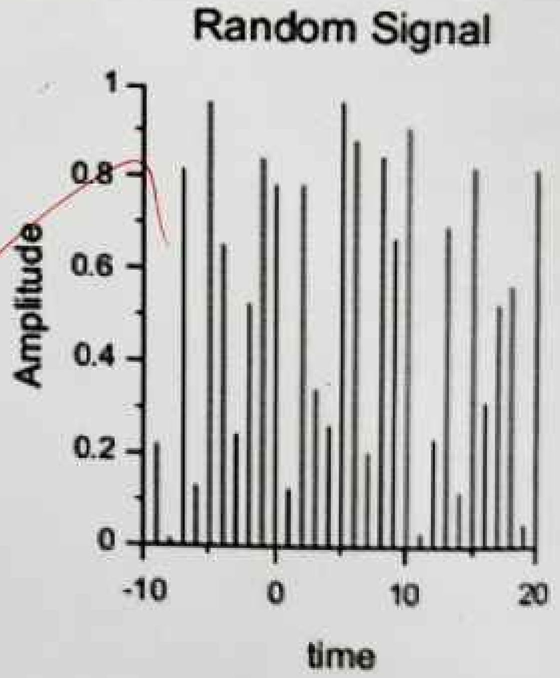
RESULT:

Thus, the program was executed successfully.

Teacher's Signature : ____________


Exponential Signal
Amplitude
time
1
0.8
0.6
0.4
0.2
0
0
5
10
15
20


Sinusoidal Signal
Amplitude
time
1
0.5
0
-0.5
-1
0
0.5
1


Random Signal
Amplitude
time
1
0.8
0.6
0.4
0.2
0
-10
0
10
20

DIT-FFT & DIF-FFT Algorithm

AIM:

To compute the DFF of the given sequence
(i) x [n] = [1,-1,-1,-1,1,1,1,-1] using DIT-FFT Algorithm
(ii) x [n] = [1,2,3,4,4,3,2,-1] using DIF-FFT Algorithm.

SOFTWARE USED:

→ Scilab 6.1.0

PROGRAM:

i) DIT-FFT Algorithm

```
clear;
close;
cls;
x=[1,-1, -1,-1,1,1,1-1]
//FFT comptation
x=fft(x,-1);
disp(x;x(z)=1);
```

ii) DIF-FFT Algorithm.

```
clear;
clc;
close;
x=[1,2, 3,4,4,3,2,+1];
// FFT computation.
x=fft(x,-1);
disp(x,x(z)=');
```

RESULT: Thus, the program was executed successfully.

10
$\frac{6}{6}$ 12

```
        column 1 to 7
 0. + 0.i  -1.4142136 + 3.4142136i   2. - 2.i   1.4142136 - 0.5857864i   4. + 0.i   1.4142136 + 0.5857864i   2. + 2.i
        column 8
-1.4142136 - 3.4142136i
"X(z) = "

-->
```

```
        column 1 to 7
 20. + 0.i  -5.8284271 - 2.4142136i   0. + 0.i  -0.1715729 - 0.4142136i   0. + 0.i  -0.1715729 + 0.4142136i   0. + 0.i
        column 8
-5.8284271 + 2.4142136i
"X(z) = "

-->
```

Design a filter using the transformation method.

AIM:

To design a filter using the transformation

(a) Bilinear transformation

(b) Impulse invariant transformation.

SOFTWARE USED:

→ Scilab 6.1.0

PROGRAM:

(a) Bilinear transformation

```
clear;
clc;
close;
s = %s;
z = %z;
Hs = (s^2 + 4.525)/(s^2 + 0.692*s + 0.504);
T = 1
Hz = horner(Hs,(2/T)*(z-1)/(z+1));
disp(Hz, 'H(z) =');
```

b) Impulse invariant transformation.

```
clear;
clc;
close;
s = %s;
T = 0.2;
```

Scilab 2025.0.0 Console

```
"H(z) = "
 1.4478601 +0.1783288z +1.4478601z^2
 ------------------------------------
       0.5298913 -1.1875z +z^2
```

Scilab 2025.0.0 Console

```
"Factorized HS = "
(1): [rational]
(2): [rational]
"HZ = "
        0.2014254z
 -------------------------
 0.246597 -1.0381995z +z^2

-->
```

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```
HS = 10'(s^2+7s+10);
ette = pfss(Hs);
disp(ette,'factorised HS = ');
p1 = -5;
p2 = -2;
z = %z;
HZ = T*((-3.33/(1-%e^(p1*T)*z^(-1)))+(3.33/(1-%e^(p2*T)*z^(-1))));
disp(Hz, 'Hz = ');
```

RESULT:

Thus, the program was executed successfully

Teacher's Signature : ____________

Design the following Butterworth filters

AIM:
To design a Butterworth filter for processing audio singnals that atutenuates frequencies abone 0.2π 0.2/pi 0.2.π radius

SOFTWARE USED:
→ Scilab 6.1.0

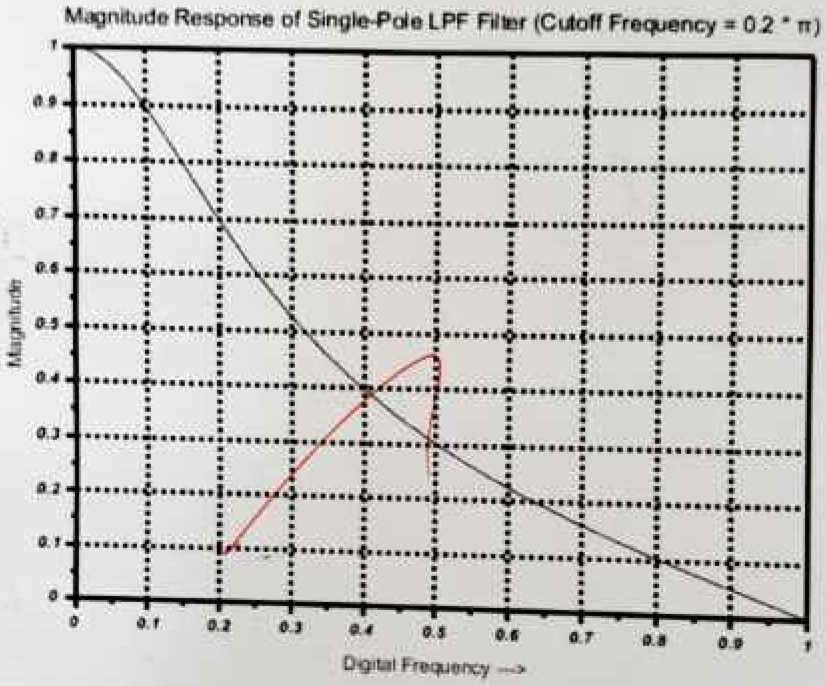
PROGRAM:
a) First Order Butterworth Low Pass Filter.

```
clear;
clc;
close;
s = poly(0,'s')
Omegac = 0.2*%pi;
H= Omegac/(s+ Omegac);
T=1; / Sampling period T=1 second.
z= poly (0,'z');
Hz = horner (H,(2/T)+((z-1)/(z+1)
Hw = frmag (Hz(2), Hz(3), 512);
    w= 0 : %pi/511 : %pi;
        a= gca();
        a.foreground = 1;
        a.front_style = 9;
        x.grid(1)
        xtitle ('Magnitude Response of Single Pole LPF");
        Disp frequency -->; Magnitude');
```

Scilab 2025.0.0 Console

```
 "Hz (Digital Filter):"
  0.6283185 +0.6283185z
  ---------------------
  -1.3716815 +2.6283185z

-->
```

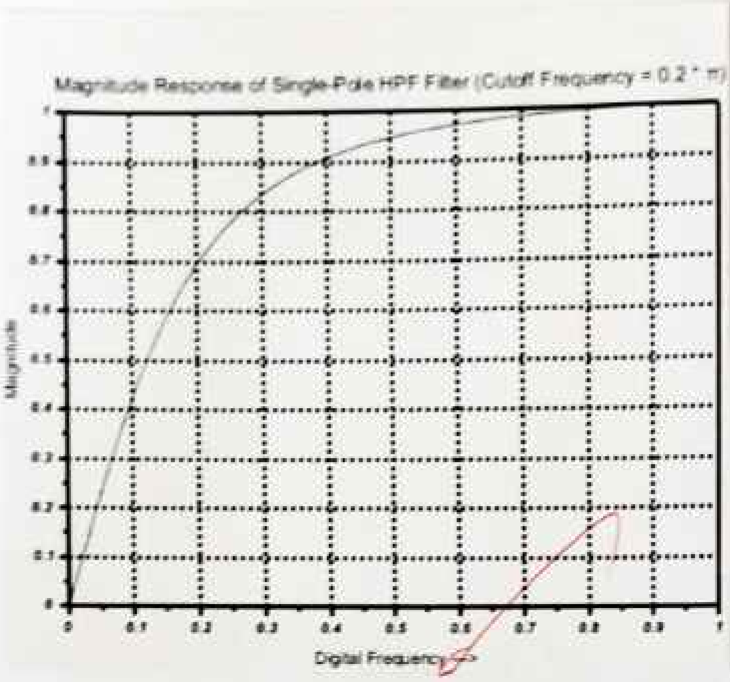


b) High Pass filter using Digital filter Transformation

```
clear;
clc;
close;
S=ploy(0.'s');
Omegac =0.2*%pi;
T=1 ;//
z=poly(0,'z');
Hz_LPF =-(cos((omega c+Omegac)/2)/((Omega c-Omegac)/2));
HW=frmag(Hz_HPF(2),Hz_HPF(3),(512);
 w=0%pi/511:%pi;
 a=gac(i);
 a.thicknes =2;
 a.foreground =1;
 a.font_style =9;
xtitle("Magnitude Response of single pole")
disp("Hz-HPF", Hz-HPF);
```

c) BPF HR Filter

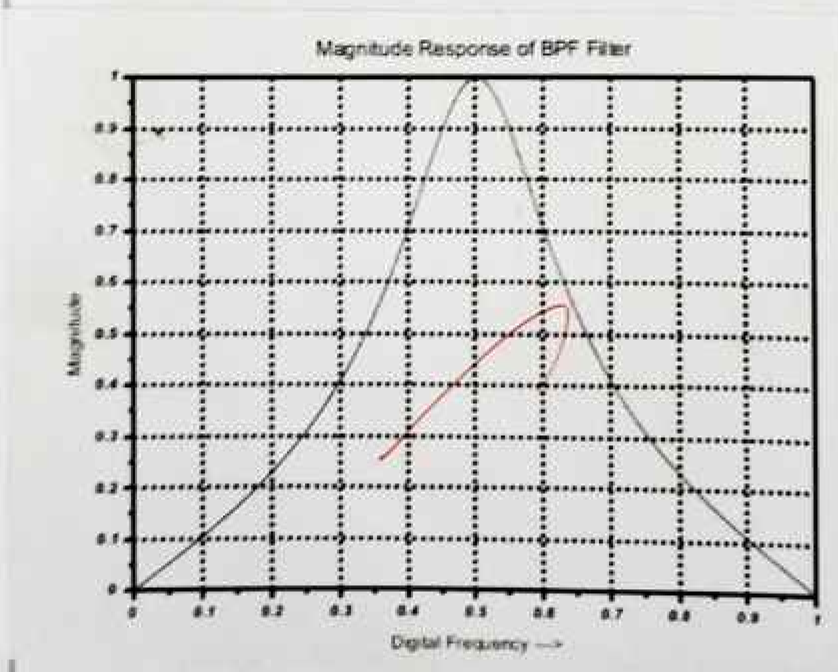
```
clear;
clc;
close;
Omegac =p.2%pi;
Omegaed =(2/5)*%pi;
Omega v=(3/5)*%pi;
z=poly(0,'z');
H_LPF =(0.245)*(H(z+1))/(1-0.509*(z-1))
disp("Hz-BPF", Hz-BPF);
```




```
Scilab 2025.0.0 Console

"HZ_HPF (High-Pass Filter):"
 -0.7484757 +0.7484757z
 ----------------------
      -0.4969514 +z

-->
```



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d) Band - stop filter:

```
clear ;
clc;
close;
omega P = 0.2 %. Pi ;
omega L = (2/5) * %. Pi
Z = Poly ( 0, 'z');
Num = ((z^2) - ((2+alpha / (H(c) * z) + ((H k) / Hk)));
H 2 BSF = hopner( H - LPF, NUM / DEN)
H W = freqmag ( H Z - BSF (2), Hz, BSF (3), 512);
w = 0 ; %. pi/5/1 : %. Pi ;
Plot (w / %. Pi, Hw)
a = gac ();
x grind (1)
Disp("H Z, BSF", H8 - BSF);
```

10/10

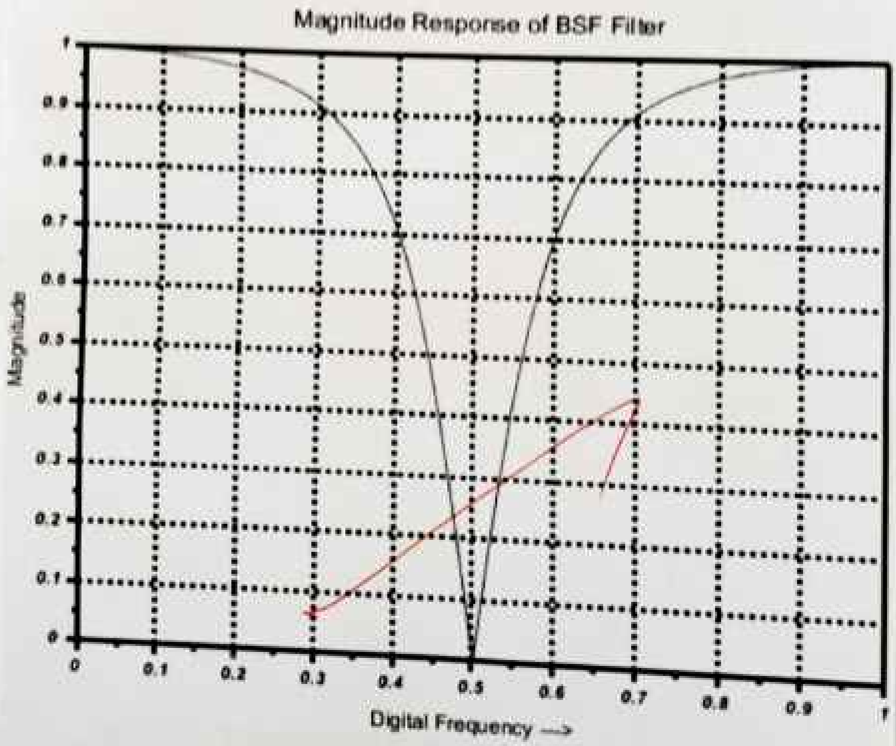
RESULT:

Thus the program was executed Successfully.

Teacher's Signature : ____________

```
Scilab 2025.0.0 Console
 "HZ_BSF"
   0.7534875 -9.702D-17z +0.7534875z^2
   ------------------------------------
        0.5100505 -9.722D-17z +z^2

-->
```



Date ....

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Page No. ....

Three Phase Induction Motor

AIM:

To Study the function of three phase induction motor driver E-mobility System

APPARATUS REQUIRED:

S.No	Requirement	Quantity
1.	750W Three Phase induction motor	1 No.
2.	Panel with DC Voltmeter, Ammeter AC meter.	1No
3.	750W variable frequency AC Drive(VFD)	1No
4.	Battery Emulator /DC Drive	1No
5.	Human Machine Interface	1No
6.	12 V Alternator with EV battries	1No.

PROCEDURE:

→ Give Ac Supply to Meter Battery Emulator/DC Drive

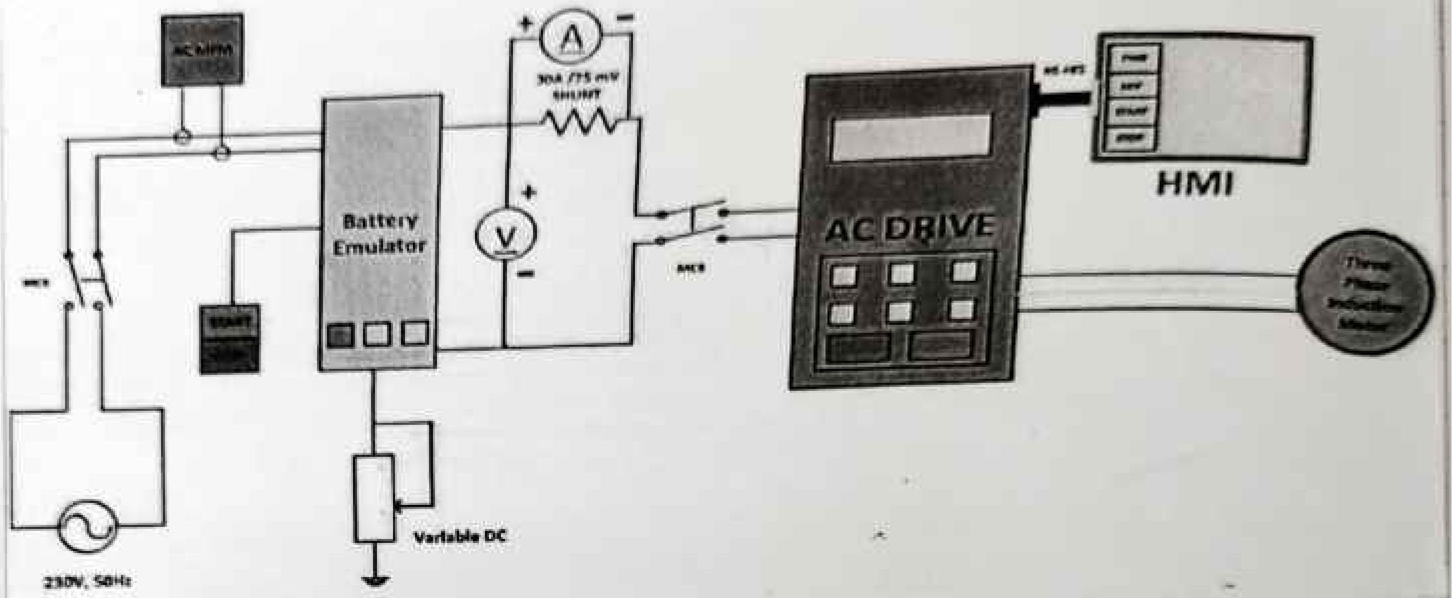
→ Fully Rotate Potentiometer of DC Control connected with Battery

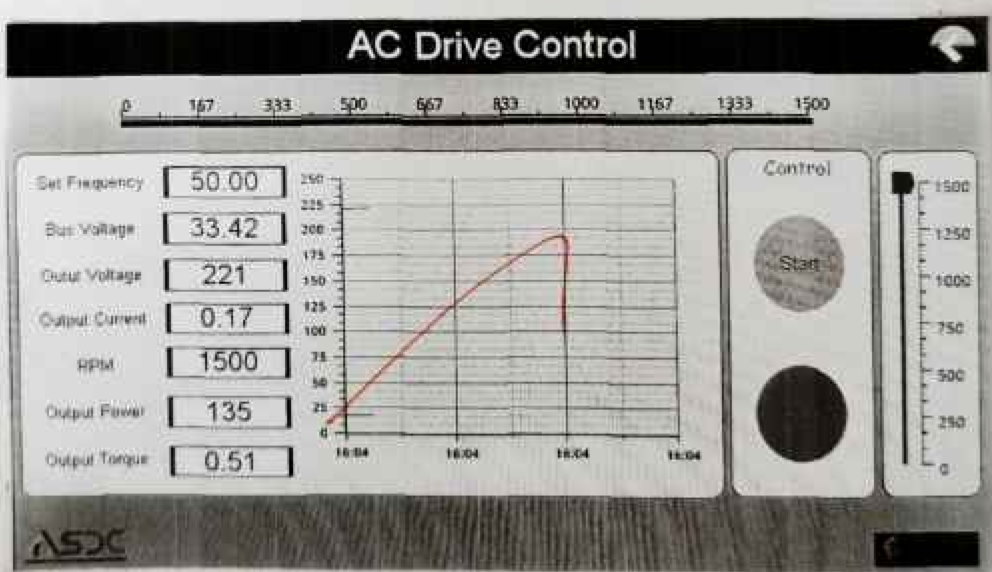
→ Select Forward/Reverse Mode using HMI

→ Vary the Frequency using FD

Teacher's Signature : ____________

Three Phase AC Induction Motor Based Model Connection Diagram





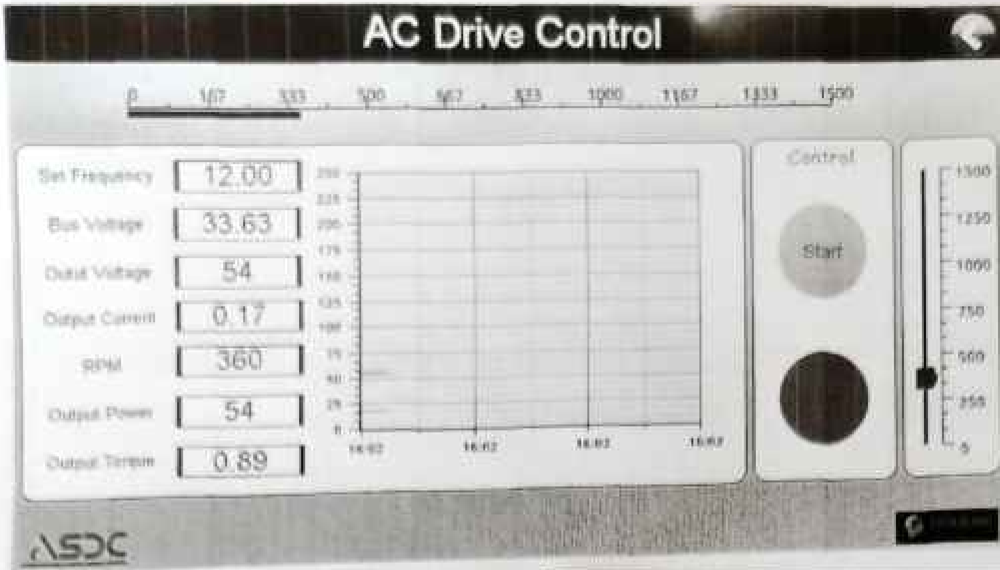
-> Connect 12 V Battery in Exciation Panel
-> Calculate different values given on the below Table.

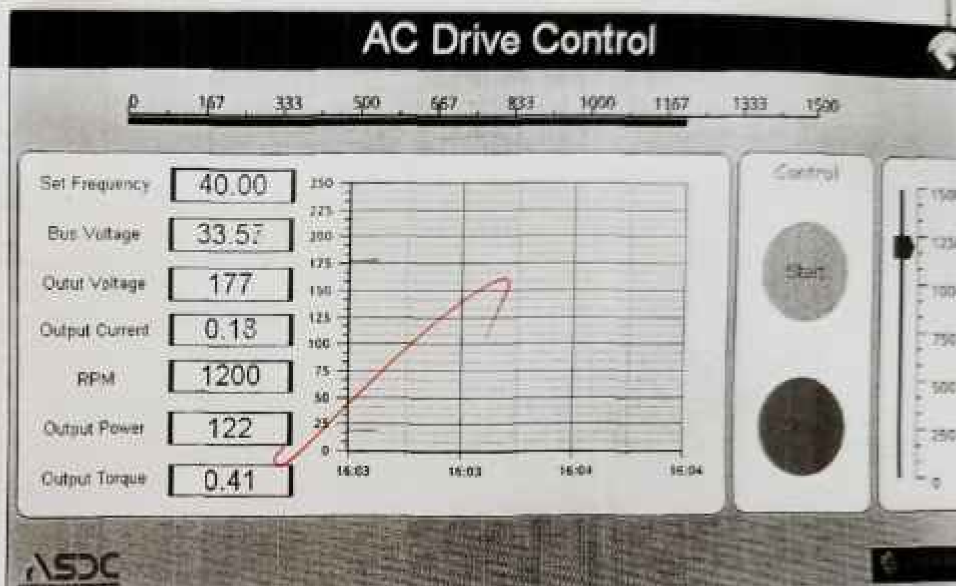
10/10
6/12

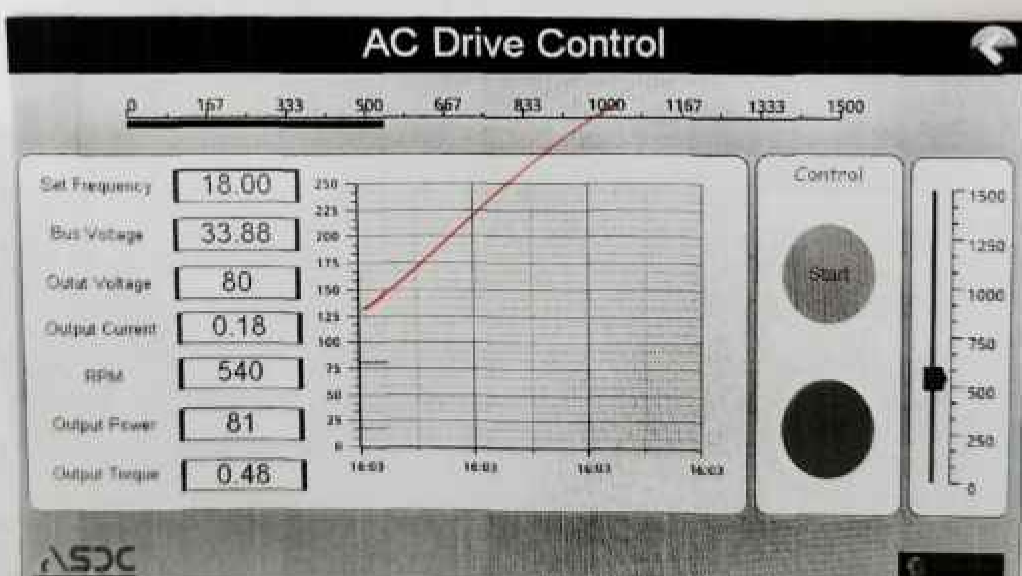
RESULT:

Thus the three phase induction motor Drive System in Emobility is Performed Successfully.

Teacher's Signature : ____________


AC Drive Control
0
167
333
500
667
833
1000
1167
1333
1500
Set Frequency
12.00
Bus Voltage
33.63
Outut Voltage
54
Output Current
0.17
RPM
360
Output Power
54
Output Torque
0.89
Control
Start
ASDC


AC Drive Control
0
167
333
500
667
833
1000
1167
1333
1500
Set Frequency
40.00
Bus Voltage
Outut Voltage
177
Output Current
0.13
RPM
1200
Output Power
122
Output Torque
0.41
16:03
16:03
16:04
16:04
Control
Start
ASDC


AC Drive Control
0
167
333
500
667
833
1000
1167
1333
1500
Set Frequency
18.00
Bus Voltage
33.88
Outut Voltage
80
Output Current
0.18
RPM
540
Output Power
81
Output Torque
0.48
Control
Start
ASDC

Verification of Ohm's Law and Kirchoff's law

a)

AIM:

To verify ohm's law for given resistive network.

APPARATUS REQUIRED:

S.No	APPARATUS NAME	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 & wires	-	Required.

PROCEDURE:

→ Make the connection as per circuit diagram

→ Switch ON the Power supply to the RPS and apply a volage

→ Adjust the rheostat in steps & takedown the readings of ammete

→ Determine and plot the slop of V-I graph.

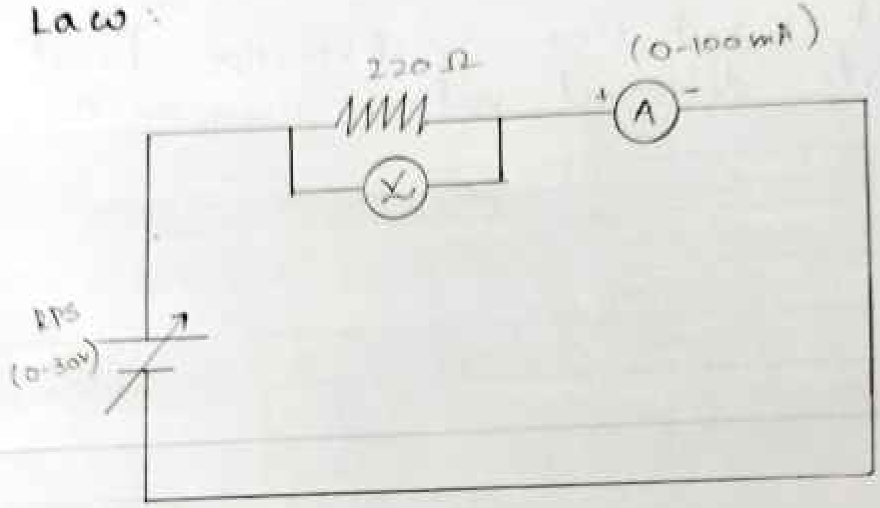
RESULT:

Thus, the Ohm's law is verified for the given circuit.

Teacher's Signature : ____________

Circuit Diagram:

OHM's Law:



Supply	I	V	Const^n	Theoretical Constant
3	2	3.5	1 KΩ	1.75
6	4	5.6	1 KΩ	1.37
8	6	7.5	1 KΩ	1.25
10	8	10	1 KΩ	1.25

Calculations

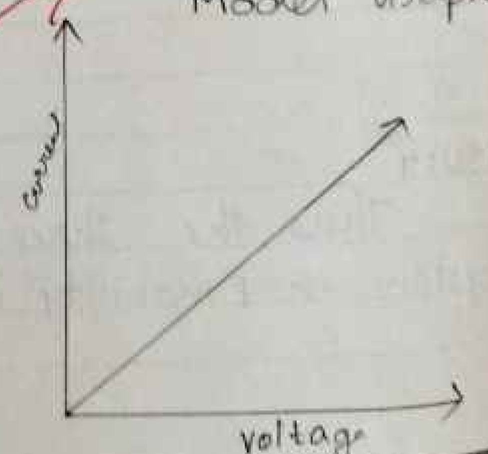
1) $R = \frac{3.5}{2} = 1.75 K\Omega$

2) $R = \frac{5.5}{4} = 1.37 K\Omega$

3) $R = \frac{7.5}{6} = 1.25 K\Omega$

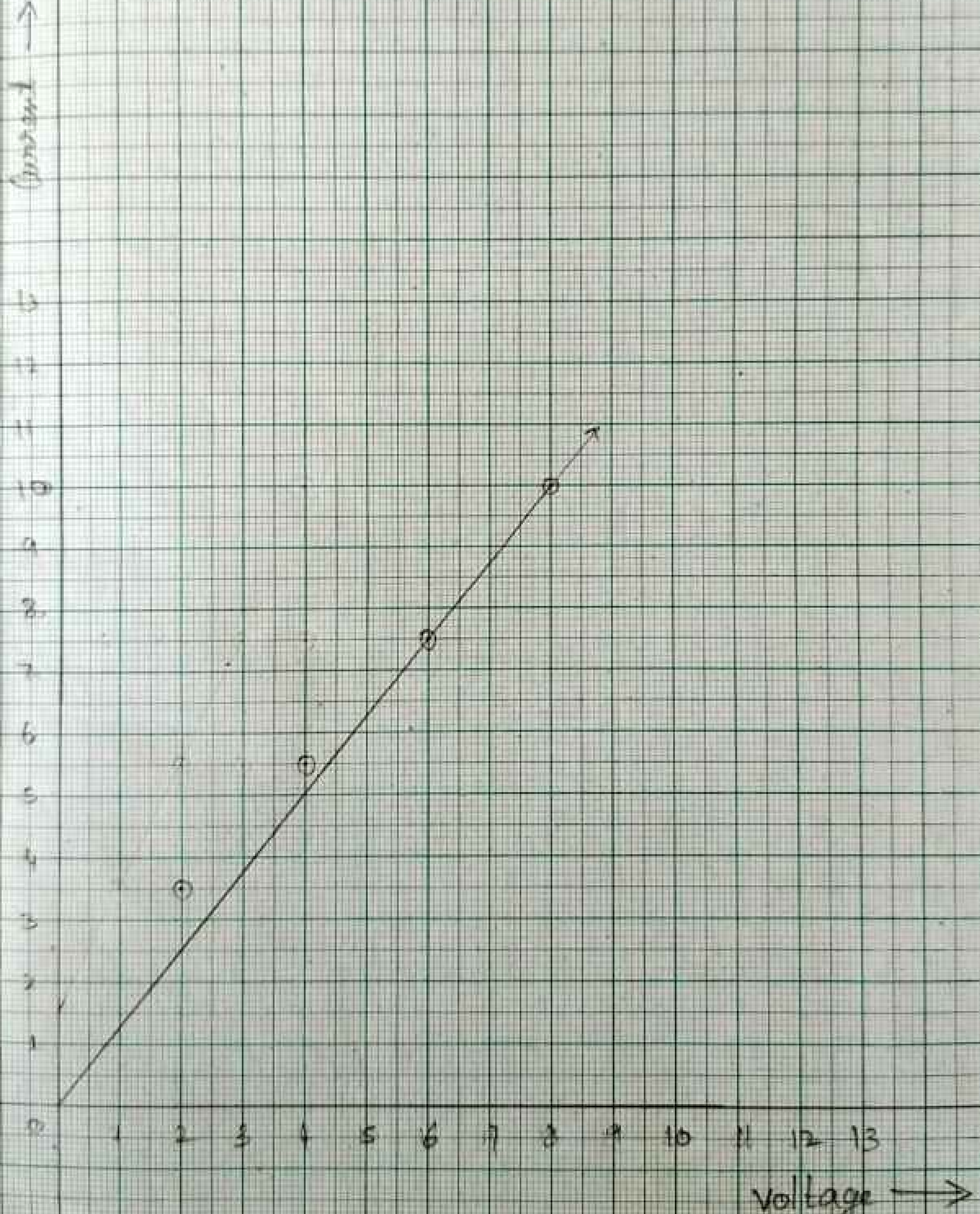
4) $R = \frac{10}{8} = 1.25 K\Omega$

Model Graph



OHM'S LAW

Scale
X axis 1cm = 1unit
y axis 1cm = 1unit



b) AIM:
To verify Kirchoff's law for voltage and current.

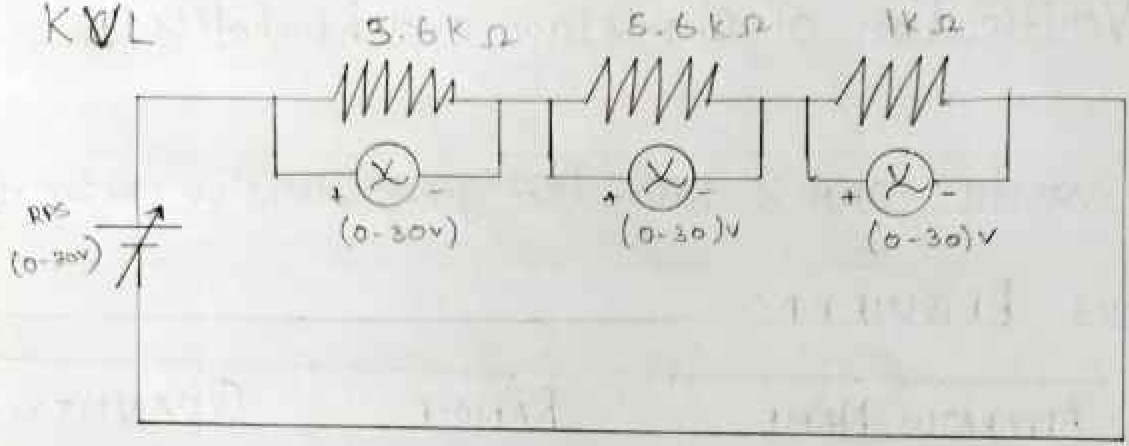
APPARATUS REQUIRED:

S.NO	Name of Equipment	Type	Range	Quantity.
1	RPS	–	(0-15)V	1
2.	Bread Board	–	–	1
3.	Ammeter	MC	(0-10), (0-5)	2
4.	Voltmeter	MC	(0-10)(0-15)V	2
5.	Resistor	~~MC~~	470Ω, 330Ω	1 each
6	Connecting wires.	–	4KΩ, 4.7KΩ	As required.

PROCEDURE:
-> Connections are given as per the circuit
-> Apply DC Voltage to the circuit from the given RPS
-> Tabulate the voltmeter and Ammeter readings for the corresponding experiment.
-> Increase the voltage step by step to get different reading till the voltage reached up to 15V.
-> Repeat Step 3 for different values
-> Switch off the power supply after bringing RPS to the minimum voltage Position

Kirchoff's Law

KVL



	Practical			Theoritical		
Supply vol	V_1	V_2	V_3	V_1	V_2	V_3
10	4.5	4.5	1.0	4.5	4.5	0.8
20	9.1	9.0	1.7	9.1	9.1	1.6
30	13.72	13.72	2.5	13.72	13.72	2.45

Calculations:

$R_T = 5.6 + 5.6 + 1 = 12.2$

$V_T = 10$

$I_{T_1} = \frac{10}{12.2} = 0.81\ mA$, $I_{T_2} = \frac{10}{12.2} = 1.6\ mA$, $I_{T_3} = \frac{30}{12.}$ 2.

1) $V_1 = 0.81\times10^{-3}\times5.6\times10^{3} = 4.536$

$V_2 = 0.81\times10^{-3}\times5.6\times10^{3} = 4.53$ $V_1+V_2+V_3 = 9.81$

$V_3 = 0.81\times10^{-3}\times1\times10^{3} = 0.81$

2) $V_1 = 1.63\times10^{-3}\times5.6\times10^{3} = 9.1$

$V_2 = 1.63\times10^{-3}\times5.6\times10^{3} = 9.1$ $V_1+V_2+V_3 = 19.8$

$V_3 = 1.63\times10^{-3}\times1\times10^{3} = 1.6$

3) $V_1 = 2.45\times10^{-3}\times5.6\times10^{3} = 13.72$

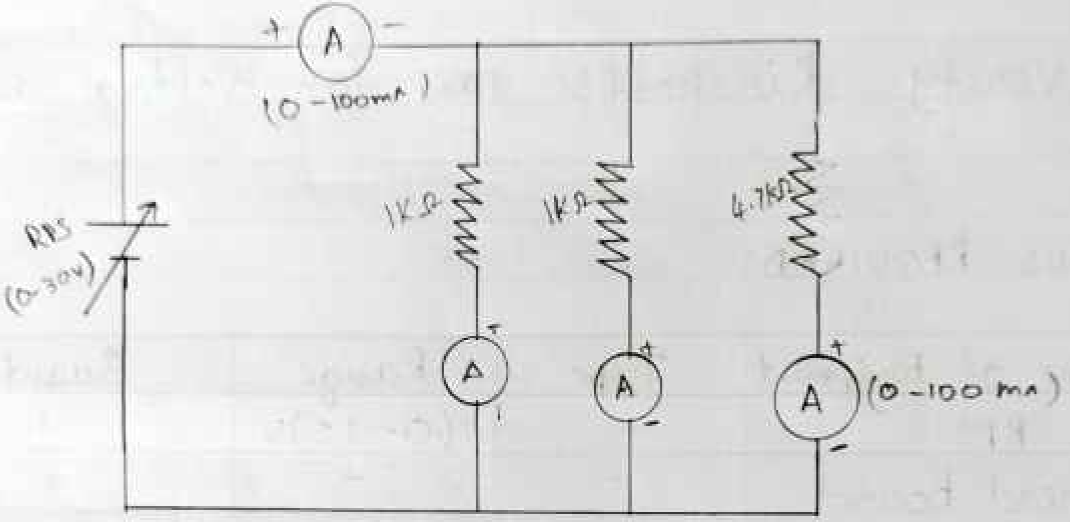
$V_2 = 2.45\times10^{-3}\times5.6\times10^{3} = 13.72$ $V_1+V_2+V_3 = 29.89$

$V_3 = 2.45\times10^{-3}\times5.6\times10^{3} = 2.45$

RESULT:

Thus the two Kirchoff's laws was verified Successfully.

KCL Circuit



	Practical				Theoritical		
Supply	I	I_1	I_2	I_3	I_1	I_2	I_3
2.7	6	2.70	2.72	0.58	2.7	2.7	0.57
3.7	8	3.61	3.63	0.76	3.7	3.7	0.78
5.5	12	5.42	5.46	1.12	5.5	5.5	1.1
7.4	16	7.23	7.28	1.49	7.4	7.4	1.5

Calculations:

$I = V/R$

1) $I_1 = \frac{2.7}{1} = 2.70$, $I_2 = \frac{2.7}{1} = 2.7$, $I_3 = \frac{2.7}{4.7} = 0.57$

2) $I_1 = \frac{3.7}{1} = 3.7$, $I_2 = \frac{3.7}{1} = 3.7$, $I_3 = \frac{3.7}{4.7} = 0.78$

3) $I_1 = \frac{5.5}{1} = 5.5$, $I_2 = \frac{5.5}{1} = 5.5$, $I_3 = \frac{5.5}{4.7} = 1.1$

4) $I_1 = \frac{7.4}{1} = 7.4$, $I_2 = \frac{7.4}{1} = 7.4$, $I_3 = \frac{7.4}{4.7} = 1.5$

Date

Expt. No. 15. Page No.

Verification of current and Voltage division Rules.

AIM:

To calculate the individual branch current and total current drawn from the power supply using current & voltage division rules.

APPARATUS REQUIRED:

S.NO	Apparatus Name	Range	Quantity.
1.	DC regulated Power Supply	(0-30)V	1
2.	Ammeter	(0-200)mA	4
3.	Resistor	1KΩ, 220Ω	Each 2
4.	Bread Board	–	– 1
5.	Connecting wires	–	Required.

PROCEDURE:

→ Give the connections as per circuit diagram

→ Set the Particular value in RPS

→ Note down the corresponding ammeter reading

→ Repeat the same for different voltages.

9

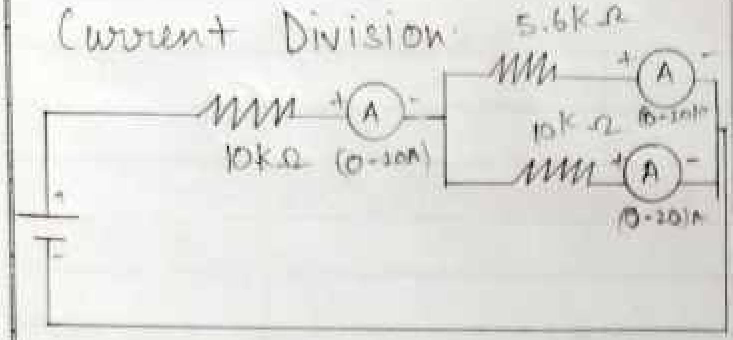
RESULT:

Thus the individual branch currents and total current drawn from the power supply are calculated using current and voltage division rules.

Teacher's Signature :

Circuit Diagram

Current Division:



V	I_1	I_2	I_3
10	0.74	0.48	0.26
15	1.11	0.72	0.39
20	1.47	0.95	0.53

Calculation:

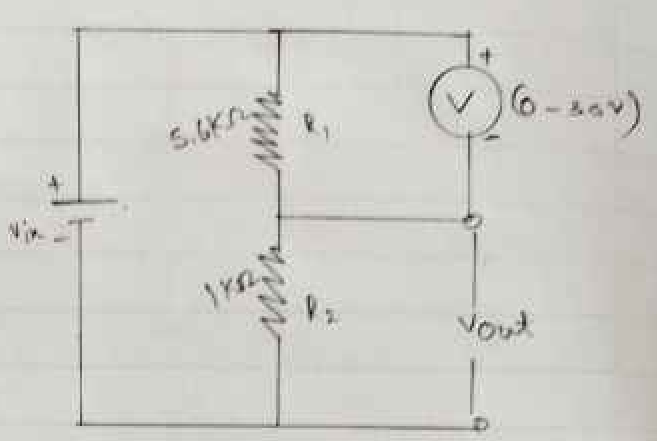
1) $I_1 = I_2 + I_3$

$0.48 + 0.26 = 0.74$

2) $0.72 + 0.39 = 1.11$

3) $0.95 + 0.53 = 1.48.$

Voltage division:



V_{in}	V_1	V_2
5	4.22	0.74
10	8.47	1.51
15	12.66	2.27

Calculation:

1) $V = V_1 + V_2 = 4.22 + 0.74 = 4.96$

2) $V = 8.47 + 1.51 = 9.98$

3) $V = 12.66 + 2.27 = 14.93$

Date..............

Expt. No. 16. Page No. ....

Verification of star delta transformation using Resistance Reduction Technique.

AIM:

To Calculate the equivalent circuit resistance using the star delta transformation technique

APPARATUS REQUIRED:

S.No	Apparatus	Range	Quantity.
1.	Resistor	220 Ω	2
2.	Breadboard	-	1
3.	Connecting wires	-	Required

PROCEDURE:

→ Give the connections as per the circuit diagram
→ Determine the equivalent resistance of the circuit.
→ verify the same by connecting Multimeters across PQ.

10/10

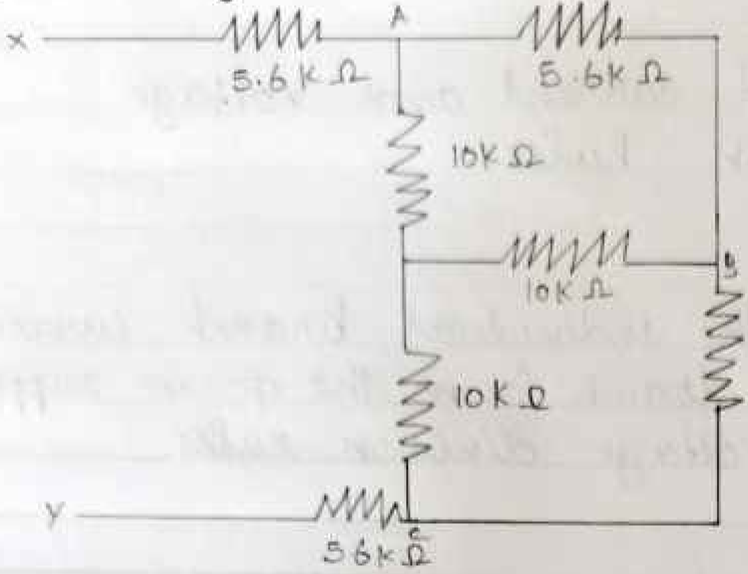
7/12

RESULT:

Thus the equivalent circuit resistance is obtained using star delta transformation technique.

Teacher's Signature : ______________

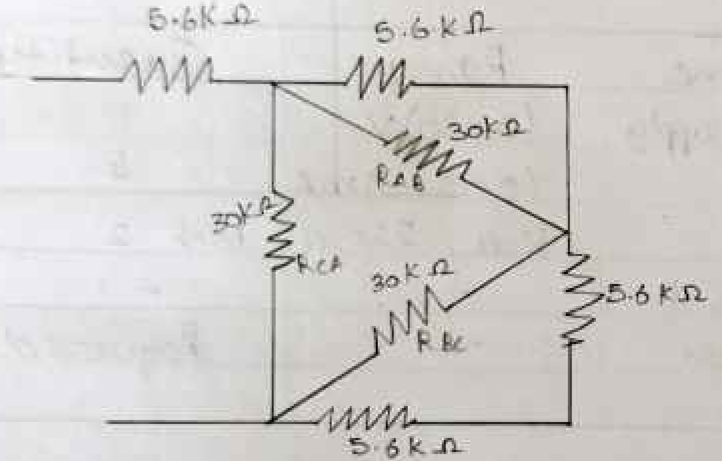
Circuit Diagram



$$R_{AB} = \frac{R_aR_b + R_bR_c + R_cR_a}{R_c} = 30K\Omega$$

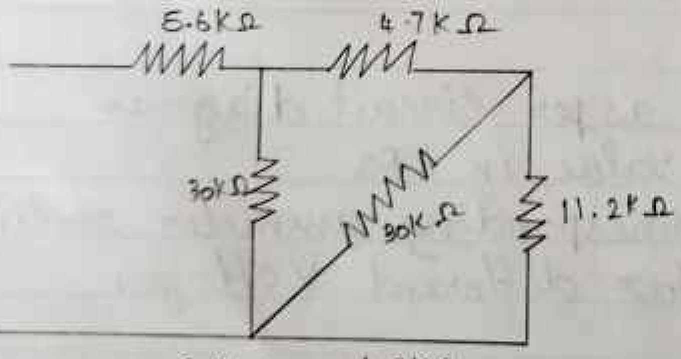
$$R_{BC} = \frac{100+100+100}{10} = 30K\Omega$$

$$R_{BA} = \frac{100+100+100}{10} = 30K\Omega$$



$$\Rightarrow \frac{5.6\times30}{35.6} = \frac{168}{35.6} = 4.72K\Omega$$

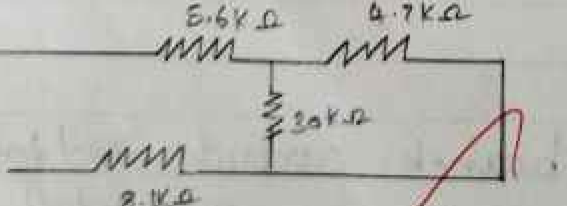
$$\Rightarrow \frac{30\times11.2}{30+11.2} = 8.1K\Omega$$

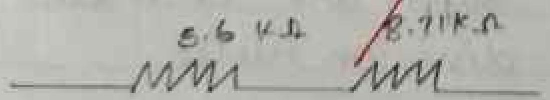


$$\Rightarrow \frac{30\times12.8}{30+12.8} = 8.97K\Omega$$

$$\Rightarrow 8.97 + 5.6$$

$$= 14.5K\Omega$$





Practical	theoritical
14.5KΩ	14.43KΩ

Date ....

Expt. No. 17. Page No. ....

Verification of Thevenins and Norton's Theorem.

AIM:

To Verify the equivalent circuit parameters of Thevenin's Theorem and Norton's theorem theoritically and practically.

APPARATUS REQUIRED:

S.No	APPARATUS	RANGE	QUANTITY
1	DC Regulated Power	(0-30)V	1
2	Voltmeter	(0 - 30)V	1
3	Ammeter	(0 -200)mA	1
4.	Resistor	330Ω, 220Ω, 1kΩ	As required
5.	Multimeter	-	1
6.	Bread board & wires	-	As required.

PROCEDURE FOR THEVENIN'S THEOREM:

→ Given the connections as per the circuit Diagram

→ Measure R using the multimeter by killing Sources

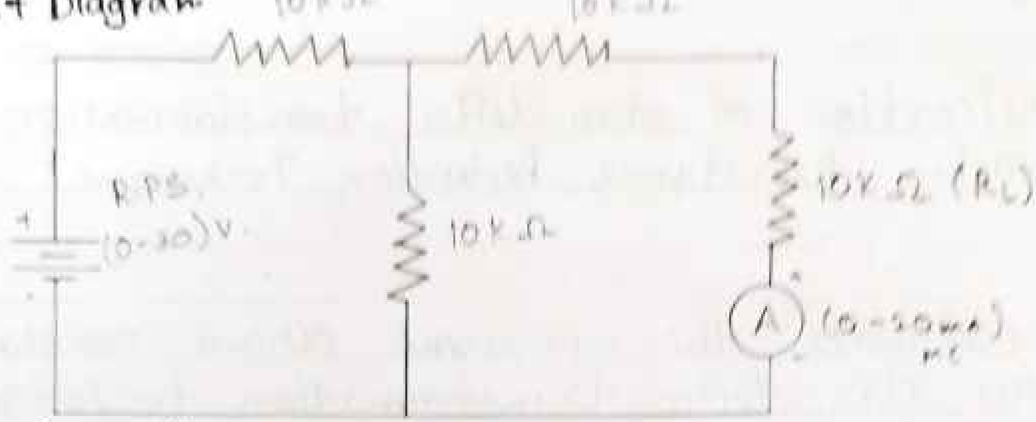
→ Measure the V_{th} across A and B

→ Measure Load current $I_L = \dfrac{V_{th}}{R_{th} + R_L}$

→ Draw the Thevenin's theorem.

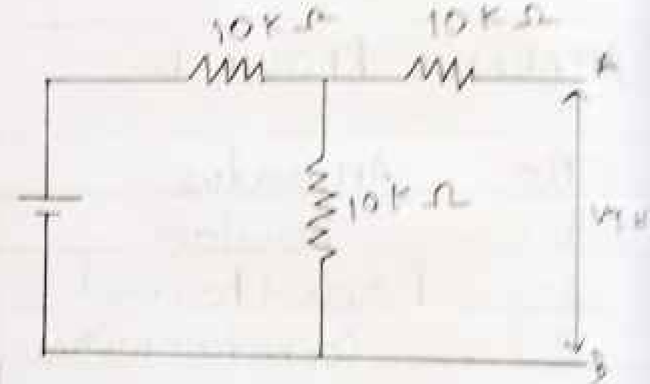
Teacher's Signature : ____________

Circuit Diagram

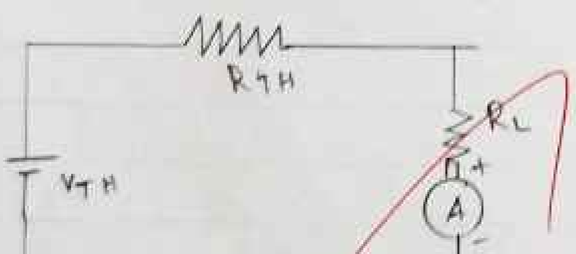


Thevenin's Theorem

S.No	V	I_L	I_2
1	10	0.23	0.24
2	15	0.36	0.36
3	20	0.48	0.47



V	V_{TH}
10	4.9
15	7.4
20	9.8



V_{TH}	I_L
4.9	0.24
7.4	0.36
9.8	0.47.

RTH Calculation

$\Delta = \begin{vmatrix} 20 & -10 \\ -10 & 25.0 \end{vmatrix} = 412$

Practical : 14.76

Theoritical : 15

$I_2 = \frac{\Delta I_2}{\Delta} \quad \frac{100}{412} = 0.24$

$\Delta I_2 = \begin{vmatrix} 20 & 20 \\ -10 & 0 \end{vmatrix} = 200$

$I_2 = \frac{\Delta I_2}{\Delta} = \frac{200}{412} = 4.$

R_{TH} :

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

$I_L = \frac{4.9}{14.66+5.6} = 0.24mA$

$I_L = \frac{7.4}{14.64+5.6} = 0.36mA$

$I_L = \frac{9.8}{14.64+5.6} \Rightarrow 0.73mA$

Calculation

Thevenin's Theorem.

1) $I = 10/20\times10^{3}$

$= 0.5\times10^{-3}$ A

$V_{th} = 0.5\times10^{-3}\times10\times10^{3}$

$= 5V$

2) $I = \frac{15}{20\times10^{3}} = \cancel{0.7}\times10^{-3}$ A 0.75×10^{-3}

$V_{th} = 0.75\times10^{-3}\times10\times10^{-3}$

$= \cancel{7.0V}$ $7.5V$

3) $I = \frac{20}{20\times10^{3}} = 1.0\times10^{-3}$ A

$V_{th} = 1.0\times10^{-3}\times10\times10^{3}$

$= 10V$.

V	Vth
10	5V
15	7.5V
20	10V

PROCEDURE: FOR NORTON'S THEOREM:

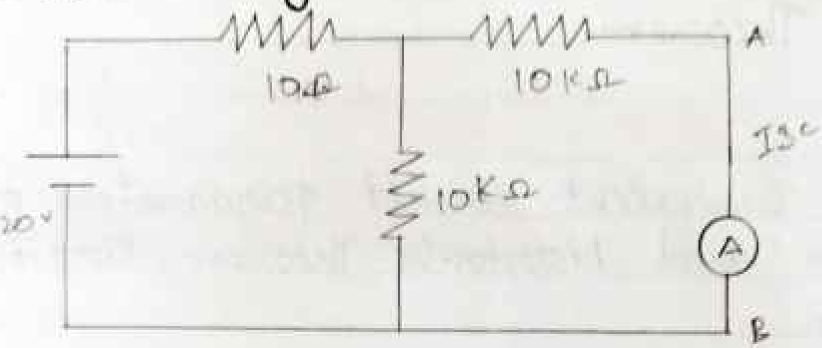
→ Give the connections as per the circuit diagram.
→ Measure R_{th} using multimeter by Kiling Sources & open circuit R_L
→ Measure I_N through A & B Measure load current I_L through R_L
→ Draw the Norton's Equivalent's Circuit.

RESULT:

Thus the equivalent circuit Parameter are obtained using Thevenin's & Norton's theorem.

NORTON Theorem:

Circuit Diagram:



S.No	V_{th}	R_{th}
1	10	14.64
2	15	14.64
3	20	14.64

$I_{SC} = \frac{V_{th}}{R_{th}}$

1) $\frac{4.9}{14.64} = 0.33$

2) $\frac{7.4}{14.64} = 0.50$

3) $\frac{9.8}{14.64} = 0.66$

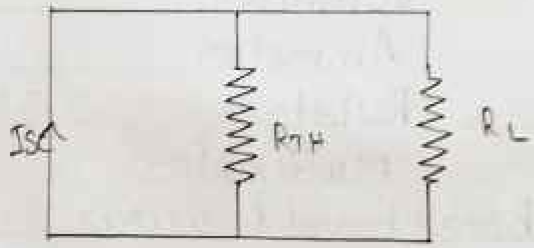
V	ISC
10	0.3
15	0.5
20	0.6

RTH:

Practical: 14.7

Theoritical: 15.0

ISC	IL
0.3	0.22
0.5	0.36
0.6	0.43



Calculation:

$V = IR$

$$\begin{vmatrix}10\\0\end{vmatrix} = \begin{vmatrix}I_1\\I_2\end{vmatrix}\begin{vmatrix}20 & -10\\-10 & 25.6\end{vmatrix}$$

$\Delta = 512 - 100 = 412$

$I_2 = \frac{\Delta I_2}{\Delta}$

1) $\Delta I_2 = \begin{vmatrix}20 & 0\\-10 & 0\end{vmatrix} = 100$

$I_2 = 0.24$

2) $\Delta I_2 = \begin{vmatrix}20 & 20\\-10 & 0\end{vmatrix} = 200$

$I_2 = \frac{200}{412} = 0.49$

3) $\Delta I_2 = \begin{vmatrix}20 & 15\\-10 & 0\end{vmatrix} = 0 + 150 = 150$

$I_2 = \frac{150}{412} = 0.36$

Verification of Superposition and Maximum power transfer Theorem.

AIM: To verify Maximum Power transfer theorem

APPARATUS REQUIRED:

S.No	APPARATUS REQUIRED	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
	Bread board	–	1
	wires	–	Required.

PROCEDURE:

→ Give the connections as per circuit Diagram Measure R_{th} Using a multimeter.

→ Measure V_{th} across 220Ω (R_L)

→ Measure current I_L through R_L

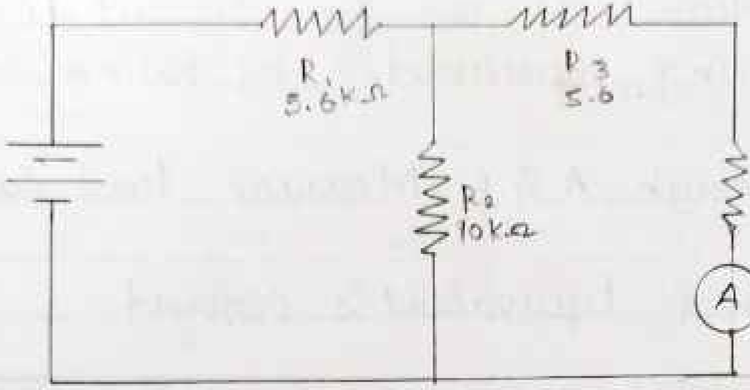
→ Calculate the max power transformed to the load.

RESULT:

Thus the maximum Power theorem is verified.

Circuit Diagram:

Maximum Power Transfer Theorem



$\frac{5.6 \times 10}{15.6}$ ($\frac{R_1 \times}{R_1 +}$

$= 3.58$

$3.58 + 5.6$

$= 9.18$

S.No	R_L	I_L	$P = I_L^2 \times R$
1	1	1.2	1.44
2	2	1.1	2.42
3	3	1.0	3.00
4	4	0.09	0.032
5	5	0.08	0.032
6	6	0.08	0.0384
7	7	0.07	0.343
8	8	0.7	3.92
9	9	0.7	4.41
10	10.	0.6	3.6

1) $1.2 \times 1.2 \times 1 = 1.44$

2) $1.1 \times 1.1 \times 2 = 2.42$

3) $1.0 \times 1.0 \times 3 = 3.00$

4) $0.09 \times 0.09 \times 4 = 0.032$

5) $0.08 \times 0.08 \times 5 = 0.032$

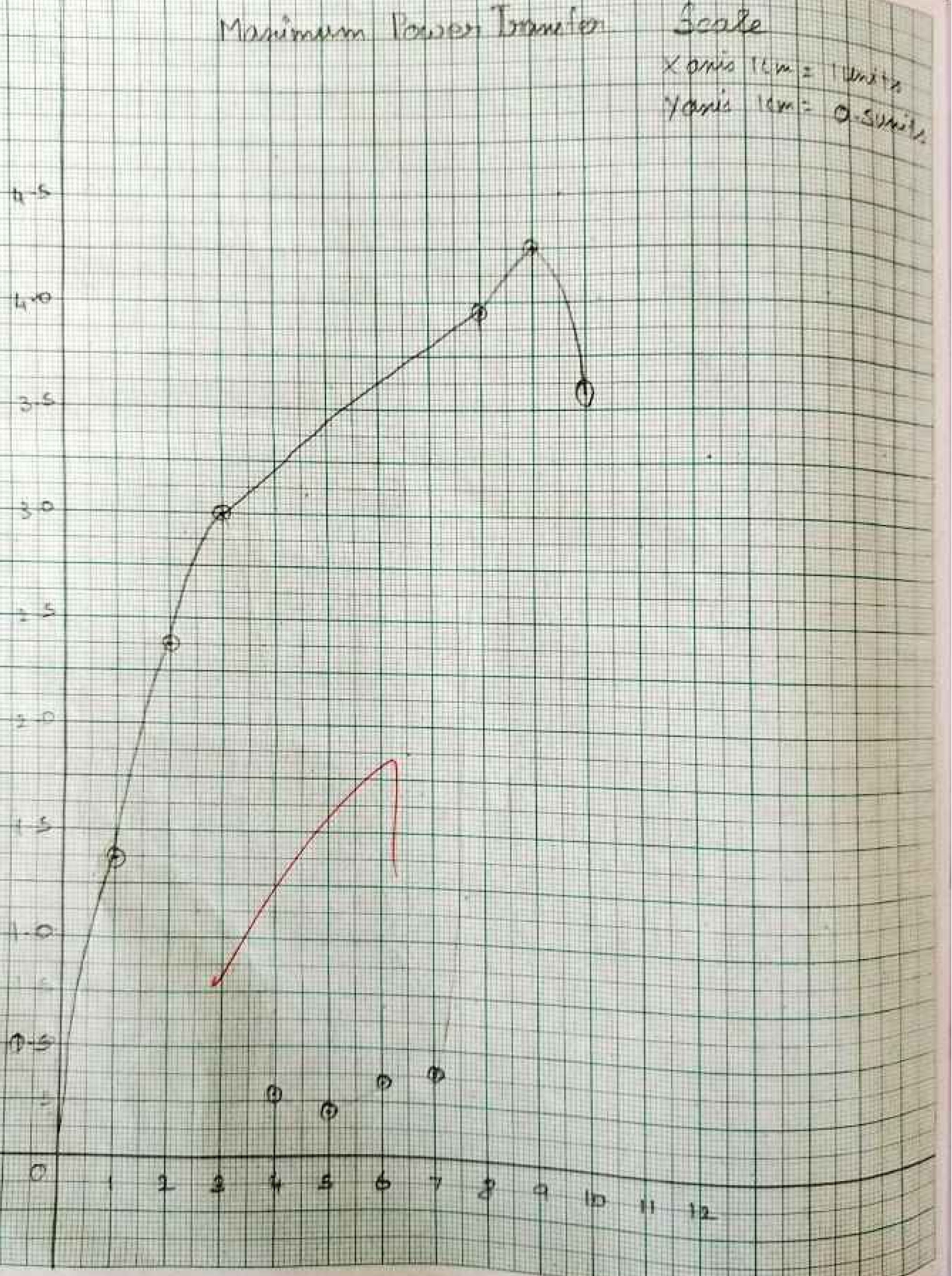
6) $0.08 \times 0.08 \times 6 = 0.38$

7) $0.07 \times 0.07 \times 7 = 0.34$

8) $0.7 \times 0.7 \times 8 = 3.92$

9) $0.7 \times 0.7 \times 9 = 4.41$

10) $0.6 \times 0.6 \times 10 = 3.6.$



Maximum Power Transfer
Scale
X axis 1cm = 1units
Y axis 1cm = 0.5units
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0
1
2
3
4
5
6
7
8
9
10
11
12

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,330	Each one
5.	Multimeter	-	1
6.	Bread Board	-	1
7.	Connecting wires	-	Required.

PROCEDURE:

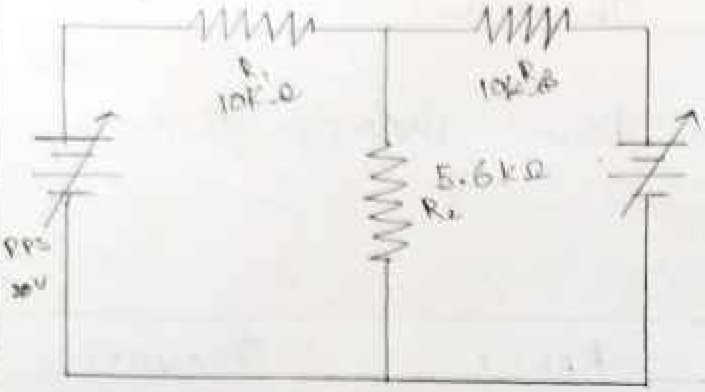
-> Given the connections as per the circuit
-> Measure current flow through 1KΩ
-> Short circuit 15 V source
-> Measure current flow through 1K:Ω
-> Short circuit 20 V
-> Verify the net current through 1KΩ resistor.

RESULT:

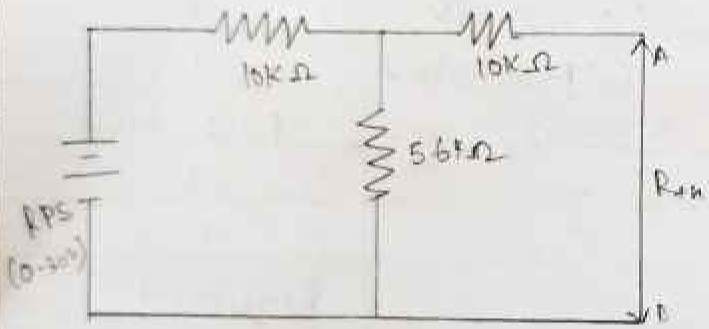
Thus the Superposition theorem was verified.

Circuit Diagram:

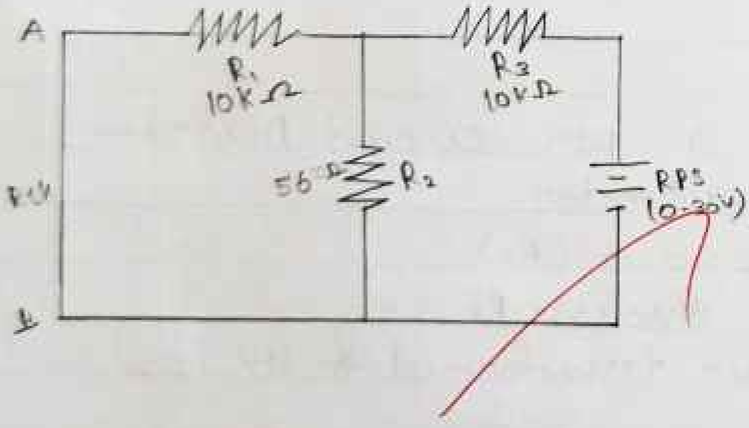
Superposition theorem:



V_1	V_2	V_L
10	10	0.94
15	30	2.14
20	30	2.37



V_1	I_L
10	0.47
15	0.70
20	0.95



V_2	I_L
10	0.47
30	1.42
30	1.42

Calculations:

$$\begin{vmatrix} R \end{vmatrix} \begin{vmatrix} I_1 \\ I_2 \end{vmatrix} = \begin{vmatrix} 15 \\ -30 \end{vmatrix}$$

$$\Delta = \begin{vmatrix} 15.6 & -5.6 \\ -5.6 & 15.6 \end{vmatrix} = 212$$

$$\Delta I_1 = \begin{vmatrix} 15 & -5.6 \\ -30 & 15.6 \end{vmatrix} = 66$$

$$I_1 = \frac{\Delta I_1}{\Delta} = \frac{66}{212} = 0.31$$

$$\Delta I_2 = \begin{vmatrix} 15.6 & 15 \\ -5.6 & -30 \end{vmatrix} = -384$$

$$I_2 = \frac{\Delta I_2}{\Delta} = \frac{-384}{212} = -1.81$$

$$I_L = I_1 - I_2 = 0.31 + 1.81$$
$$= 2.12\ mA$$

i) V_2 is Short

$\Delta = 212$

$$I_{L_1} = \begin{vmatrix} 15 & -5.6 \\ 0 & 15.6 \end{vmatrix}$$
$$= 234 - 0 = 234$$

$$I_{L_1} = \frac{234}{212} = 1.10$$

$$\Delta I_{L_2} = \begin{vmatrix} 15.6 & 15 \\ -5.6 & 0 \end{vmatrix}$$
$$= 84.$$

$$\Delta I_{L_2} = \frac{84}{212} = 0.39$$

$$I_{L_1} = 1.10 - 0.39 = 0.71$$

ii) V_1 is short

$$\begin{vmatrix} 30 & -5.6 \\ 0 & 15.6 \end{vmatrix} = I_1 = 2.20$$

$\Delta = 212$

$$\Delta I_{L_2} = \begin{vmatrix} 15.6 & 30 \\ -5.6 & 0 \end{vmatrix}$$

$\Delta I_2 = 168$

$$I_2 = \frac{168}{212} = 0.79$$

$$I_{L_2} = 2.20 - 0.79 = 1.41$$

$$I_L = I_{L_1} + I_{L_2}$$
$$= 0.71 + 1.41$$
$$= 2.12\ mA$$

Date

Expt. No. 19.

Page No.

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.

PROCEDURE:

-> Connect the circuit according to circuit Diagram

-> Switch on the power supply.

-> The wire is initially brought to null position.

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

-> Now turn the nut in anticlockwise direction to move the core outwards.

-> Plot the graph from observation.

10/10

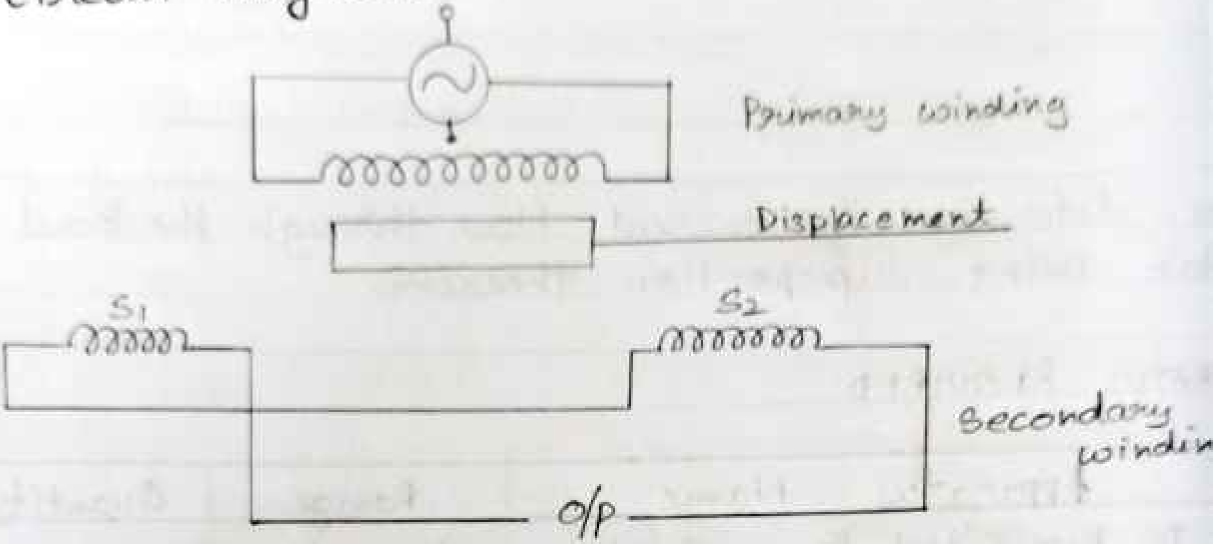
RESULT:

Thus the output characteristics of LVDT is ploted.

6/11

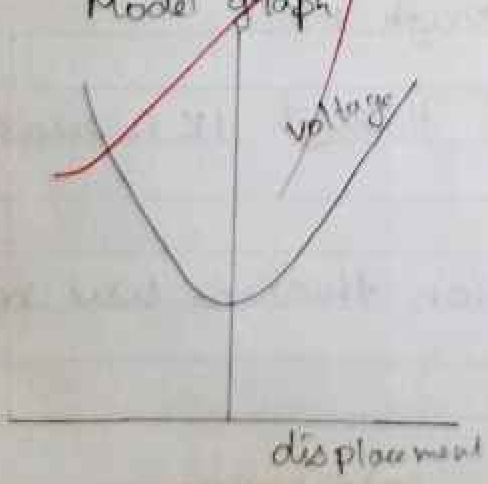
Teacher's Signature :

Circuit Diagram:

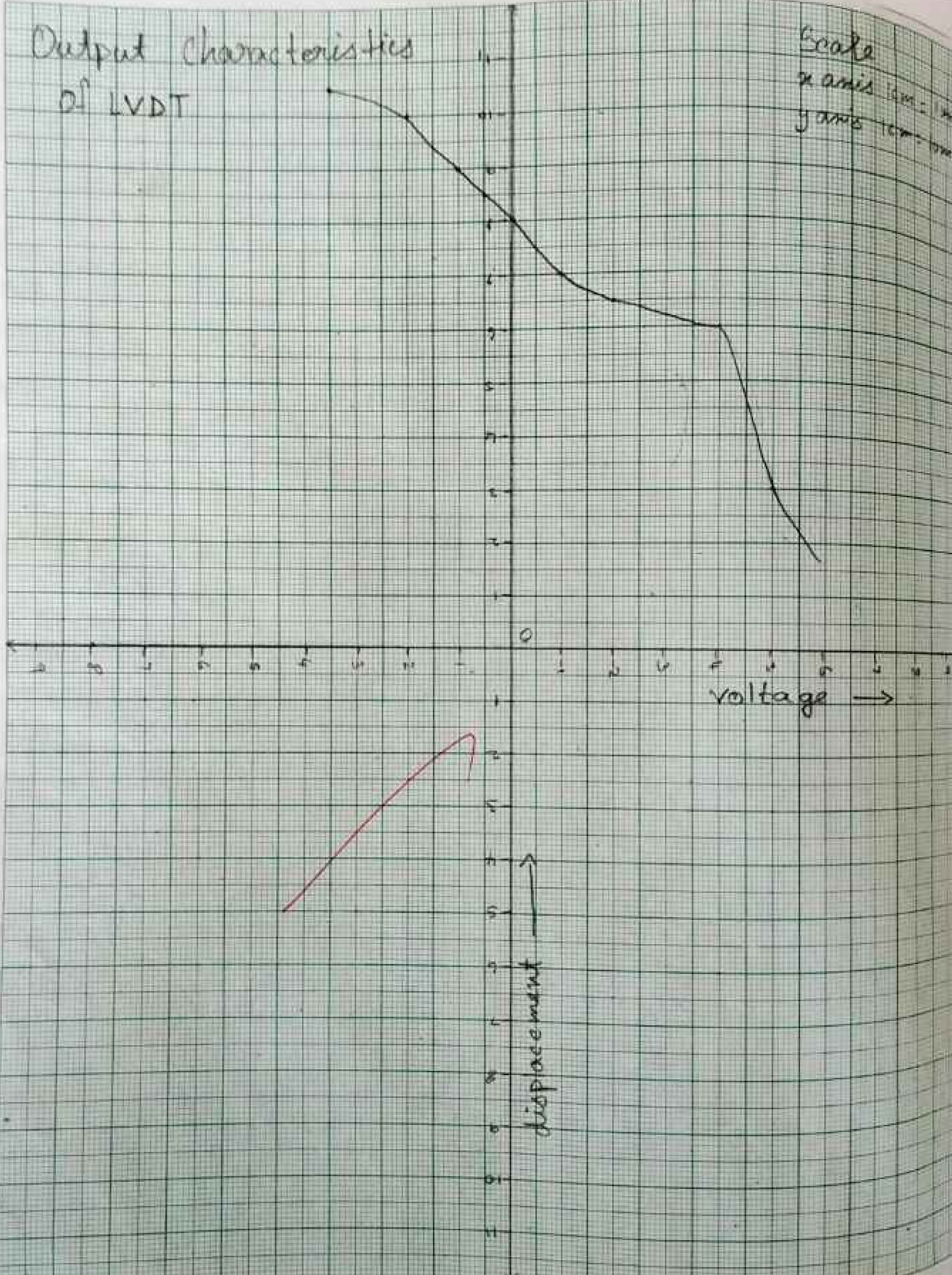


	Displacement (mm)	Voltage (v)
	3	5
	6	4
	6.5	2
	7	1
	8	0
	8.5	-0.5
	9	-1
	10	-2
	10.5	-3.5

Model graph



Output Characteristics of LVDT



Date

Expt. No. 20 Page No.

a) # Staircase Wiring

AIM:

To Control the status of given lamp using two way switches.

APPARATUS REQUIRED:

S.No	Apparatus	Range/Type	Quantity
1	Incandescent Lamp	60w/40w	1
2	SPDT	230V	2
3	Lamp holder	Pendant type	1
4	Line Tester	500k/Taparlasia	1
5	3Pin Plug	5A/230V	1
6	wire cutter	Pye 950	1
7	wires	12A/1.sq m o.thw.	As requir

PROCEDURE:

-> A piece of wire is connected to phase & other end to middle point of SPDT swith.

-> Anothe point of Lamp holder is connected to neutral

-> upper point of SPDT is connede to uper point of switch 2

-> Circuit is tested that all switch connection.

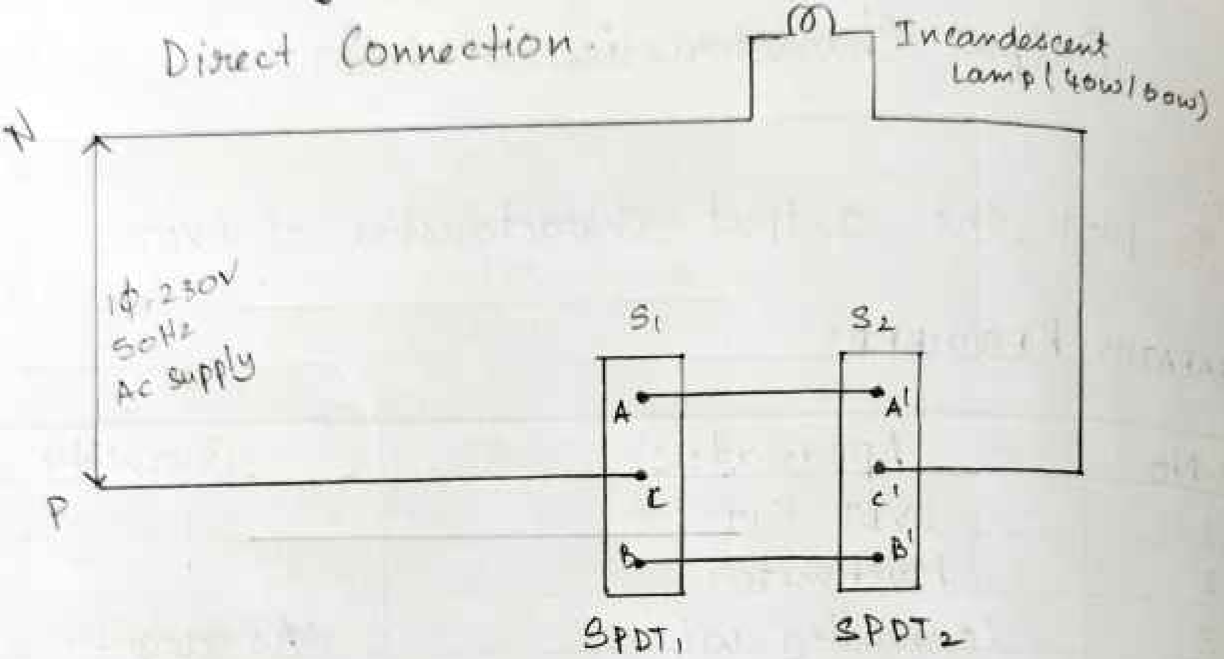
RESULT:

Thus the status of given lamp was controlled and tested under direct & indirect connection.

Teacher's Signature :

Circuit Diagram

Direct Connection



Indirect Connection

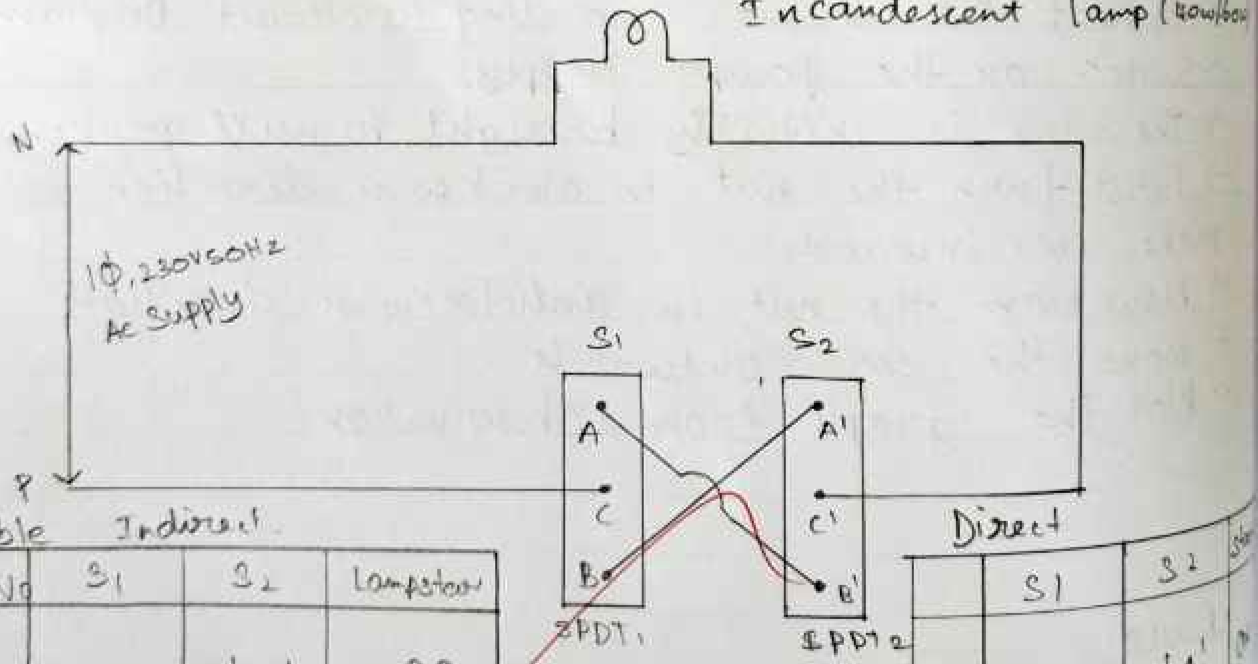


table Indirect

S.No	S1	S2	Lampstatus
1	CA	C'A'	off
2	CB	C'A'	on
3	CA	C'B'	off
4	CB	C'B'	on.

Direct

	S1	S2	St[illegible]
1	CA.	C'A'	[illegible]
2	CB	C'B'	[illegible]
3	CA	C'B'	[illegible]
4	CB	C'A'	[illegible]

Date ....

Expt. No. .... Page No. ....

b. Flurosent tube Wiring

AIM:

To prepare wiring for the flurosent tube light with switch control.

APPARATUS REQUIRED:

SNo	APPARATUS	Range	Quantity
1.	Tubelight with fitting	–	1
2.	Joint clips	–	As required
3.	Switch	–	1
4.	wires	–	As required
5.	Screws	–	As required
6.	Switch board	–	1

PROCEDURE:

→ Mark the switch & tubelight location points & draw lines for wiring on the wooden board.
→ Place wires along the lines & fix them with help of clips
→ Complete the wiring as per the circuit
→ Test the working of tube ~~lig~~ light by giving electric supply.

RESULT:

Thus the wiring for the tubelight is completed & tested.

Teacher's Signature : ____________

Circuit Diagram: