EXPERIMENT-1

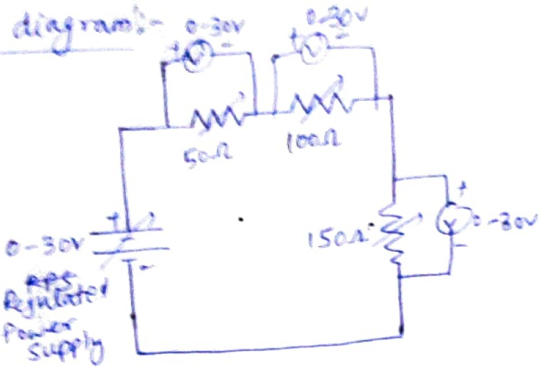
VERIFICATION OF KCL AND KVL

Aim: To verify KCL and KVL for given DC circuit

Apparatus: (i) 0-30V, 2A regulated dc power supply - 1No,
(ii) 0-30V voltmeters - 3Nos, 0-2A Ammeters - 3Nos
50Ω/2A, 100Ω/2A, 150Ω/2A Rheostat 1No each

Verification of KVL

Circuit diagram:-



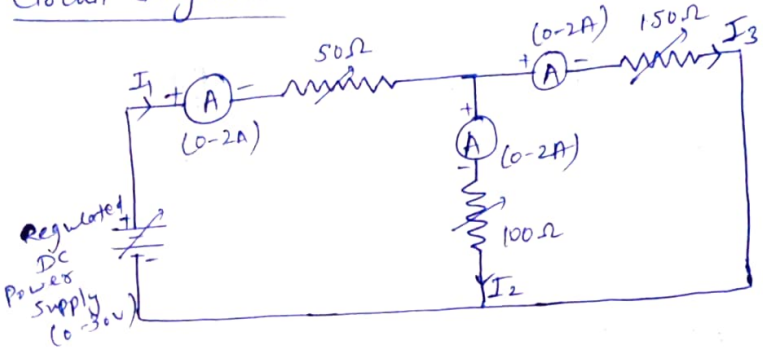
Tabular Column -

SNo	R.P.S vtg	V_1(V)	V_2(V)	V_3(V)	$V = V_1 + V_2 + V_3$
1.	10V	2V	3V	4.5V	10 = 2+3+4.5
2.	15V	3V	5V	7V	15 = 3+5+7
3.	20V	4V	6V	10V	20 = 4+6+10
4.	25V	5V	8V	12V	25 = 5+8+12
5.	30V	5V	10V	14.5V	30 = 5+10+14.5

Result:-
For the given DC circuit, KVL is verified.

Verification of KCL

Circuit Diagram:-



Tabular Column:-

Sl. No.	R.P.S Vtg	I_1(A)	I_2(A)	I_3(A)	$I_1 = I_2 + I_3$
1.	10V	0.35A	0.25A	0.10A	0.35 = 0.25 + 0.1
2.	15V	0.6A	0.4A	0.2A	0.6 = 0.4 + 0.2
3.	20V	0.75A	0.50A	0.25A	0.75 = 0.5 + 0.25
4.	25V	1A	0.65A	0.35A	1 = 0.65 + 0.35
5.	30V	1.2A	0.8A	0.4A	1.2 = 0.8 + 0.4

Result:-

For the given DC circuit, KCL is verified.

13/1/22

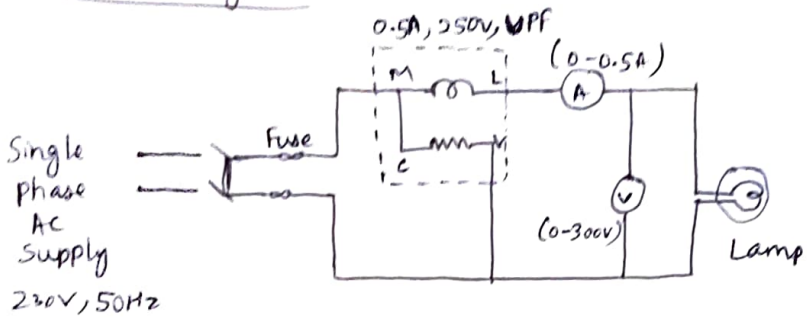
20/01/22

EXPERIMENT-2

MEASUREMENT OF CURRENT, POWER, PF OF INCANDESCENT LAMP, FLUROCENT LAMP

Aim:- To measure current, power and power factor of incandesent lamp, fluorocent lamp and LED lamp.

Ciocuit Diagram:-



Tabular Column :-

SNo	Lamp	V	I	P	P.F	
					Measured	Calculated
1.	Incandescent	224.5V	0.169A	37.7W	0.996	0.993
2.	CFL	225 V	0.038A	7.250W	0.940	0.847
3.	LED	225.2V	0.035A	6.897W	0.952	0.875

Calculations:-

$P = VI \cos\phi$

$P.F = \cos\phi = \frac{P}{VI}$

For Incandescend lamp $= \frac{37.7}{224.5 \times 0.169} = 0.993$W

For fluorocent lamp $= \frac{7.250}{225 \times 0.038} = 0.847$W

For LED lamp $= \frac{6.897}{225.2 \times 0.035} = 0.875$W

Result:

Meassured current, power and power factor of incandescent, fluorocent and LED lamp successfully.

Incandescent is ~~observing~~ consuming more power.

LED is consuming less power.

20/01/22

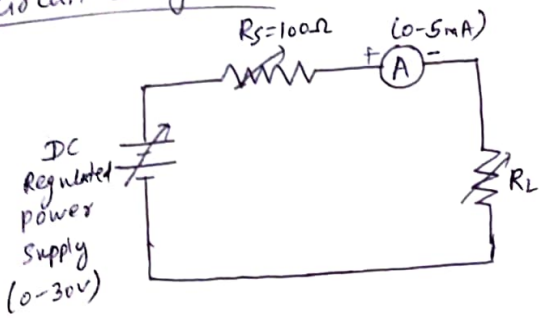
20/01/22

EXPERIMENT - 3

Maximum power Transfer Theorem

Aim:- To determine maximum power transferred from source to the load when the internal resistance is equal to load resistance.

Circuit Diagram:-



Tabular Column V = 25V R_S = 105Ω

Sl. No	R_L in Ω	I_A in mA	$P = I^2 R_L$ in W
1.	10	0.32A	1.024 W
2.	20	0.29A	1.682 W
3.	30	0.26A	2.028 W
4.	40	0.24A	2.304 W
5.	50	0.22A	2.420 W
6.	60	0.21A	2.646 W
7.	70	0.19A	2.527 W
8.	80	0.18A	2.592 W
9.	90	0.17A	2.601 W
10.	100	0.16A	2.560 W
11.	110	0.16A	2.816 W
12.	120	0.15A	2.700 W
13.	130	0.14A	2.548 W
14.	140	0.13A	2.366 W
15.	150	0.13A	2.535 W
16.	160	0.12A	2.304 W

Result:- By Maximum power transfer theorem, source resistance is equal to load resistance.

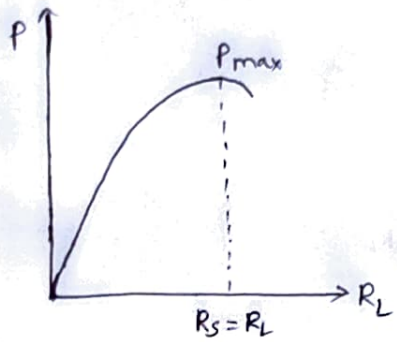
$R_S = R_L = 110\Omega$

$P_{max} = 2.8\,W$

Condition for Maximum power transfer:

$R_S = R_L$

Model Graph:



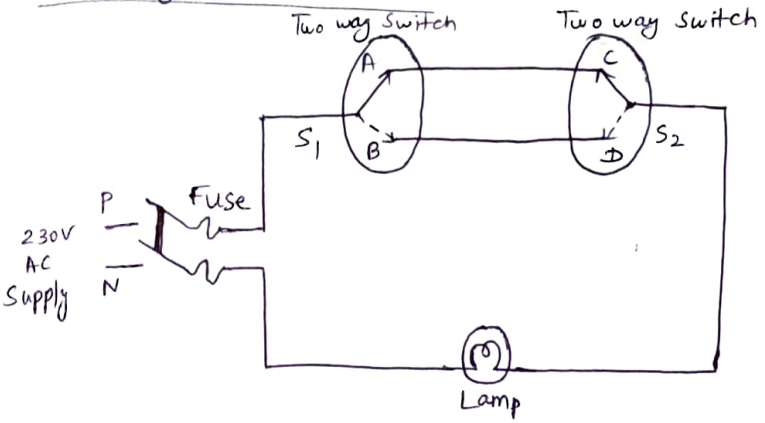
7/01/22

EXPERIMENT-4

TWO WAY AND THREE WAY CONTROL OF LAMP

Aim:- To conduct two way and three way control of lamp using switches in single phases circuit.

Two way Control of Lamp

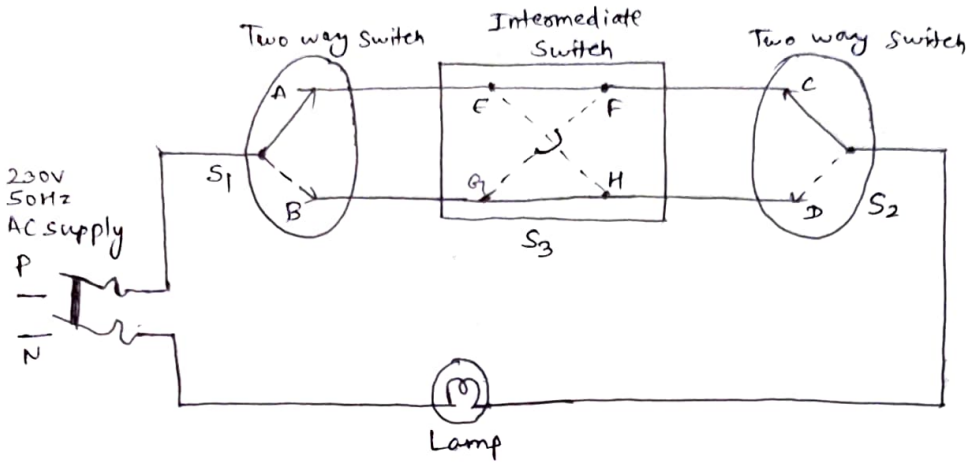


Tabular Column:-

Sl. No	Switch S_1	Switch S_2	Condition of Lamp Analysis	Condition of Lamp Observer	Tracing the Path
1.	A	C	ON	ON	P-A-C-Lamp-N
2.	A	D	OFF	OFF	–
3.	B	D	ON	ON	P-B-D-Lamp-N
4.	B	C	OFF	OFF	–

Three way Control

Circuit Diagram:-



Tabular Column:-

Sl. No.	Switch S_1	Switch S_2	Switch S_3	Condition of Lamp Analysis	Condition of Lamp Observer	Tracing the Path
1.	A	C	EF, GH	ON	ON	P-A-EF-C--Lamp-N
2.	A	D	EF, GH	OFF	OFF	—
3.	B	D	EF, GH	ON	ON	P-B-GH-D--Lamp-N
4.	B	C	EF, GH	OFF	OFF	—
5.	B	C	EH, GF	ON	ON	P-B-GF-C--Lamp-N
6.	B	D	EH, GF	OFF	OFF	—
7.	A	D	EH, GF	ON	ON	P-A-EH-D--Lamp-N
8.	A	C	EH, GF	OFF	OFF	—

Result:-

Conducted experiment on two way and three way control of lamp using switches in single phase circuit and verified the truth table successfully.

17/2/22

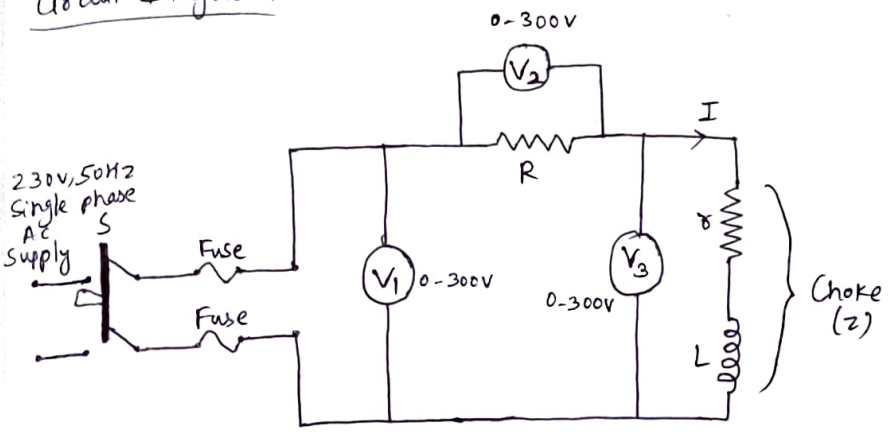
27/01/22

EXPERIMENT - 5

Measurement of Resistance and Inductance of a Choke by three Voltmeter Method

Aim:- To measure the resistance and inductance of a choke coil using three voltmeter methods.

Circuit Diagram:-



Tabular Column:-

$R = 472\ \Omega$

Sl No.	V_{supply} (Volts) V_1	V_{choke} (Volts) V_3	V_R (Volts) V_2	Current (I) (Amps)	$\cos\phi$	L (Hennery)	r (Ω)
1.	100.6V	25.94V	93.32V	0.197A	0.152	0.414H	20.014Ω
2.	150.7V ~~150.6V~~	39.62V	139.7V	0.296A	0.146	0.421H	19.544Ω
3.	200.4V	52.91V	186.3V	0.394A	0.134	0.423H	17.995Ω

Calculations:-

1) $V_{supply} = V_1$; $V_R = V_2$; $V_{choke} = V_3$

$$V_{supply} = \sqrt{V_R^2 + V_{choke}^2 + 2 V_R V_{choke} \cos\phi}$$

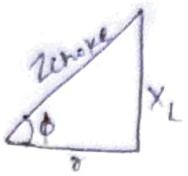
$$\cos\phi = \frac{V_{supply}^2 - V_R^2 - V_{choke}^2}{2 V_R V_{choke}}$$

2) $I = \frac{V_R}{R} =$

$R = 472\ \Omega$

3) $Z_{choke} = \frac{V_{choke}}{I}$

4)



$R = Z_{choke} \cos\phi$

$X_L = Z_{choke} \sin\phi$

$X_L = 2\pi f L$

$L = \frac{X_L}{2\pi f}$

5) L_1, L_2, L_3 $\quad r_1, r_2, r_3$

$L = \frac{L_1 + L_2 + L_3}{3}$ $\quad R = \frac{r_1 + r_2 + r_3}{3}$

Result :- Measured the resistance and inductance of a choke coil using three voltmeter method successfully.

Resistance (R) = 19.184 Ω

Inductance (L) = 0.419 H

17/2/22

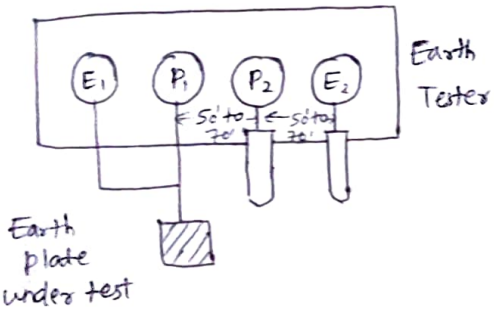
17/02/22

EXPERIMENT-6

Measurement of Earth Resistance

Aim:- To measure earth resistance of an installation with the help of earth tester.

Circuit Diagram:-



Tabular Column:-

S No	Earth Resistance (Ω)
1.	2.33
2.	4.03
3.	2.07
4.	1.36
5.	2.13
6.	4.33

Earth resistance = 2.708 Ω

Result:- Measured earth resistance of an installation with the help of earth tester.

Earth resistance = 2.708 Ω

17/2/22

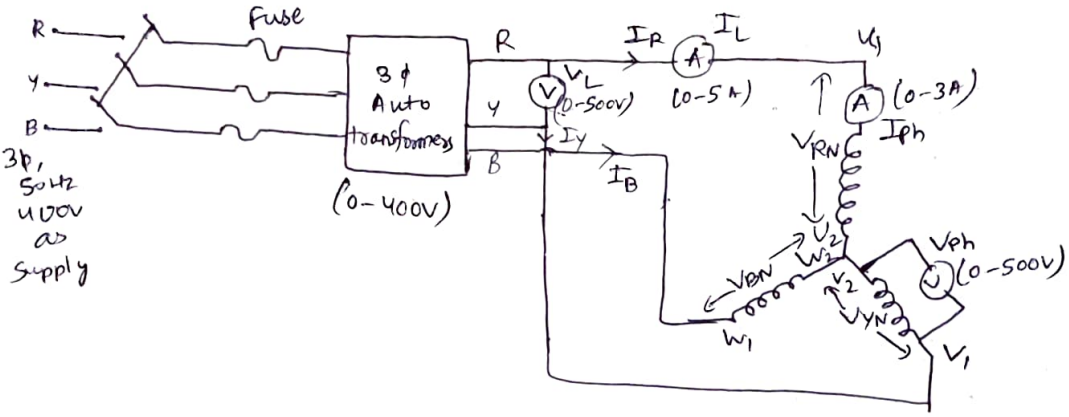
03/03/22

EXPERIMENT-7

Determination of phase and line quantities in 3φ star and delta loads

Aim:- To determine the relationship b/w the phase quantities and line quantities in star and delta connected three phase system.

Circuit diagram:- (Star connected)



Tabular Column:-

Sl	I_L (A)	I_{ph} (A)	V_{ph} (V)	V_L	
				Measured	Calculated
1.	0.332	0.333	231.1	401.6	400.2
2.	0.665	0.667	231.3	401.7	400.6
3.	1.001	1.002	231.2	401.4	400.45

Calculation:-

$$\frac{I_L}{I_{ph}} = 1 \Rightarrow \frac{0.332}{0.333} \approx 1$$

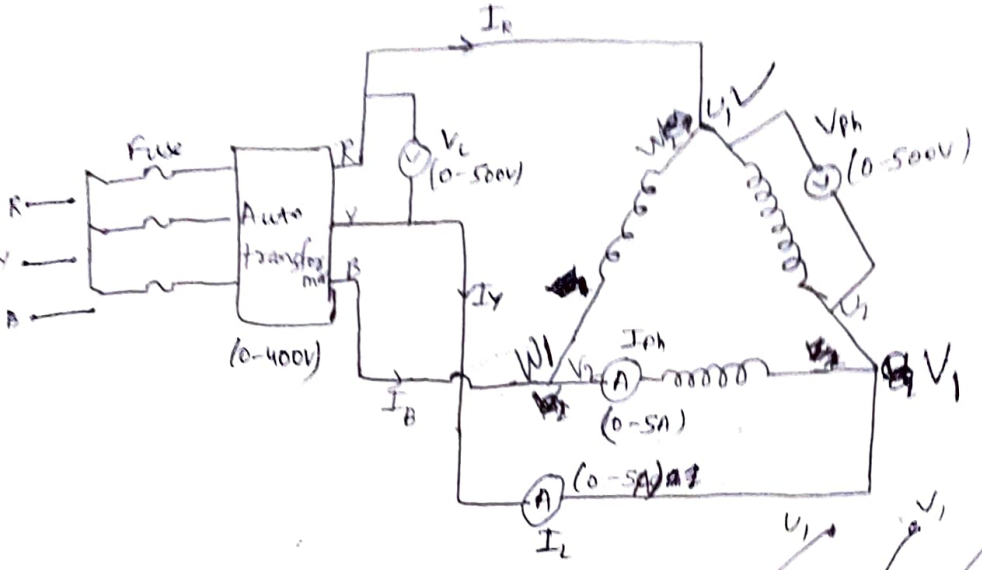
$$V_L = \sqrt{3}\, V_{ph}$$

$$400.2 = \sqrt{3} \times 231.1$$

$$400.6 = \sqrt{3} \times 231.3$$

$$400.45 = \sqrt{3} \times 231.2$$

Delta Connected load



Tabular Column :-

Sl	V_L (V)	V_{ph} (V)	I_{ph} (A)	I_L (A)	
				Measured	Calculated
1.	402.4	401.4	0.582	1.008	1.008
2.	402.3	401.1	1.164	2.013	2.016

Result: Determined the relationship b/w the phase and line paramaters in star & delta connected load.

For star connected, $V_L = \sqrt{3}\, V_{ph}$, $I_L = I_{ph}$

For delta connected, $I_L = \sqrt{3}\, I_{ph}$ $V_L = V_{ph}$

3/3/22

Calculation :-

$\frac{V_L}{V_{ph}} = 1 \quad \frac{402.4}{401.4} \times 1$

$I_L = \sqrt{3}\, I_{ph}$

$1.008 = \sqrt{3} \times 0.582$

$2.016 = \sqrt{3} \times 1.164$