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Name : C. Sridhar Reddy Std. : Sec. :

Roll No. : 192111283 Sub :

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2.		Output characteristic of LVDT		✓
3.		Generation of common time signals.		✓
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5.		Filter using the Transformation method		
6.		Analog Butterworth Filter		✓
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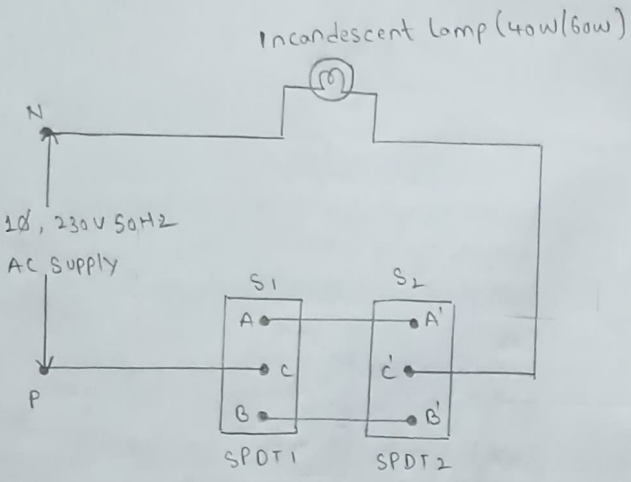
19.		voltage and current division rule		✓
20.		Star/delta transformation		✓

*circuit Diagram:

direct connection:



Tabulation:

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

Experiment-01(A)

Staircase wiring

*Aim: To control the status of the given lamp using two-way switches.

*Apparatus Required:

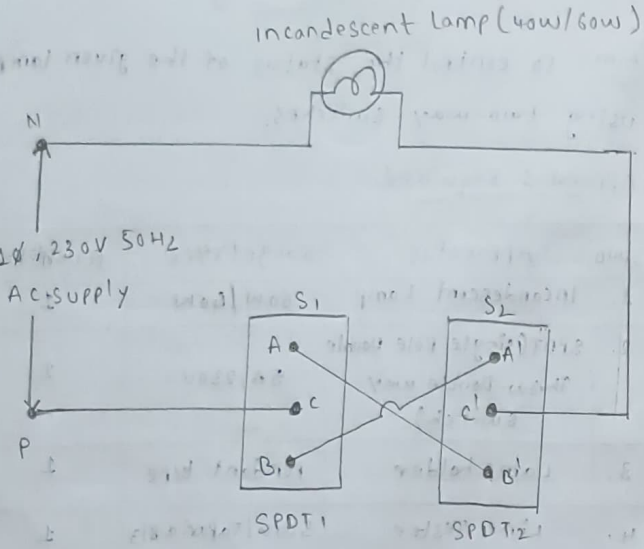
S.No	Apparatus	Range/Type	Quantity
1.	Incandescent Lamp	60W/40W	1
2.	SPDT(single Pole Double Throw-Double way switch)	5A, 230V	2
3.	Lamp holder	pendant type	1
4.	Line Tester	500V/Taparia 813	1
5.	3 pin plug	5A, 230V	1
6.	wire stripper cum cutter	Pye 950	1
7.	connecting wires	12A/1sq.mm Area/0.7 Thickness	As per Requirement.

* Procedure:

1. A piece of wire is connected to the phase side and other end to the middle point of SPDT switch 1.
2. Another point of lamp holder is connected to neutral line.
3. Upper point of SPDT switch 1 is connected to the upper point of SPDT switch 2. Lower

*circuit Diagram:

Indirect connection



Tabulation:

S.NO	S_1	S_2	Lamp Status
1.	CA	C'A'	OFF
2.	CB	C'B'	OFF
3.	CA	C'B'	ON
4.	CD	C'A'	ON

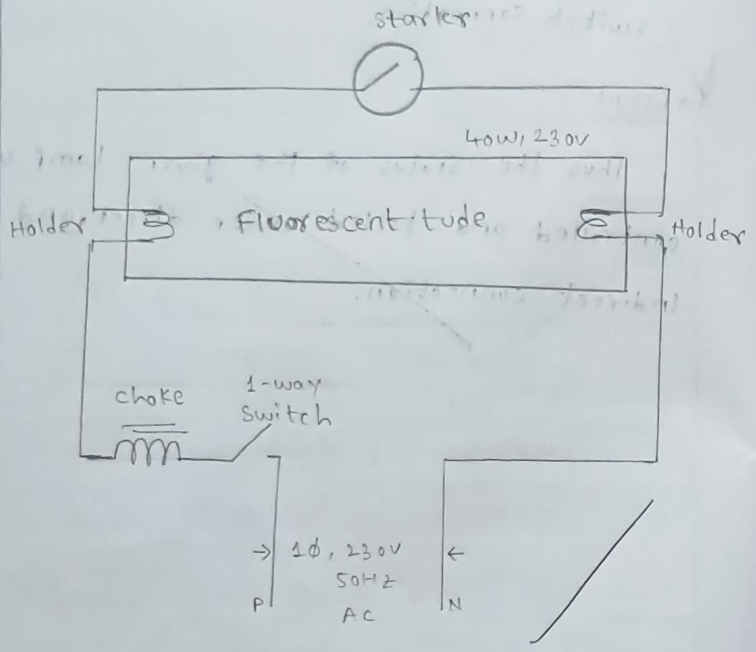
point of SPDT switch 1 is connected to the lower point of switch 2.

4. circuit is tested that all combination of switch connection.

*Result:

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

circuit diagram - Tube Light



Experiment-01(B)

Fluorescent tube wiring,

* **Aim:** To prepare wiring for a fluorescent tube light with switch control.

* **Apparatus Required:**

Sl.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:**

working of the Fluorescent tube light:

The fluorescent lamp circuit consists of a choke, a starter, a fluorescent tube and a frame. The length of the commonly used fluorescent tube is 100 cm; its power rating is 40 W and 230 V. The tube is filled with argon and a drop of mercury. when the supply is switched on, the current heats the filaments and initiates emission of electrons. After one or two seconds, the starter circuit opens and makes the choke

to induce a momentary high voltage surge across the two filaments. Ionization takes place through argon and produces bright light.

* Procedure:

1. Mark the switch and tube light location points and draw lines for wiring on the wooden board.
2. Place wires along the lines and fix them with the help of clips.
3. Fix the switch and tube light fitting in the marked positions.
4. complete the wiring as per the wiring diagram.
5. Test the working of the tube light by giving electric supply to the circuit.

* Result:

Thus the wiring for the tube light is completed and tested.

Tabular Form of LVDT:

Displacement direction	Displacement (mm)	voltage (v)	Null collected displacement
+ve	0	3.83	6
+ve	1	3.36	5
+ve	2	2.58	4
+ve	3	2.01	3
+ve	4	1.43	2
+ve	5	0.78	1
+ve	6	0.01	0
-ve	7	-0.54	-1
-ve	8	-1.13	-2
-ve	9	-1.76	-3
-ve	10	-2.45	-4
-ve	11	-3.01	-5
-ve	12	-3.56	-6

Experiment-01

Output characterstic of LVDT

*Aim:- To plot the output characterstics of LVDT.

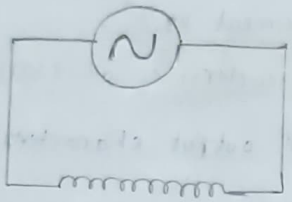
* Apparatus Required:

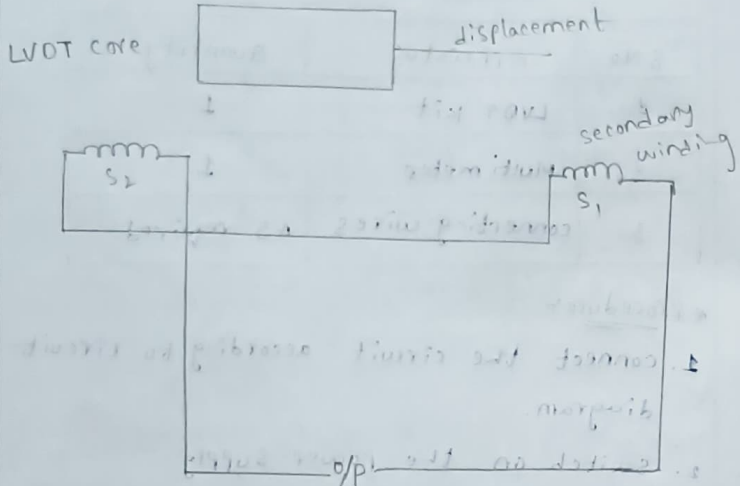
S.No	Apparatus	Quantity
1.	LVDT kit	1
2.	Multimeter	1
3.	connecting wires	As required.

*Procedure:-

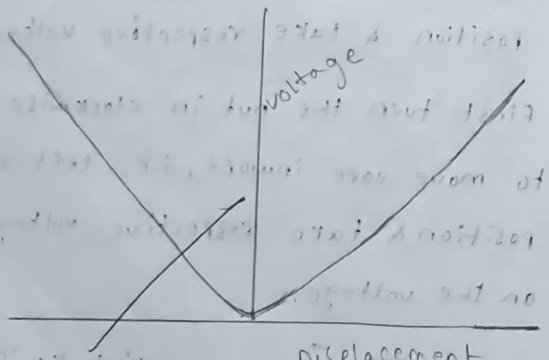
1. connect the circuit according to circuit diagram.
2. switch on the power supply
3. The core is initially brought to null position to move core inward. i,e left of null position & take respective voltage.
4. First turn the nut in clockwise direction to move core inword, i.e, left of null position & take respective voltage reading on the voltage.
5. Now turn nut in anticlockwise direction to move the core towards right of null

circuit Diagram





Model Graph



point & again take respective voltage reading from voltmeter.

6. Plot the graph from the observation taken.

Generation of continuous

* Aim:- To write the SCILAB code to generate the signal, plot the signal & label the axis appropriately. For:
  a) unit step signal
  b) unit Impulse signal
  c) unit ramp signal
  d) sinusoidal signal
  e) exponential signal

* Software required:-
  - scilab.

* Procedure:
1. Start the scilab program.
2. Open the scinotes & type the program in current directory compile & run the program
3. If any error occur in the program correct the error & run the program
4. For the output, see the console window.

* Result: Scilab programs are generated successfully.

Experiment-03

Generation of common Time signals:

*Aim:- To write the SCILAB code to generate the signal, plot the signal & label the axis appropriately. For:

a) unit step signal

b) unit Impulse signal

c) unit ramp signal

d) sinusoidal signal

e) Exponential signal

*Software Required:-

- scilab.

*Procedure:

1. Start the scilab Program.
2. open the scinotes & type the program in current directory compile & run the program
3. If any error occur in the program correct the error & run the program
4. For the output, see the console window.

*Result: scilab programs are generated successfully.

Experiment-04

DIT-FFT & DIF-

*Aim:- To write ... obtain the following:

(a) Dit-fft Algorithm

(b) Dif-fft Algorithm

*software required:

- Scilab.

*Procedure:

1. Start the scilab program.
2. open scinotes, type the program & save the program in the current directory.
3. compile & run the program
4. If any error occur in the program correct the error & run the program
5. For output see the console window.

*Result:

scilab programs are generated successfully.

Output:

Dif-fft

Column 1 to 3

20 + 0.1 - 5.828427 - 2.414213 6i 0 +

Column 4 to 5

-0.1715729 - 0.41421361 + 0.+0.i

Column 6 to 7

-0.1715729 + 0.41421361 + 0 +0.i

Column 8

-5.8284271 + 2.414213611

Output:

Dit-fft

Column 1 to 3

4.+i -1.2928932 - 0.7071068i

1.039w-16+2.220w-16i

Column 4 to 6

0.7071068 + 2.7071068i 4. -1

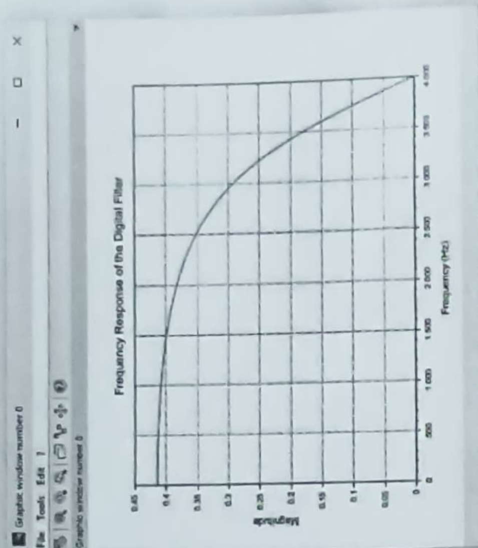
- 2.7071068 +0.7071068i

Column 7 to 8

1.857w-17-2i-0.7071068 + 1.2928932i

```
function X = dit_fft(x)
  N = length(x);
  X = x;
  j = 1;
  for i = 1:N
    if i < j
      temp = X(i);
      X(i) = X(j);
      X(j) = temp;
    end
    m = N / 2;
    while m >= 1 && j > m
      j = j - m;
      m = m / 2;
    end
    j = j + m;
  end
  L = log2(N);
  for l = 1:L
    m = 2^l;
    wm = exp(-%i * 2 * %pi / m);
    for k = 1:N / m
      w = 1;
      for j = 0:m/2-1
        t = w * X(k + j + m/2);
        u = X(k + j);
        X(k + j) = u + t;
        X(k + j + m/2) = u - t;
        w = w * wm;
      end
    end
  end
end
x = [1, -1, -1, -1, 1, 1, 1, -1];
X = dit_fft(x);
disp("DFT of the sequence is:");
disp(X);
```

```
fs = 8000;
fc = 1000;
omega_c = 2 * %pi * fc;
prewarped_wc = 2 * fs * tan(omega_c / (2 * fs));
num = [0, prewarped_wc];
den = [1, prewarped_wc];
T = 1 / fs;
a = 2 / T;
numz = [num(2), num(2)] / (den(2) + den(1) * a);
denz = [1, (den(1) * a - den(2)) / (den(2) + den(1) * a)];
disp("Numerator coefficients (b):");
disp(numz);
disp("Denominator coefficients (a):");
disp(denz);
N = 512;
f = linspace(0, fs / 2, N);
z = exp(%i * 2 * %pi * f / fs);
H = polyval(numz, z) ./ polyval(denz, z);
clf();
plot(f, abs(H));
xgrid();
xlabel("Frequency (Hz)");
ylabel("Magnitude");
title("Frequency Response of the Digital Filter");
```



Experiment - 05

Filter using the Transformation Method.

*** Aim:-** To write the scilab program to design a filter using the transformation method.

a) Bilinear Transformation

b) Impulse Invariant Transformation

*** Software Required:-**

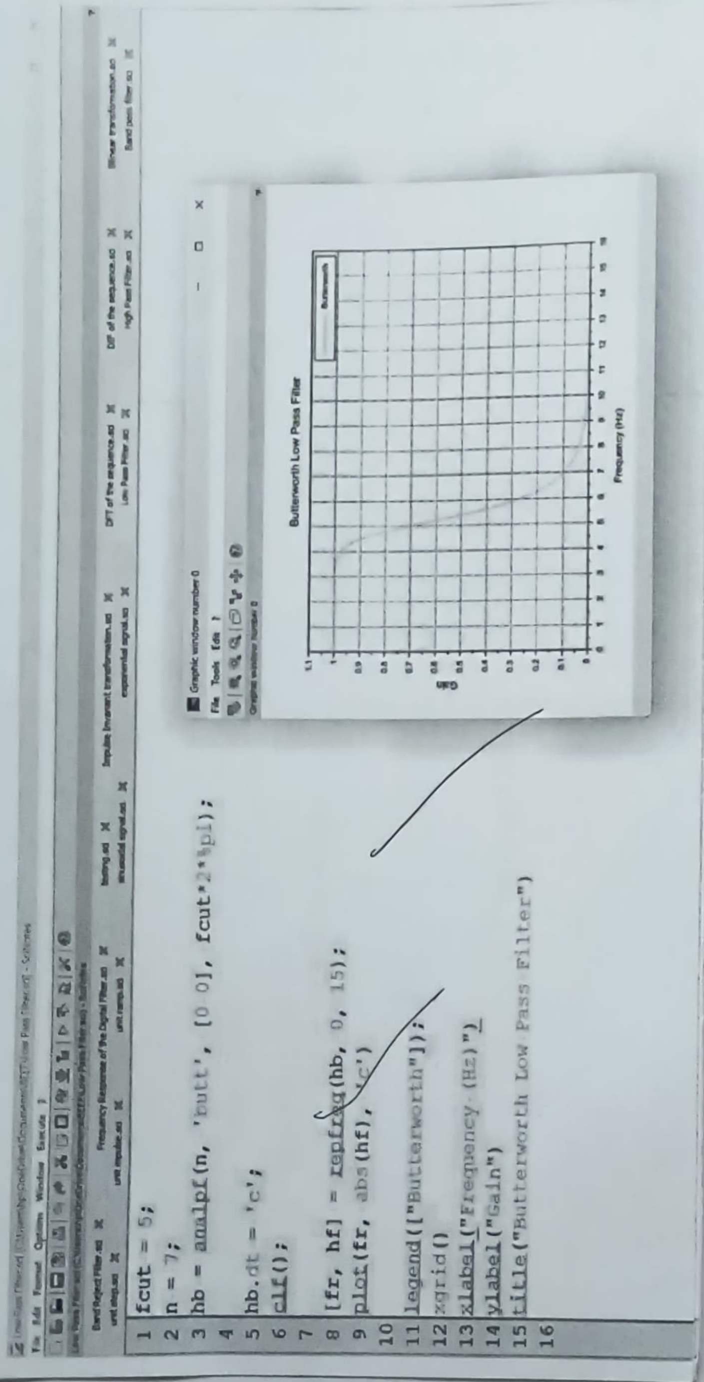
- Scilab.

*** Procedure:**

1. Start the scilab program.
2. Open scinotes, type the program & save the program in the current directory.
3. Compile & run the program.
4. If any error occur in the program correct the error & run the program.
5. For output see the console window.

*** Result:**

Scilab Programs are generated successfully.



Experiment-06

Analog Butterworth Filter

* **Aim:-** To write the scilab program to design the following filters.
  - (a) Low pass filter
  - (b) High pass filter
  - (c) Band pass filter
  - (d) Band reject filter.

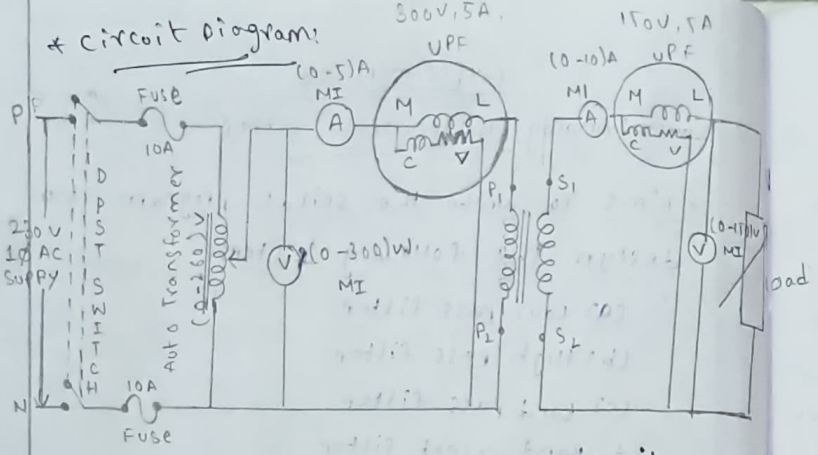
* **Software required:**
  - Scilab.

* **Procedure:**
  1. Start the scilab.
  2. open scinotes, type the program & save the program in the current directory
  3. compile & run the program.
  4. If any error occurs in the program correct the program & run the program
  5. For the output. see the console window.

* **Result:**

scilab programs are generated successfully.

* circuit diagram:



Fuse Rating:

125% of rated current

$\frac{125 \times 5}{100} = 6.25A$

Name plate details:

	Primary	secondary
Rated voltage	220v	110v
Rated current	5A	10A
Rated Power	1KVA	1KVA

Tabular column: MF -> Multifying factor = 4

Sl.No.	Load	Primary			Secondary			Input Power $W_1 \times MF$	output power $W_2 \times MF$	efficiency (η) %	voltage Regulation (%)
		V_1 (volts)	I_1 (Amps)	W_1 (watts)	V_2 (volts)	I_2 (Amps)	W_2 (Watts)				
1	1	220	0.25	80	220	0	0	80	0	0	100
2	2	220	1.8	240	214	1.7	200	240	200	83.34	2.72
3	3	220	2.2	440	210	1.8	400	440	400	90.90	4.5
4	4	220	2.5	640	208	2.5	580	640	580	90.98	5.4
5	5	220	3.0	800	200	3.1	780	800	780	92.9	9.0

Experiment-07

Load 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	Ranges	Type	Quantity
1	Ammeter	(0-10)A (0-5) A	MI	1
2	voltmeter	(0-150)V (0-300)V	MI	1
3	wattmeter	(300V, 5A)	UPF	1
4	Auto Transformer	1ϕ, (0-260)V	-	1
5	Resistive load	5KH, 230V	-	1
6	connecting wires	2.5 sqmm	copper	Few

*Precautions:

1. Auto transformer should be in minimum position.
2. The AC supply is given and removed from the transformer under no load condition.

*Procedure:

1. connection are made as per the circuit diagram.
2. After checking the no load condition, minimum position of auto transformer

*Formulae:

output power = W_2 × multiplication factor (MF)

input power = W_1 × MF

efficiency η % = $\frac{\text{output power}}{\text{input power}} \times 100\%$

Regulation R% = $\frac{V_{NL} - V_{FL}\ (\text{secondary})}{V_{NL}} \times 100$

*calculation:

(i) $R = \frac{220 - 0}{220} \times 100 = 100$

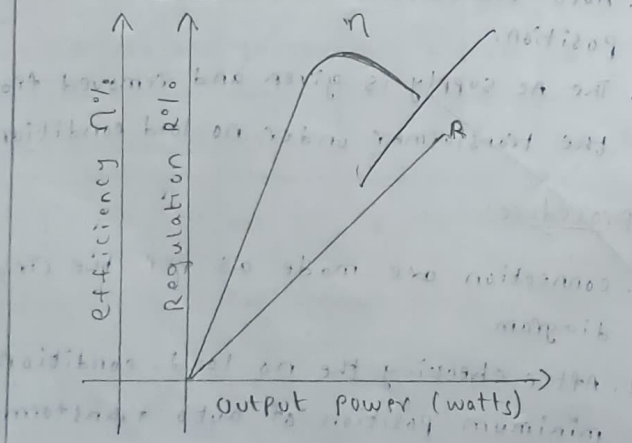
(ii) $R = \frac{220 - 214}{220} \times 100 = 2.7$

(iii) $R = \frac{220 - 210}{220} \times 100 = 4.5$

(iv) $R = \frac{220 - 208}{220} \times 100 = 5.4$

(v) $R = \frac{220 - 200}{220} \times 100 = 9.0$

*Model Graphs:



and DPST switch is closed.

3. Ammeter, voltmeter and wattmeter readings on both primary and secondary side are noted.

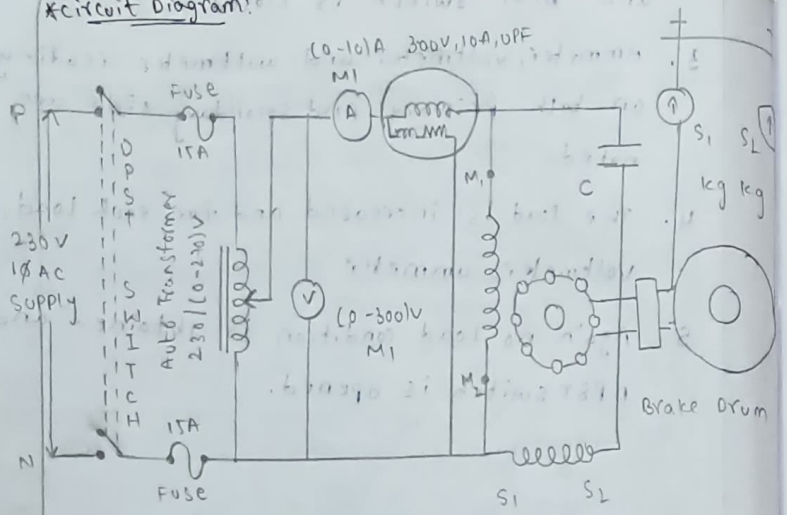
4. The load is increased and for each load, voltmeter, ammeter.

5. Again no load condition is obtained and DPST switch is opened.

*Result:

The load test on single phase transformer is conducted.

*circuit Diagram:



Tabular column:

Sl.No.	Line voltage	line current	Input power	spring Balance			Torque (N)	speed (N)	output power	η %	S %
				S_1	S_2	$S_1 \sim S_2$					
1.	230	3.15	60	0	0	-	2	1500	240	-	-
2.	210	3.5	140	0.8	4.2	-	3.11	1470	560	-	-
3.	220	4	190	1.6	7.4	-	4.86	1410	710	-	-
4.	220	4.5	225	1.8	8.9	-	5.01	1400	900	-	-
5.	220	5	250	2.8	11	-	5.25	1390	1000	-	-

Experiment-08

Load test on a single phase Induction Motor

*Aim:- To conduct load test on single phase induction motor to plot the following performance characteristics.

1) output power vs efficiency
2) output power vs speed
3) output power vs %slip
4) output power vs Torque
5) output power vs line current

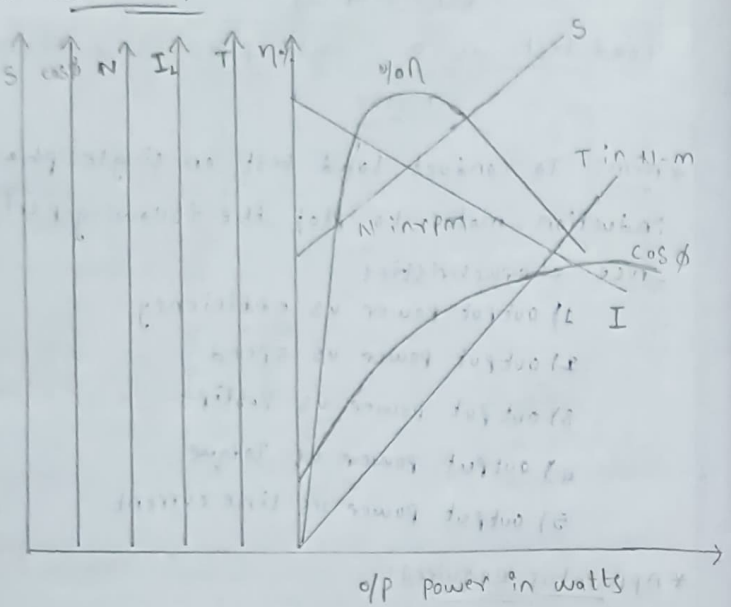
*Apparatus Required:

S.No	Apparatus	Range	Type	Quantity
1.	Ammeter	(0-20)A	MI	1
2.	voltmeter	(0-300)V	MI	1
3.	wattmeter	(300V,10A)	UPF	1
4.	Auto Transformer	1Φ,(0-270)V	-	1
5.	connecting wires	2.5 sqmm	copper	Few

*Procedure:

1. The circuit connections are made as per the circuit diagram.
2. Keeping the motor field rheostat in its minimum position and the starter in its OFF position the main supply is switched ON to the circuit.

*Model Graph:

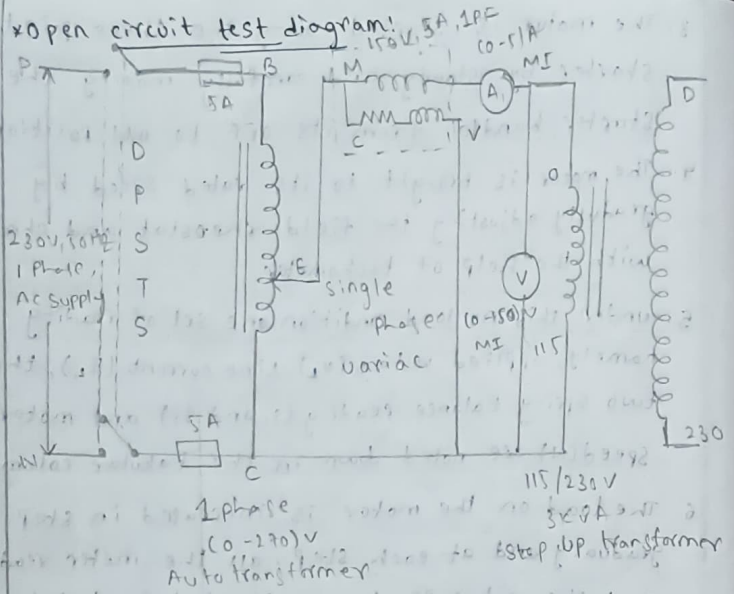


3. The motor is started using the three point starter by slowly and carefully moving the starter handle from its OFF to ON position.
4. The motor is brought to its rated speed by gradully adjusting the field rheostat and checked with the help of tachometer.
5. under this no load condition one set of reading namely, applied voltage(V_L), Line current (I_L), the two spring balance reading (S_1 and S_2) and motor speed(N) are noted down in the tabular columns.
6. The load on the motor is increased in step gradualy and at each step, all the meter reading and the motor speed are recorded in tabular column. The above procedure is repated until the motor is loaded to 120% of its rated current.
7. After the expirement is completed, the load on motor is gradually decreased to minimum and the rheostat is brought back to its original position and then the main supply is switched OFF
8. plot the performance characterisbics.

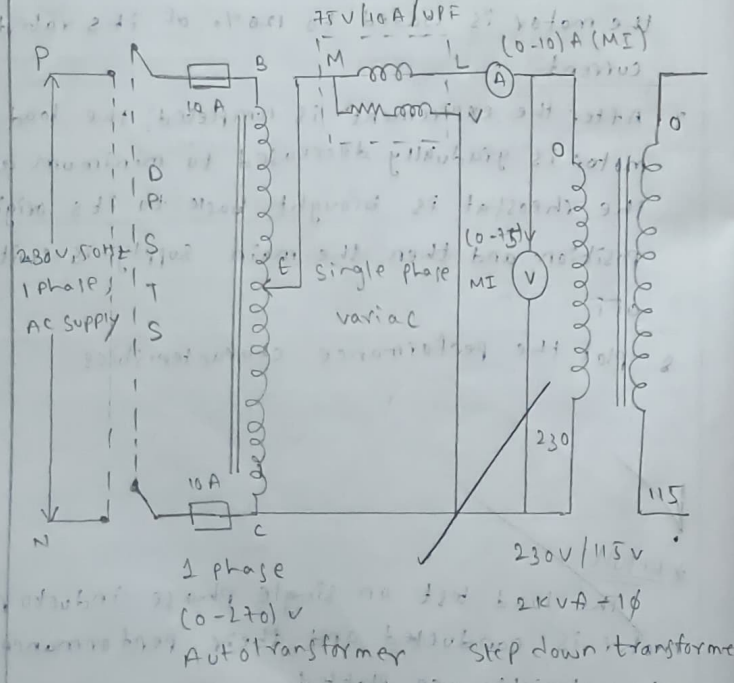
*Result:

The load test on single phase inductor motor is conducted and their performance characteristic are plotted.

*Open circuit test diagram:



*Short circuit test diagram:



Experiment-9

OC and OS 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	(0-5)A	MI	1
2.	voltmeter	(0-300)V	MI	1
3.	wattmeter	(300V, 5A)	UPF	1
4.	Auto Transformer	1ϕ, (0-260)V	-	1
5.	Resistive load	5KH, 230V	-	1
6.	connecting wires	2.5 sq.mm	copper	Few

*Procedure:-

(i) OC Test:

1. The circuit connections are made as per circuit diagram.
2. Keeping the H.V winding open and the auto transformer in its minimum position the main supply is switched on.
3. By slowly and carefully adjusting the auto-transformer, the rated voltage (115V) is applied to L.V winding of the transformer.
4. Under this condition the ammeter (I_o), voltmeter (V_o) and wattmeter (W_o) reading noted

Tabulation:

Test	VOLTAGE(V)	CURRENT(A)	POWER(W)
o.c test (on L.V side)	115	0.4	4
S.C test (on H.V side)	12	4.2	9

down.

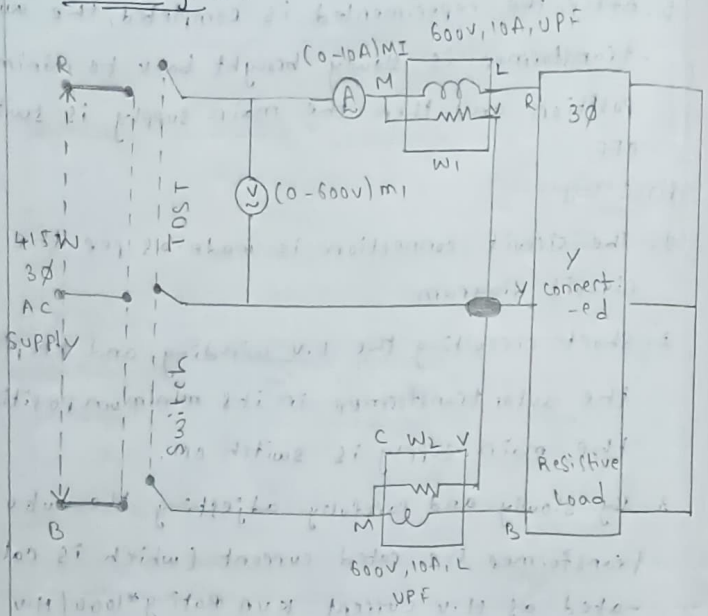
5. After the experimented is completed, the auto-transformer is slowly brought back to minimum position and then the main supply is switched OFF.

(ii) SC Test:-

1. The circuit connection is made as per the circuit diagram
2. Short circuiting the L.V winding and keeping the autor transformer in its minimum position, the main supply is switch ON.
3. By slowly and carefully adjesting the auto transformer the rated current (which is calculated as H.V current = kVA Rating * 1000 / H.V is circulated through the H.V winding.
4. under this condition, the ammeter (ISC), the voltmeter (VSC) and the wattmeter (WSC) reading and noted down.
5. After the experiment is completed, the auto transformer is brought back to its minimum position and main supply is switched OFF.

*Result: The o.c and S.C test are conducted on the single phase transformer and the efficiency and regulation graphs and also the equivalent circuit as refferred to H.V side is drawn.

Circuit Diagram:



Tabular column:

SI NO	Line voltage V_L (V)	Line current I_L (A)	wattme-ter (W_1) x8	watton-eter (W_2) x8	$W = W_1 + W_2$ (W)
1.	415	2.4	94	0	94
2.	415	2.7	128	0	128
3.	415	3	148	25	173
4.	415	3.4	180	70	290

Experiment-10

Three Phase Power Measurement using two Wattmeter Method

*Aim: To measure the power measurement using two wattmeter method.

*Apparatus Required:

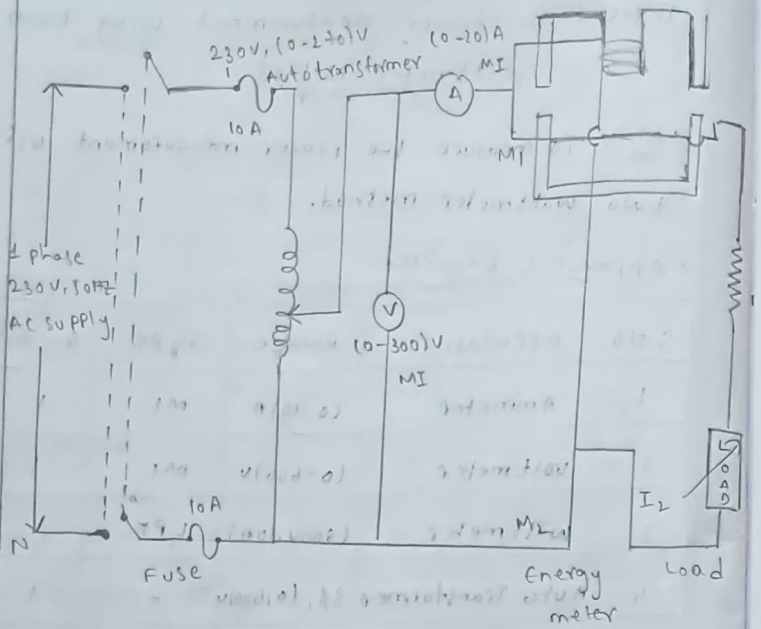
S.NO	Apparatus	Range	Type	Quantity
1.	Ammeter	(0-10)A	MI	1
2.	voltmeter	(0-600)V	MI	1
3.	Wattmeter	(600V, 10A)	LPF	2
4.	Auto Transformer	3ϕ, (0,600)V	-	1
5.	Lamp load	-	-	1
6.	connecting wire	2.5 sq.mm	copper	Few

*Procedure:

1. Make the connection, as per the circuit diagram
2. Switch ON 3phase AC supply
3. Apply load and measures the value of wattmeters, ammeter and voltmeter.
4. Switch OFF all the loads and supply.

*Result:- Three phase measurment using two wattmeter method is executed successfully.

* circuit diagram:



* Tabular column

Sl. No.	Line voltage V_L (V)	Line current I_L (A)	Time taken for revolution (sec)	No. of revolution (n)	calculated Energy	Measured Energy
1.	230	0.9	70	10	0.00431	0.0083
2	230	3	37.5	10	0.0067	0.0043
3.	230	3.7	38.0	10	0.0070	0.0081

Experiment-11

Energy consumption Measurement using a single phase energy meter.

*Aim: To measure the energy consumption using phase energy meter.

* Apparatus required:

S.NO	Apparatus	Range	TYPE	Quantity
1.	Ammeter	(0-20)A	MI	1
2.	voltmeter	(0-300)v	MI	1
3.	Auto Transformer	1ϕ, (0,270) V	-	1
4.	Lamp load	-	-	1
5.	connecting wires	2.5 sqmm	copper	Few

* Procedure:

1. connect the circuit as in diagram
2. connect the load rheostat 10Ω/12A is series with load.
3. keep the variac in minimum output voltage position.
4. keep the load in maximum position.
5. Adjust the variac output equal to the

Model calculation:

Formulae:-

1. calculated energy consumed during 'n' revolution was

$$W = \frac{V * I * t}{3600 \times 1000}$$

where V = voltage (V)

I = current (A)

T = time (s)

2. Measured energy by energy meter is

$$WR = N / \text{meter constant}$$

rated voltage of e.

6. Adjust the load till rated current of energy meter passes through it.

7. note down the voltmeter and ammeter reading.

8. note down the time taken for 2 revolutions of disc in the energy meter.

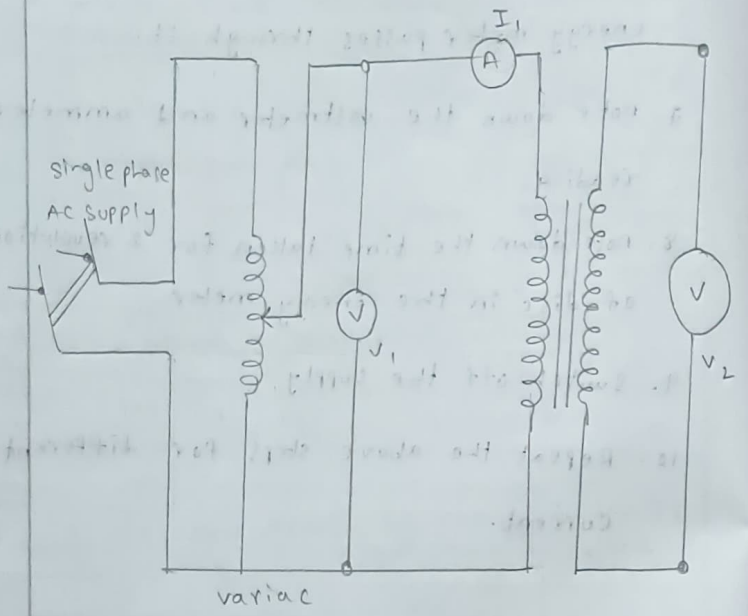
9. Switch off the supply.

10. Repeat the above steps for different current.

*Result:-

The energy consumption using single phase energy meter is measured.

*Circuit Diagram



*Tabular column:-

Sl.No	Primary voltage (V_1) in volts	Secondary voltage (V_2) in volts	Primary current (I_1) in Amps	Turn ration ($K = V_1/V_2$)	Secondary current $I_2 = I_1/K$
1.	80	36	2.2	2.2	1
2.	120	64	3.6	1.875	1.89
3.	160	90	4.1	1.778	2.28
4.	200	105	5.2	1.905	2.27
5.	220	112	5.5	1.964	2.81

Experiment - 12

Calculation of secondary turns and current in a transformer.

*Aim:- To calculate the secondary turns and current in a single transformer.

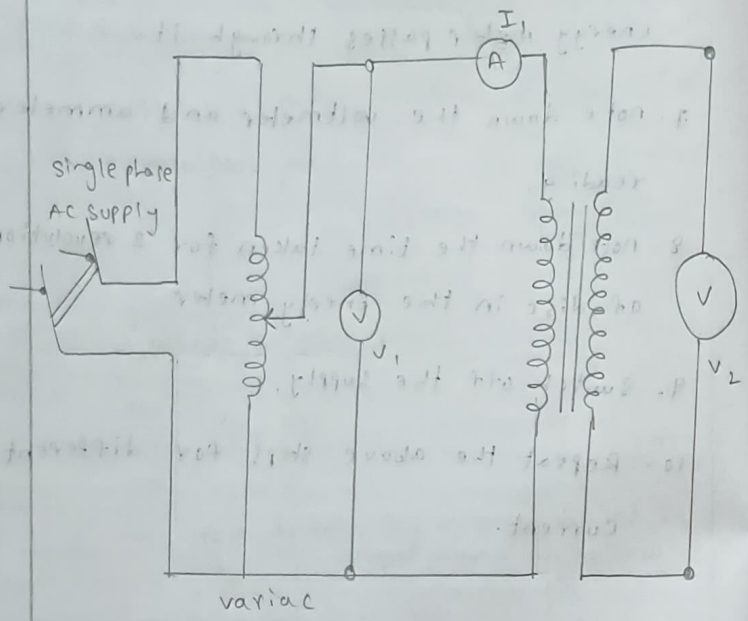
*Apparatus Required:

Sl.NO	Apparatus	Range	Quantity
1.	single phase transformer	230/115V	1
2.	Auto transformer	0-300V AC	1
3.	volt-meter	0-300V AC	2
4.	Ammeter	0-10A AC	1
5.	connecting wires	-	required
6.	single phase AC power	-	-

*Theory:

It is essential to know the relative polarity at any instant of primary and secondary terminals for making correct connections. when the two transformers are to be connected in parallel to share the load on the system. The marking is correct if voltage V_3 is less than V_1, such a polarity is formed as subtractive polarity because it reduces the voltage stress between adjacent boards. In case $V_3 > V_1$,

*Circuit Diagram



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