VIII Resources Required

S. No.	Name of Resource	Suggested Broad Specification	Quantity
1	EMF source	ampere=0-1A Voltage=0-300V	1 No.
2	Voltmeter	0-300voltage	1 No.
3	Ammeter	0-1 A	1 No.
4	Single Phase Transformer	1 kVA, 230/115V	1 No.

IX Precautions to be Followed

1. Avoid loose connections
2. Don't touch wire with wet hand.

X Procedure

1. Select the Single Phase Transformer.
2. Select the relevant voltmeter, ammeter.
3. Connect the circuit as per circuit diagram.
4. Vary the dimmer, measure the current and voltage.
5. Plot B-H curve and calculate permeability by drawing tangent to linear portion of the curve.

XI Resources Used

S. No	Name of Resource	Broad Specifications		Qty	Remarks (If any)
		Make	Details		
1.	EMF Source		Ampere = 0-1A	1	
2.	Voltmeter		0-300 Voltage	1	
3.	Ammeter		0-1A	1	
4.	Single phase transformer		1 kVA	1	

XII Actual Procedure Followed

1) State the Single phase transfomer, voltage ammeter 2) Connect the circuit as per circuit diagram

XIII Precautions Followed

1) Avoid lose connection
2) Dont touch wire with wet hand

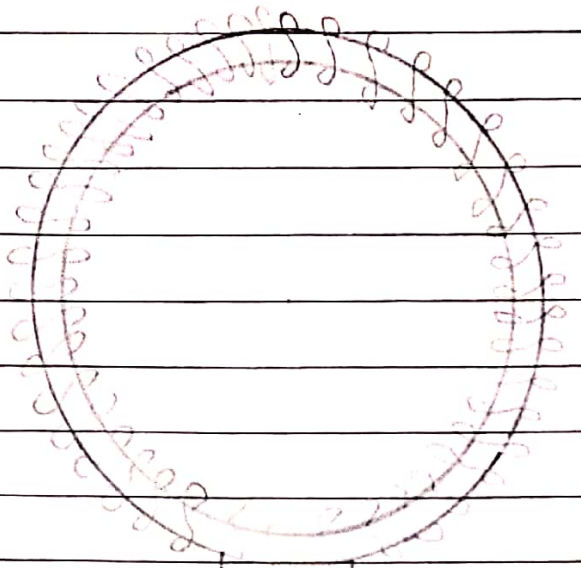
XIV Observations and Calculations

S.No.	Voltage (V) (volt)	Current(I)(ampere)
1	67	0.10
2	78	0.15
3	8C	0.20
4	92	0.25
5	97	0.30
6	102	0.35
7	104	0.40
8	108	0.45
9	112	0.50

PAGE NO.:

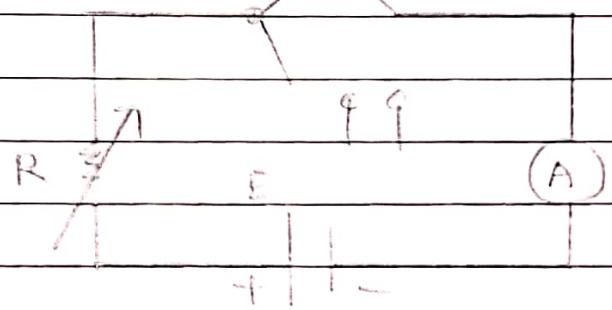
DATE : / /

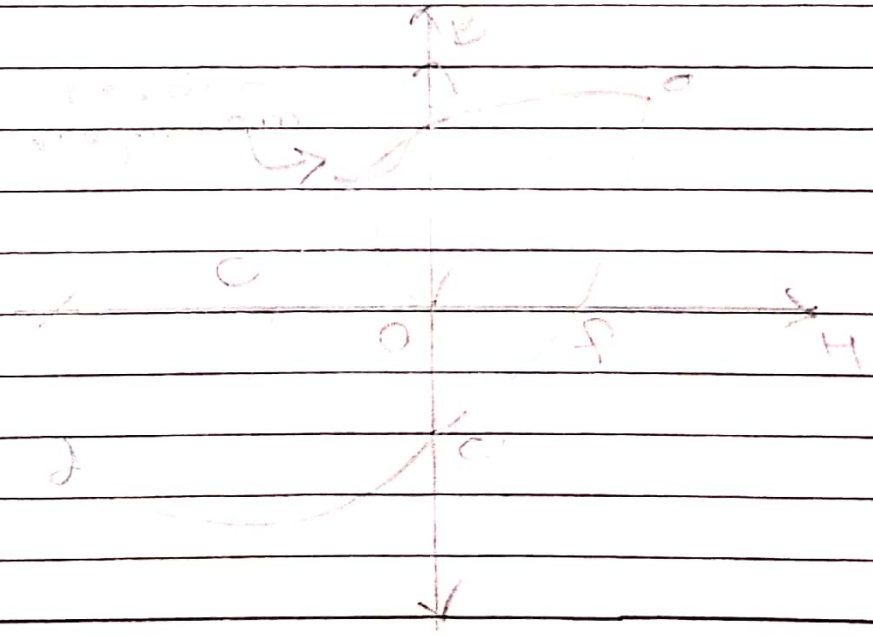
* Magnetic hystrisis loop :-

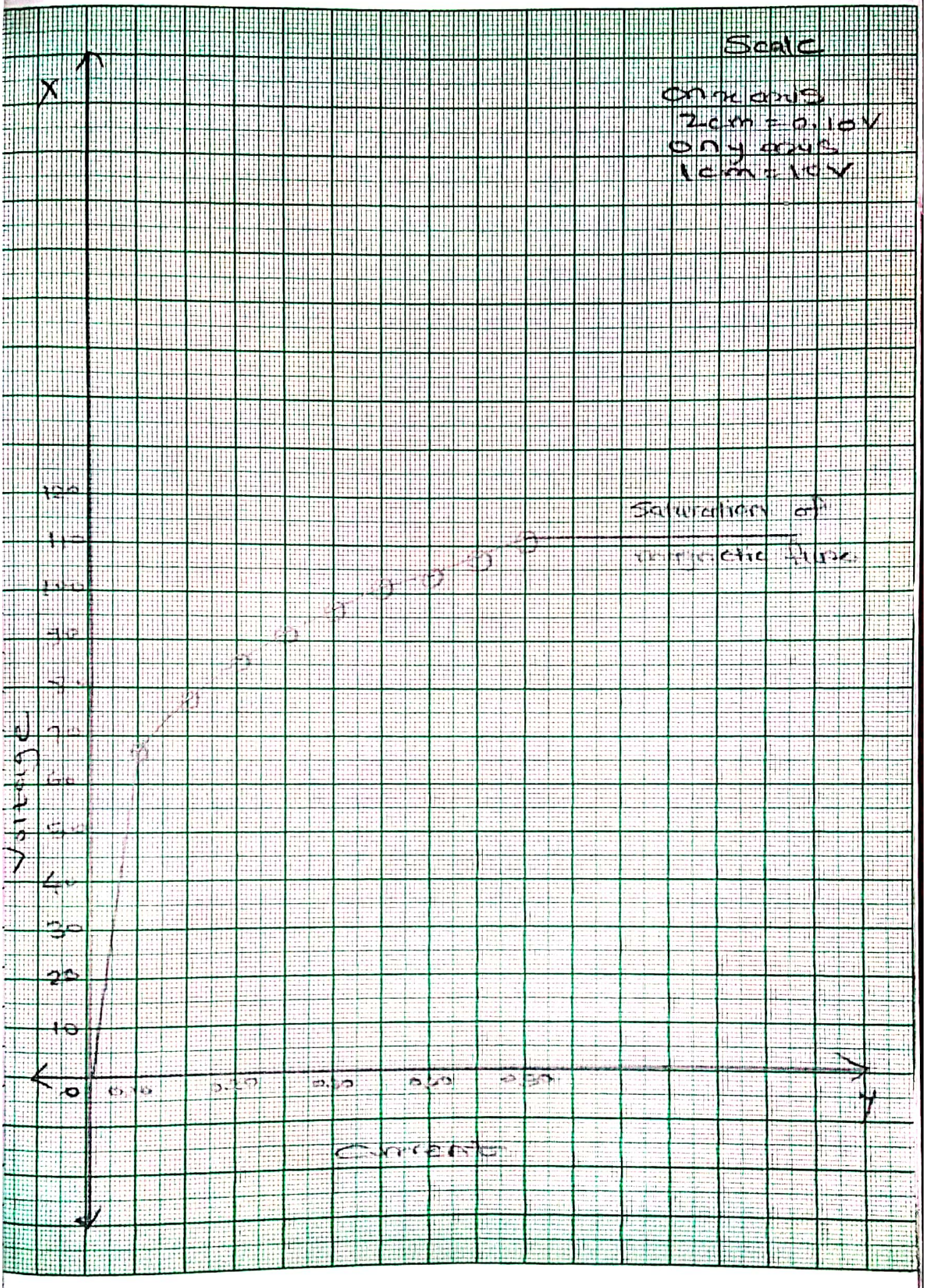


Ring of magnetic material

DPDT Switch (Reversible)






Scale
On x axis
2cm = 0.1V
On y axis
1cm = 1mV
Saturation of
Voltage
Current
X
Y

XV Results

Value of permeability=

XVI Interpretation of Results (Giving meaning to the results)

From this experiment we studied that for magnetic material after knee point If we increase small amount of flow density.

XVII Conclusions(Actions to be taken based on the interpretations)

We determine the permeability of the magnetic material.

XVIII Practical Related Questions

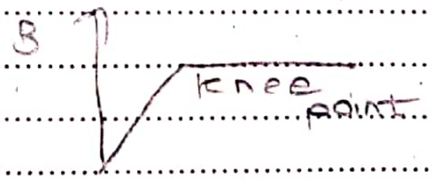
Note: Below given are few sample questions for reference. Teachers <u>must design</u> more such questionsso as to ensure the achievement of identified CO.

1. Which of the following are magnetic materials
   Copper, Silicon-Steel, Mica, Cobalt, Aluminum, Nickel, Wood.
2. Write the relation between B and H and also between other quantities like flux, MMF, ampere turns, voltage induced E, Current I.
3. Draw B-H curve for nonmagnetic material.
4. Draw hysteresis loop for magnetic material. Mark all parameters.

[Space for Answer]

Q.1]
→ Copper, cobalt, Aluminium are magnetic materials.

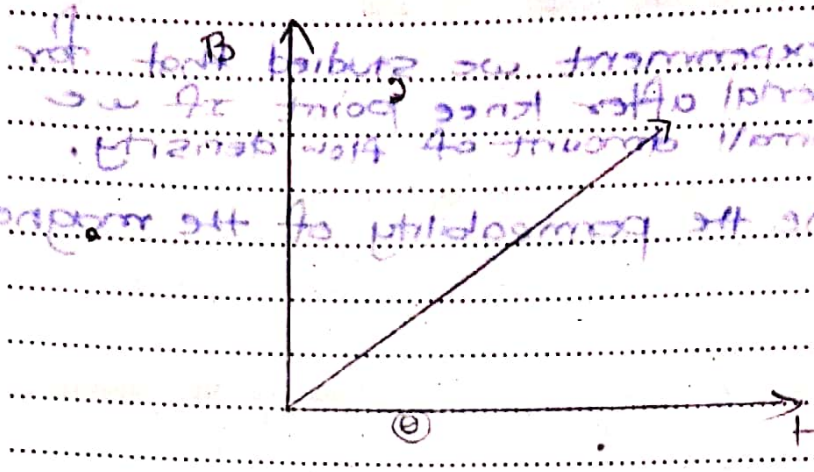
Q2] Fluxe density (B) = ϕ / a
magnetic field strength (H) = NI / L
When current increases then magnetic field strength increases then flux increases, Due to flux increases flux density also increases but after knee point if I increase then there is core saturate so flux is constant So flux density is constant as shown below -



$e = BIV \sin\theta$

$H = \frac{NI}{L}$

Q.3] B-H curve for non-magnetic material.



XIX References / Suggestions for Further Reading

1. www.electrical4u.com
2. www.howstuffworks.com
3. www.electricaltechnology.org

XX Suggested Assessment Scheme

Performance Indicators		Weightage	Marks obtained
Process Related (15 Marks)		**60%**	
1	Handling of the instrument	20%	
2	Determination of current and voltage	40%	
Product Related (10 Marks)		**40%**	
3	Plot B-H curve and interpretation of result	20%	
4	Conclusion	10%	
5	Practical related questions	10%	
	Total (25 Marks)	**100 %**	

Names of Student Team Members

1. ...Sumit.....
2. ...Karthik.....
3. ...Shrinath.....
4. .....

Marks Obtained			Dated signature of Teacher
Process Related(15)	**Product Related(10)**	**Total (25)**	

X Procedure

1) Connect the function generator output to the CRO's channel using CRO probe.
2) Adjust the volt per division and time per division of CRO such that the waveform of the current or voltage can be observed properly.
3) Adjust the peak to peak value of voltage.
4) Measure and note down the time period and peak value of sine wave.
5) Switch off the supply.

XI Actual procedure followed

1) Connect the function generator output to the CRO's channal.
2) Adjust the peak to peak value of Voltage.
3) Measure time period & peak value of Sinewave
4) Switch off the supply.

XII Resources used (with major specifications)

S. No.	Name of Resource	Broad Specifications		Quantity	Remarks (If any)
		Make	Details		
1.	CRO		10 Hz - 30 MHz	1	
2.	Function generator		0.1 Hz - 11 MHz	1	
3.	Probe		0.1	1	
4.					

XIII Precautions followed

Connect the function generator output to the CRO's channel using CRO probe.

XIV Observations

1. Time period of ac waveform (T)= 6 .....division.
2. Peak value of ac waveform = 2 .....division.
3. Time per division = 5
4. Voltsper division = 2

Calculations-

1) Time period of ac waveform (T)= 6 .div x 5 ...time per div= 30 sec.
2) Peak value of ac waveform = 2 ....div x 2 volt per div= 4 ...v.
3) R.M.S value of ac waveform=Peak value x 0.707= 2.828 v
4) Average value of ac waveform=Peak value x 0.637= 2.548 v

XV Results

1. Time period= 30 .....sec.
2. Peak value= 4 ...v.
3. R.M.S value= 2.828 v.
4. Average value= 2.548 v.

XVI Interpretation of results (Giving meaning to the results)

From this result we find the rms average, time period, value of AC quantity.

XVII Conclusions and Recommendations (Actions to be taken based on the interpretations)

when we increase frequency then time period is increases.

XVIII Sample Practical Related Questions.

Note: Below given are few sample questions for reference. Teachers must design more such questions so as to ensure the achievement of identified CO.

1. The value indicated by electrical measuring instrument is.....(average value/rms value)

[Space for Answer]

1] RMS value of Ac waveform
= 0.707 x peak value
= 0.707 x 4
= 2.828 V

2] Average value = 0.637 x Peak value
= 0.637 x 4
= 2.548 V

3] Peak value of Ac waveform
= number of divisions x volt per division
= 2 x 2
= 4 V

4] Time period of Ac waveform
= number of divisions x time per division
= 6 x 5
= 30 sec

5] Average value
Average value of an alternating quantity is 2.548 V

6] RMS value

RMS value is defined as square root of an instantaneous value.

XIX References / Suggestions for Further Reading

1. www.electrical4u.com
2. www.howstuffworks.com
3. www.electricaltechnology.org

XX Suggested Assessment Scheme

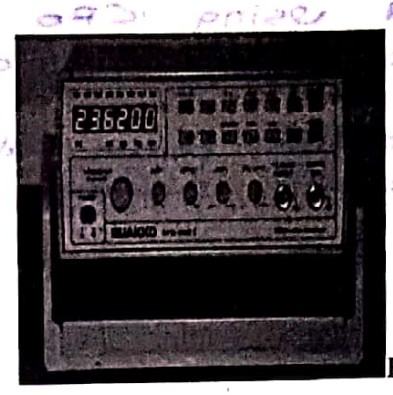
Performance indicators		Weightage
Process related (15 Marks)		**60%**
1	Handling of the components	10 %
2	Identification of component	20 %
3	Measuring value using suitable instrument	20 %
4	Working in team	10 %
Product related (10 Marks)		**40%**
5	Calculate theoretical values of given component	10 %
6	Interpretation of result	05 %
7	Conclusions	05 %
8	Practical related questions	15 %
9	Submitting the journal in time	05%
	Total (25 Marks)	100 %

Names of Student Team Members

1. Amit
2. Kartik
3. Shrinath
4. .....

Marks Obtained			Dated signature of Teacher
Process Related(15)	**Product Related(10)**	**Total (25)**	

VII Circuit diagram



VIII Resources required

S. No.	Name of Instrument	Specifications	Quantity	Remarks
1	CRO with probe	10Hz-30MHz	01	
2	Function generator	0.1 Hz-11MHz	01	

IX Precautions to be followed (if any)

Connect the function generator output to the CRO's channel using CRO probe Properly.

X Procedure

1)Connect the function generator output to the CRO's channel using CRO probe.
2) Adjust the volt per division and time per division of CRO such that the waveform of the current or voltage can be observed properly.
3) Adjust the peak to peak value of voltage.
4) Measure and note down the time period and peak value of sine wave.
5) Switch off the supply.

XI . Resources used (with major specifications)

S. No.	Name of Resource	Broad Specifications		Quantity	Remarks (If any)
		Make	Details		
1.	CRO with prob		10 Hz - 30 MHz	1	
2.	function generator		0.1 Hz - 11 MHz	1	
3.					
4.					

XII Actual Procedure followed

1) Connect function generator output to the CRO's channel using CRO probe.
2) By adjusting Volt per division & time per division
3) We adjust peak to peak value.
4) Switch off power supply.

XIII Precautions followed

Connect the function generator output to the CRO channel using CRO probe properly.

XIV Observations

1. Time period of ac waveform (T)= 6 .....division.
2. Peak value of ac waveform = 2 .....division.
3. Time per division = 5
4. Volts per division = 2

Calculations-

1) Time period of ac waveform (T)= 6 ...div x 5 ....time per div=30 .....sec.
2) Peak value of ac waveform = 2 ...div x 2 ...volt per div=4 ...v.
3) R.M.S value of ac waveform=Peak value x 0.707=2.828 v
4) Average value of ac waveform=Peak value x 0.637=2.548 v
5) Peak factor=Peak value/R.M.S value = 1.41
6) Form factor=R.M.S value/Average value = 1.10

XV Results

1. Time period=30 ....sec.
2. Peak value=4 ...v.
3. R.M.S value=2.828 v
4. Average value=2.548 .....v.
5. Peak factor=1.41 .....
6. Form factor=1.10 .....

XVI Interpretation of results (Giving meaning to the results)

When we increase frequency time period decreases & we find the value of peak factors form factor.

XVII Conclusions and Recommendations (Actions to be taken based on the interpretations)

From this experiment we calculate frequency time period, peak value, average value, form factor.

XVIII Sample Practical Related Questions.

Note: Below given are few sample questions for reference. Teachers must design more such questions so as to ensure the achievement of identified CO.

1. Calculate form factor and peak factor for 50 Hz sinusoidal AC supply.

[Space for Answer]

1] Form factor -

$$\text{Form factor} = \frac{\text{RMS Value}}{\text{Avg Value}}$$

$$= \frac{2.828}{2.548}$$

$$= 1.10$$

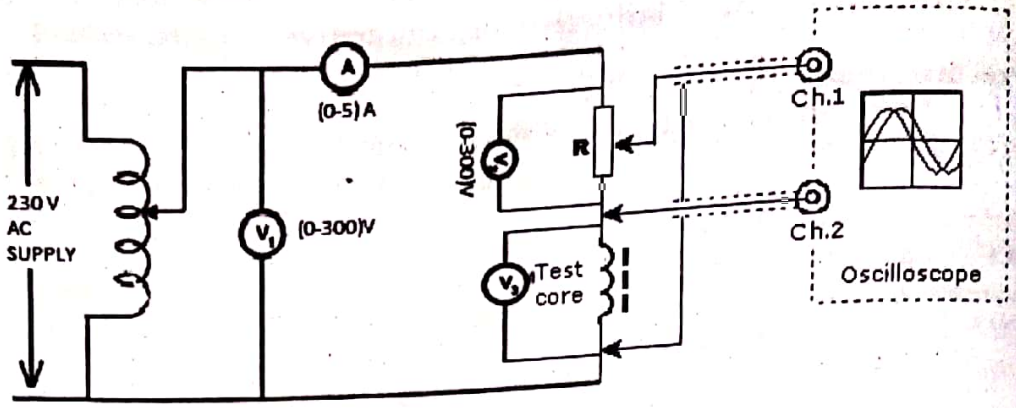
2] Peak factor -

$$\text{Peak factor} = \frac{\text{Peak Value}}{\text{RMS Value}}$$

$$= \frac{4}{2.828}$$

$$= 1.41$$

VII Experimental set-up



VIII Resources required

S. No.	Particulars	Specification	Quantity	Remark
1	Rheostat	Suitable Rheostat	1	
2	Inductor	Suitable Inductor	1	
3	Voltmeter	Suitable Voltmeter	3	
4	Ammeter	Suitable Ammeter	1	
5	CRO	With 2 attenuator probes	1	

IX Precautions to be followed

1. All electrical connections should be neat and tight.
2. Check the power supply before connection.
3. Connect Ammeter in series.
4. Connect Voltmeter in parallel.
5. Do not give high voltage to CRO.

X Procedure

1. Connect the circuit as per circuit diagram.
2. Connect the CRO for observing current and voltage waveform.
3. Repeat step 2 for different input voltage.
4. Plot the waveform for voltage across R and current
5. Plot the waveform for voltage across test core (L) and current.

XI Resources used

S. No.	Name of Resource	Broad Specifications		Quantity	Remarks (If any)
		Make	Details		
1.	Rheostat		Suitable Rheostat	1	
2.	Inductor		Suitable Inductor	1	
3.	Voltmeter		Suitable Voltmeter	3	
4.	Ammeter		Suitable Ammeter	1	

XII Actual procedure followed

1) Connect a circuit as per circuit diagram.
2) Connect the CRO for observing current & voltage waveform.

XIII Precautions Followed

1) All electrical connections shall be neat & tight
2) Do not give high voltage to CRO.

XIV Observations and Calculations

1. phase difference measured on CRO=

S.N.	V1	V2	V3	CURRENT(I)
i)	110V	64V	81V	0.20A
ii)	146V	86V	108V	0.45A
iii)	177V	105V	130V	0.50A
iv)	208V	124V	153V	0.53A

XV Results

We successfully completed this practical. We know what is RL circuit & it's features.

XVI Interpretation of results (Giving meaning to the results)

We successfully learn to take reading of RL circuit.

XVII Conclusions and Recommendations (Actions to be taken based on the interpretations)

We individually connect the circuit & we took all the readings.

XVIII Practical Related Questions

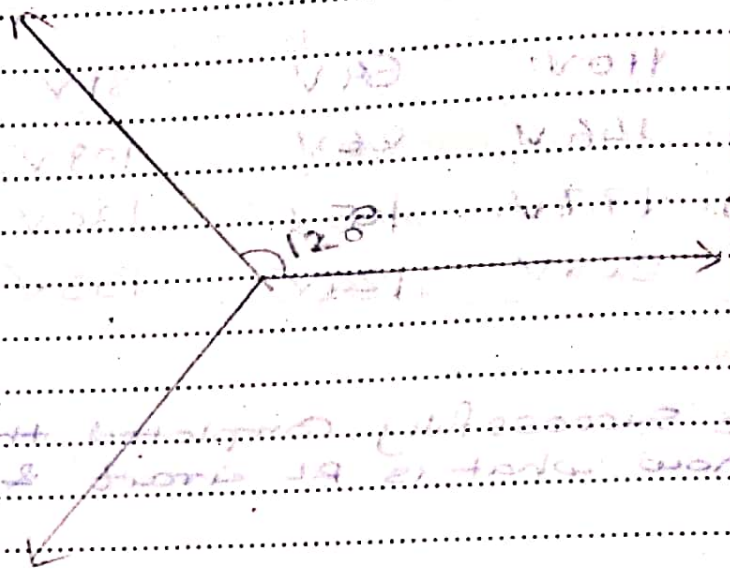
Note: Below given are few sample questions for reference. Teachers must design more such questionsso as to ensure the achievement of identified CO.

1. Give current ,voltage relation in R,L,C element
2. Draw phasor diagram showing relation between V_1, V_2, V_3.
3. Obtain phase difference between supply voltage and current for your set up.
4. Calculate power factor of the circuit.
5. Calculate active and reactive power of the circuit for any one set of readings.
6. Draw power triangle.

[Space for Answer]

1] For a Series RLC circuit relation between Voltage & current is as follows. The current in circuit is depend on the Voltage. As the Voltage increases current starts to increase.

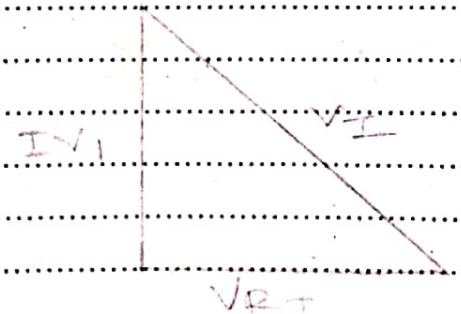
2]



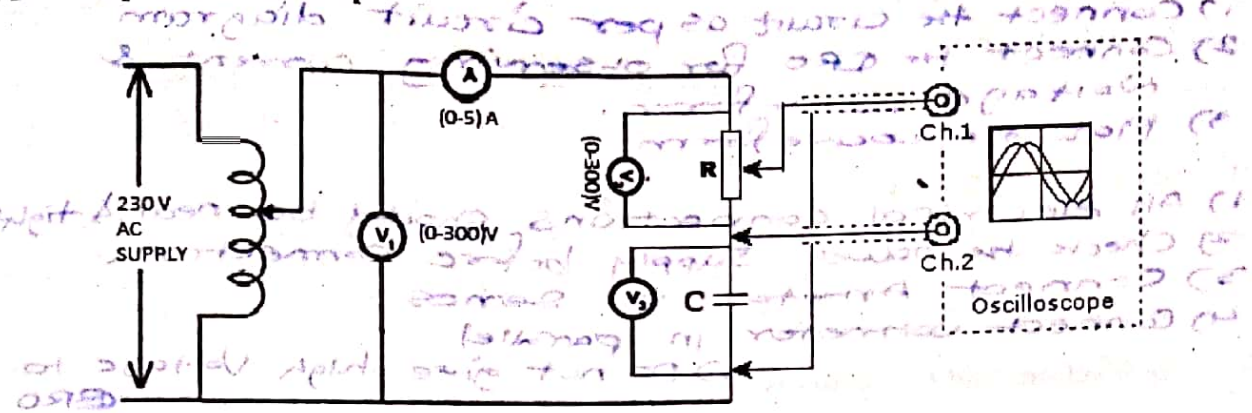
5] Active power = V . I . cos ϕ
= 110 × 0.20 × cos ϕ
= 22 cos ϕ

∴ Reactive power = V . I . sin ϕ
= 110 × 0.20 × sin ϕ
= 22 sin ϕ

6]



VII Experimental set-up



VIII Resources required

S. No.	Particulars	Specification	Quantity	Remark
1	Rheostat	Suitable Rheostat	1	
2	Inductor	Suitable Inductor	1	
3	Voltmeter	Suitable Voltmeter	3	
4	Ammeter	Suitable Ammeter	1	
5	CRO	With 2 attenuator / Differential probes	1	

IX Precautions to be followed

1. All electrical connections should be neat and tight.
2. Check the power supply before connection.
3. Connect Ammeter in series.
4. Connect Voltmeter in parallel
5. Do not give high voltage to CRO

X Procedure

1. Connect the circuit as per circuit diagram.
2. Connect the CRO for observing current and voltage waveform.
3. Repeat step 2 for different input voltages.
4. Plot the waveform.

XI Resources used

S. No.	Name of Resource	Broad Specifications		Quantity	Remarks (If any)
		Make	Details		
1.	Rheostat		Suitable Rheostat	1	
2.	Inductor		Suitable Inductor	1	
3.	Voltmeter		Suitable Voltmeter	3	
4.	Ammeter		Suitable Ammeter	1	

XII Actual procedure followed

1) Connect the circuit as per circuit diagram.
2) Connect the CRO for observing current & voltage waveform.
3) Plot the waveform.

XIII Precautions Followed

1) All electrical connections should be neat & tight
2) Check the power supply before connection.
3) Connect Ameter in series.
4) Connect Voltmeter in parallel
5) Do not give high Voltage to CRO

XIV Observations and Calculations

S.N.	V1	V2	V3	CURRENT(I)
i)	95V	48V	81V	0.20A
ii)	127V	65V	108V	0.30A
iii)	158V	80V	133V	0.35A
iv)	180V	92V	152V	0.45A

XV Results

We successfully completed this practical & we know that what is RC circuit & its features.

XVI Interpretation of results (Giving meaning to the results)

We successfully learn to take reading of RC circuit.

XVII Conclusions and Recommendations (Actions to be taken based on the interpretations)

We individually connect & we took all the reading of RC circuit.

XVIII Practical Related Questions

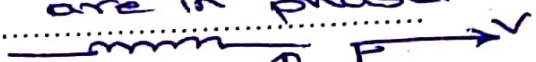
Note: Below given are few sample questions for reference. Tedchers must design more such questions so as to ensure the achievement of identified CO.

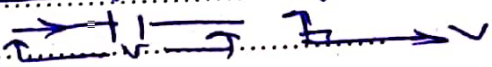
1. Give current, voltage relation in R,L,C element
2. Draw phasor diagram showing relation between V_1, V_2, V_3
3. Obtain phase difference between supply voltage and current for your set up.
4. Calculate power factor of the circuit.
5. Calculate active and reactive power of the circuit for any one set of readings.
6. Draw power triangle.

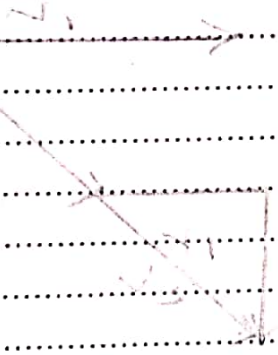
[Space for Answer]

1] i) Resistance Symbol – 

Voltage & current are in phase.

ii) Inductance Symbol – 

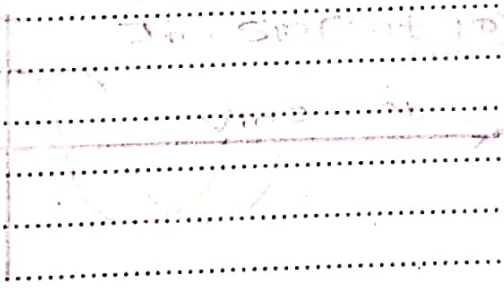
iii) Capacitor Symbol – 

2] 

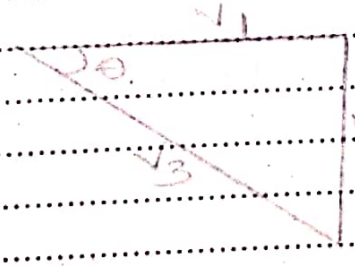
V_1 = Voltage across resistance.

V_2 = Voltage across inductor.

V_3 = Source Voltage.

3] 

For RC circuit current lead voltage by 2π/3

4] 

Power factor = $\frac{\text{Voltage across resistance}}{\text{Supply voltage}}$

$= \frac{V_2}{V_3}$

$= 0.92$

5] $P = V_3 I \cos\theta$

Active power $= V_3 I \cos\theta = 5.12 \times 0.92$

Reactive power $\theta = V_3 I \sin\theta$

$= 51.2 \times 47 \times 10^{-3} \times 10.3)$

$= 0.99$ VAR.

XIX References / Suggestions for Further Reading

1. www.electrical4u.com
2. www.howstuffworks.com
3. www.electricaltechnology.org

XX Suggested Assessment Scheme

Performance indicators		Weightage
Process related (15 Marks)		**60%**
1	Handling of the components	10 %
2	Identification of component	20 %
3	Measuring value using suitable instrument	20 %
4	Working in team	10 %
Product related (10 Marks)		**40%**
5	Calculate theoretical values of given component	10 %
6	Interpretation of result	05 %
7	Conclusions	05 %
8	Practical related questions	15 %
9	Submitting the journal in time	05%
	Total (25 Marks)	100 %

Names of Student Team Members

1. ..Sumit.....
2. ...Ramtik.....
3. ..Shrnath.....
4. .....

Marks Obtained			Dated signature of Teacher
Process Related(15)	Product Related(10)	Total (25)	

VIII Resources required

S. No.	Particulars	Specification	Quantity	Remark
1	Three phase variac	Suitable Three phase variac	1	
2	Three phase load	Suitable Three phase load	1	
3	Ammeter	Suitable Ammeter	2	
4	Voltmeter	Suitable Voltmeter	2	

IX Precautions to be followed

1. All electrical connections should be neat and tight.
2. Check the power supply before connection.
3. Connect Ammeter in series.
4. Connect Voltmeter in parallel
5. Use only balanced load

X Procedure

1. Connect the three-phase Star circuit as shown in figure.
2. Switch on three phase supply and adjust dimmerstat to obtain required voltage at output
3. Measure line current(A_1), phase current (A_2), phase voltage(V_2), line voltage (V_1)
4. Repeat 3 and 4 for different input voltages.

XI Resources used

S. No.	Name of Resource	Broad Specifications		Quantity	Remarks (If any)
		Make	Details		
1.	3phase variac		Suitable 3 phase variac	1	
2.	3 phase load		Suitable 3 phase load	1	
3.	Ammeter		Suitable Ammeter	2	
4.	Voltmeter		Suitable Voltmeter	2	

XII Actual procedure followed

1) Connect the three phase Star circuit.
2) Switch on three phase supply & adjust dimmerstat to obtain required voltage at output.
3) Measure line current (A_1), phase current (A_2), phase voltage (V_2), line voltage (V_1)

XIII Precautions Followed

1) All electrical connections should be neat & tight.
2) Check the power supply before the connection.
3) Connect Ameter in series.
4) Connect Voltmeter in parallel.
5) Use only balanced load.

XIV Observations and Calculations

Star connected load:

S. No.	Line voltage V_L	Phase voltage -V_{ph}	Ratio V_L/V_{ph}	Line current-I_L	Phase current-I_{ph}	Ratio I_L/I_{ph}
1.	311 V	178 V	1.75	0.20	0.20	1
2.	322 V	182 V	1.78	01.5	1.5	1
3.	391 V	221 V	1.78	1.10	1.10	1
4.	427 V	342 V	1.25	1.20	1.20	1

XV Results

From the experiment we get phase line relationship between phase line voltage & current.

XVI Interpretation of results (Giving meaning to the results)

In star connect load line voltage $\sqrt{3}$ times of phase voltage but line current & phase voltage are same.

XVII Conclusions and Recommendations ((Actions to be taken based on the interpretations)

In balanced star connected load line voltage in $\sqrt{3}$ times of phase voltage but line current phase current are same.

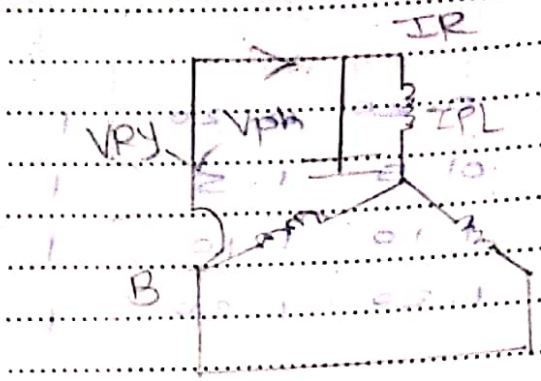
XVIII Practical Related Questions

Note: Below given are few sample questions for reference. Teachers must design more such questions so as to ensure the achievement of identified CO.

1. State relation between line voltage and line current in Star connection.
2. Write relation for power drawn in three phase star connected load.
3. State meaning of balanced load.
4. State meaning of unbalanced load.
5. Write value of neutral current and neutral voltage in balanced load.

[Space for Answer]

1] Star connection :-



VL = line voltage.
Vpn = Phase voltage.
IL = Line current.
Iph = Phase current
For star connection
$V_L = \sqrt{3}\, V_{ph}$
$I_L = I_{ph}$

2] For Id ; $P = V_{ph}\, I_{ph} \cos\phi$
In star connection
$V_L = \sqrt{3}\, V_{ph} = I_L = I_{ph}$
For 3ϕ $P = 3 V_{ph}\, I_{ph} \cos\phi$ — ①
put $V_L = \sqrt{3}\, V_{ph}$ & $I_L = I_{ph}$ in eqn ①
$V_{ph} = V_L / V\sqrt{3}$
$P = \frac{3 V_L}{\sqrt{3}}$, $I_L = \cos\phi$
$P = \sqrt{3}\, V^2 I_L \cos\phi$ watt

3] Balance load :- Balance load means if same magnetude of 3 impedence is same & phase angle same then it is called as balance load.

4] Onbalanced load :- In magnetudes phase angle of 3 impedence Z_1, Z_2, Z_3 different from each other then it is called as Onbalanced load.

5] In balanced star connected load value of neutral current is zero.

XIX References / Suggestions for Further Reading

1. www.electrical4u.com
2. www.howstuffworks.com
3. www.electricaltechnology.org

XX Suggested Assessment Scheme

Performance indicators		Weightage
Process related (15 Marks)		**60%**
1	Handling of the components	10 %
2	Identification of component	20 %
3	Measuring value using suitable instrument	20 %
4	Working in team	10 %
Product related (10 Marks)		**40%**
5	Calculate theoretical values of given component	10 %
6	Interpretation of result	05 %
7	Conclusions	05 %
8	Practical related questions	15 %
9	Submitting the journal in time	05%
	Total (25 Marks)	100 %

Names of Student Team Members

1. Simit
2. Kartik
3. Shrinath
4. .....

Marks Obtained			Dated signature of Teacher
Process Related(15)	**Product Related(10)**	**Total (25)**	

XI Resources used

S. No.	Name of Resource	Broad Specifications		Quantity	Remarks (If any)
		Make	Details		
1.	Ammeter		0-10A AC	2	
2.	Voltmeter		0-300V AC	2	
3.	Single phase trans-		1KVA 230/125V.	1	
4.	Resistive load		Single phase 230V, 15A, resistive load.	1	

XII Actual procedure followed

1) Connect equipment as per circuit diagram.
2) Switch on power supply.
3) Note down reading of ammeter & voltmeter.

XIII Precautions followed

1) All electricals connections should be neat & tight.
2) Check the power supply before connection.

XIV Observations and Calculations

S. No.	Ip	Is	Vp	Vs	CURRENT RATIO=Ip/Is	VOLTAGE RATIO=Vp/Vs
1	0.04A	0.075	98V	46V	0.53	2.08
2	0.44A	0.75	116V	56V	0.68	2.07
3	0.63A	1.225	144V	71V	0.51	2.02
4	1.02A	1.32	175V	85V	0.56	2.05

XV Results

Voltage Ratio is found to _____ and Current ratio is found _____ for given Transformer.

XVI. Interpretation of results (Giving meaning to the results)

From this experiment we find voltage ratio, current ratio of transformer which is connecte for different supply voltage.

XVII. Conclusions and Recommendations(Actions to be taken based on the interpretations)

From this experiment conclude that voltage ration, current ratio remain same for different primary voltage.

XVIII Practical Related Questions

Note: Below given are few sample questions for reference. Teachers must design more such questions so as to ensure the achievement of identified CO.

1. Give applications of step up transformer.
2. Give applications of step down transformer.

[Space for Answer]

1] Step up transformer:-
Step up transformer is used after generating station to increase voltage level for transmission of power.

2] Application of Step down transformer:-
It is used in receiving station to step down the voltage level consume purpose.

3] Transformation ratio:-
It is ratio Secondary voltage to the primary voltage of a transformer.
Transformer ratio (K) = $\frac{V_2}{V_1} = \frac{E_2}{E_1}$

XI Resources Used

S. No.	Name of Resource	Broad Specifications		Quantity	Remarks (If any)
		Make	Details		
1.	DC Shunt motor		5 HP, 220V DC	1	
2.	3 point Starter		Suitable for 5HP DC Shunt	1	
3.	Variable DC Supply		0-230 Volt, 50 amp	1	
4.					

XII Actual Procedure Followed

1) Connect the apparatus as shown in circuit diagram.
2) Switch on DC supply.
3) Move hande of starter from start to run position gradually.
4) Observe the starting of DC shunt motor.

XIII Precautions Followed

1) Connect three point starter with DC Shunt motor
2) Keep rheostat of field winding of DC Shunt motor minimum positive.

XIV Observations and Calculations

At a starting resistance of the starter is maximum when the motor is speed up resistance is cut down slowly.

XV Results

The DC Shunt Motor is started with the help of three point starter.

XVI Interpretation of Results (Giving meaning to the results)

Hence, by using three point, we start the DC shunt motor.

XVII Conclusions (Actions to be taken based on the interpretations.)

By using three point starter the DC Shunt motor without heating.

XVIII Practical Related Questions

Note: Below given are few sample questions for reference. Teachers must design more suchquestionsso as to ensure the achievement of identified CO.

1. "Starter is necessary for starting of DC Motor." Give reason.
2. Write functions of different parts of Three Point Starter.

[Space for Answer]

1] Starter is device to limit starting current up to start value of armeture current. Current an a protect abnormal condition like over load field winding failure or supply. In starter we can add xbenal axis. In armeture circuit of the starting & remove motor goes its which the help of handle.

$$Ia = \frac{V - Eb}{Ra}$$

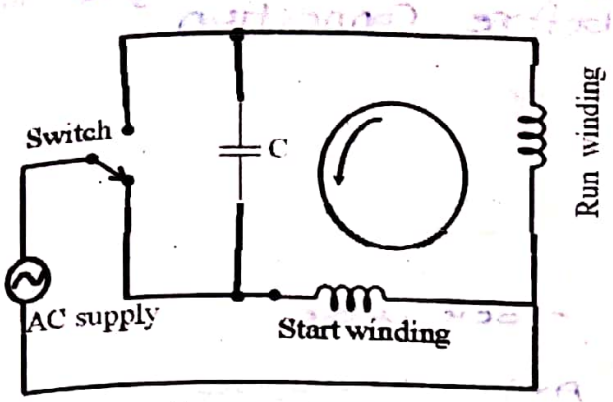
of the starting No=0 so that Fb=0 thus motor takes a large current & finaly armeture damage, This can overcome with the help of starter.

2] Three point starter:-

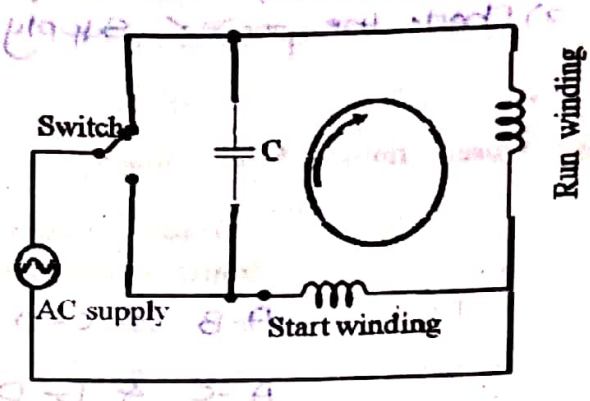
In above figure shows three point starter. It is 3 point i.e. A are available on starter it is called as 3 point starter. It is consist of overload coil starting resister & holding coil it is connected in series with armeture circuit.

At the time of starting the handle is restoff stud so that motor is stop when handle is rest on the stud so that motor is stop. when handle is more off to that starting current is reduces is the motor goes it rotated speed starting resistance is remove with the help of handle of finding handle is hold by holding coil.

Reversing single Phase Induction Motor by using External switch



Normal Direction



Reverse Direction

VIII Resources required

S. No.	Particulars	Specification	Quantity	Remark
1	Single Phase Induction Motor	¼ HP , Single Phase , 230 V	1	
2	Single phase supply	Single Phase, 230 V AC	1	

IX Precautions to be followed

1. All electrical connections should be neat and tight.
2. Check the power supply before connection.

X Procedure

1. Connect circuit as per circuit diagram.
2. Switch on the supply.
3. Start the motor and check the direction of rotation.
4. Change starting winding terminals and check the direction of rotation.

XI Resources used

S. No	Name of Resource	Broad Specifications		Quantity	Remarks (If any)
		Make	Details		
1.	Single phase Induction		¼ HP, Single phase, 230V	1	
2.	Single phase Supply		Single phase, 230V AC	1	
3.					
4.					

XII Actual procedure followed

1) Connect circuit as per circuit diagram.
2) Switch on the supply.
3) Start the motor & check the direction of rotation.

XIII Precautions Followed

1) All electrical connections should be neat & tight.
2) Check the power supply before connection.

XIV Observations and Calculations

S.N.	Winding terminal Initial / interchanged	Rotation of motor Clockwise or Anticlockwise
1	A-B & C-D	clock wise
2	A-C & B-D	Anti clock wise

XV Results

When the A-B & C-D are connected then motor rotated clockwise when the A-C & B-D then motor rotated anti clockwise direction.

XVI Interpretation of results (Giving meaning to the results)

Hence by changing the terminal of the main winding we can change the direction of single phase winding.

XVII Conclusions and Recommendations (Actions to be taken based on the interpretations)

By changing the terminal of the main winding we can change of the direction of single phase winding.

XVIII Practical Related Questions

Note: Below given are few sample questions for reference. Teachers must design more such questions so as to ensure the achievement of identified CO.

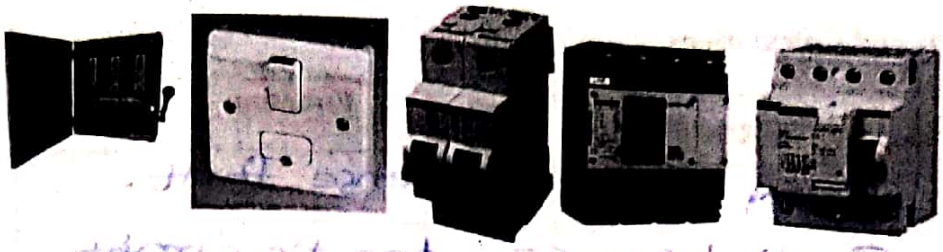
1. Give different types of Single Phase Induction Motors.
2. "Single phase Motors are not self-starting". Explain this statement.

[Space for Answer]

1] Single phase induction motor are classified as following.

1) Split phase Induction motor.
2) Capacitor Start Induction motor.
3) Capacitor Start Capacitor run induction motor.
4) Shadded pole induction motor.

2] Single phase induction motor are not Self-starting without an auxiliary Stator winding driven by an ~~pt~~ of phase current of near go. Once Started the auxiliary winding is optional. The auxiliary winding of a permanent Split Capacitor motor has a Capacitor Series with it during Starting & running.



VIII Resources required

S. No.	Particulars	Specification	Quantity	Remark
1	Different switchgears	Suitable ratings	1 each	

IX Precautions to be followed

Select proper switchgear.

X Procedure

1. Observe the various switchgears.
2. Write the function and application of each switchgear.

XI Resources used

S. No.	Name of Resource	Broad Specifications		Quantity	Remarks (If any)
		Make	Details		
1.	Diffn Switchgears		Suitable ratings	1	
2.					
3.					
4.					

XII Actual procedure followed

1) Observe the various switch gears.
2) Write the function & applications of each switch gear.

XIII Precautions Followed

1) Select proper switch gear.

XIV Observations and Calculations

S.N.	Switchgear Name	Function
1	Relay	To sense fault.
2	Circuit breaker	To trip the circuit.
3	MCB	To trip circuit.
4	Fuse	To protect against current
5	Switch	Makes break circuit.
6	Solotor	Make & break circuit.
7		

XV Results

There are various electric Switchgear equipment are used for the protection of power system. Relay is used to sense fault. Circuit breaker is used to trip the circuit. MCB is used to trip circuit. Fuse is used to protection against current.

XVI Interpretation of results (Giving meaning to the results)

There are various electrical equipment are used for the protection of power system. Relay are used to sense fault. Circuit breaker are used to trip the circuit. MCB is used to trip circuit. Fuse is used to protection against current.

XVII Conclusions and Recommendations (Actions to be taken based on the interpretations.)

There are various electrical equipment are used for the protection of power system. Relay are used to sense fault. Circuit breaker are used to trip the circuit. MCB is used to trip circuit. Fuse is used to protection against current.

XVIII Practical Related Questions

Note: Below given are few sample questions for reference. Teachers must design more such questions so as to ensure the achievement of identified CO.

1. State various types of switchgears used in engineering.

[Space for Answer]

1]

→ 1) Fuse :- It is the protection device which consist of fuse wire. When the high current is occur fuse wire is melt & disconnect DC supply.

2) Relay :- Relay is the electro-magnetic device it is used to sense if fault is occur when fault is occur relay will sense. The fault & give signal to circuit breaker given signal to trip the circuit.

3) Circuit Breaker :- It is used to make & break the circuit. When the relay give the signal circuit breaker will be operate & disconnect from supply.

Test Equipment with the help of Multimeter

VIII Resources required

S. No.	Particulars	Specification	Quantity	Remark
1	Resistance or Equipment	-	1	
2	Switch	5 Amp	1	
3	Multimeter	Suitable multimeter	1	
4	Test lamp	Suitable test lamp	1	

IX Precautions to be followed.

1. All electrical connections should be neat and tight.
2. Check the power supply before connection.

X Procedure

1 Connect circuit as per circuit diagram.
2 Switch on supply and operate switch for testing.
3 Use Multimeter for testing given equipment.
4 Repeat the procedure with other equipment.

XI Resources used

S. No.	Name of Resource	Broad Specifications		Quantity	Remarks (If any)
		Make	Details		
1.	Resistance or equipment		—	1	
2.	Switch		5A	1	
3.	Multimeter		Suitable multimeter	1	
4.	Test lamp		Suitable test lamp	1	

XII Actual procedure followed

1) Connect circuit as per circuit diagram.
2) Switch on supply & operate switch for testing.
3) Use multimeter for testing given equipment.

XIII Precautions Followed

1) All electrical connections should be neat or tight.
2) Check the power supply before connection.

XVIII Practical Related Questions

Note: Below given are few sample questions for reference. Teachers must design more such questions so as to ensure the achievement of identified CO

1. Write necessary conditions for using Test Series Lamp for testing.
2. Draw a diagram for testing choke coil using Series Test lamp
3. Write meaning of 'SERIES' in Series Test Lamp.

[Space for Answer]

2] To test Series lamp which is connected in Series should get complete path of current.

3] In Series test lamp Series indicated that circuit all experiment accessories (Switch large) circuit one series Connected means their is only one path for flow of current.

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