Practical No. 11: Start single phase induction motor and reverse the direction of rotation of it.

I Practical Significance:

Single phase induction motor is necessary in some industrial process applications. Stator of Single phase Induction motor consist of Main winding & starting winding placed at 90° electrically apart to produce rotating magnetic field. For this capacitor is connected in series with starting winding along with centrifugal switch.

II Industry/Employer Expected Outcome(s)

Use FHP motors for diversified applications. Reverse the direction of rotation of single phase induction motor.

III Course Level Learning Outcome(s)

Select the fractional horse power motor for the given application.

IV Laboratory Learning Outcome(s)

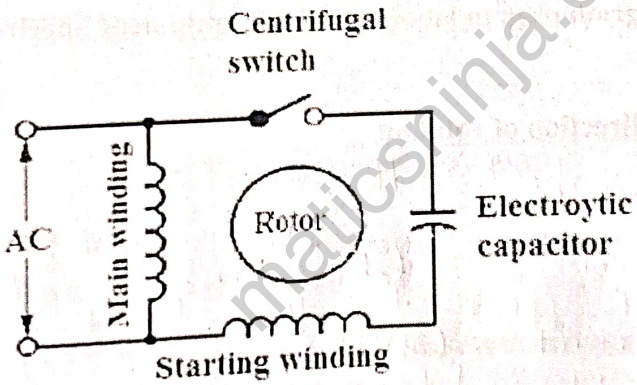
LLO Connect single phase induction motor to the supply.

LLO Change the direction of rotation of single phase induction.

V Relevant Affective Domain related outcome(s)

Follow safety electrical rules for safe practices.

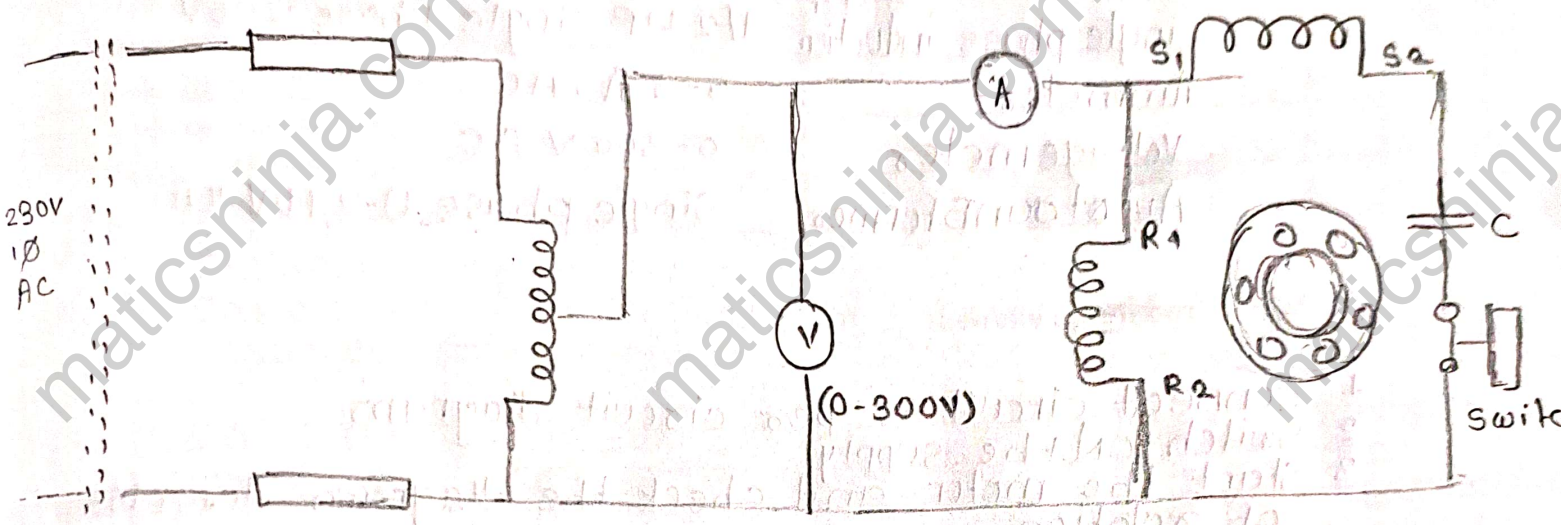
VI Relevant Theoretical Background



- In single phase induction motor main winding is designed for low resistance & starting winding for high resistance. Phase difference in both winding is produced by connecting capacitor in series with starting winding. Direction of rotation of single phase induction motor depends upon the instantaneous polarities of main winding flux & starting winding flux. So direction of rotation can be changed by reversing the polarity of either main or starting winding as shown in figure.

Diagram for reversing direction of rotation:

(Students can draw the circuit diagram; write meter ranges & specifications of equipments)



VIII Required Resources/apparatus/equipment with specification:

Sr. No.	Name of Resource	Suggested Broad Specification	Quantity
1	Single phase induction motor	1/2 HP single phase 230V	1
2	Ammeter	0-5 A, AC	1
3	Voltmeter	0-300 V AC	1
4	Autotransformer	Single phase 0-270V, 10A	1

IX Precautions to be followed:

1. Make sure that main switch is in OFF position while making connection
2. All electrical connections should be neat and tight.

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 Required Resources/apparatus/equipment with specification:

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1	Single phase induction motor	1/2 HP single Phase 230V	1
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4	Autotransformer	Single phase 0-270V, 10A	1

XII Actual Procedure Followed:

1. connect circuit as per circuit diagram
2. Switch ON the supply
3. Start the motor and check the ~~diagram~~ direction of rotation
4. change starting winding terminals and check
5. the direction of rotating

XIII Observations:

Condition	Direction of rotation
Initial connection	Forward / Reverse [Forword]
Reversing starting winding connections	Forward / Reverse [Reverse]

XIV Results:

The single-phase induction motor started successfully in both direction. The direction of rotation reversed when the starting connections were interchanged

XV Interpretation of results:

The single-phase motor started sucessfully in both direction.

XVI Conclusion and recommendation

The single-phase induction motor is not self starting and requires phase relation ship between the main and starting etc. a reversal of the magnetic field.

XVII Practical related questions (Provide space for answers)

1. State different types of single phase induction motors.
2. Differentiate between main winding & starting winding.
3. State the type of capacitors used in 1 phase induction motor.
4. Give the applications of various types of 1 phase induction motor.
5. State the function of centrifugal switch.
6. '1 phase induction motor is not self-starting.'- Justify
7. 'Main winding resistance is low & starting winding resistance is high. 'Give reason

1] • Split-phase induction motor
• Capacitor start motor
• Capacitor-Start capacitor-run motor
• Shaded poler motor

2. • Main winding : lower resistance and higher inductance responsible for generating the main magnetic field.
• Starting winding : Higher resistance and lower inductance, used to create phase difference for starting torque

3. electrolytic capacitors (for capacitor-start motors)
Oil-filled cacpacitors (for capacitor-run motors)

4. Split phase motors - small fans, blowers
Capacitor-start motor - compressors, pumps

5. The centrifugal switch disconnects the starting winding once the motor reaches 70-80% of the its rated speed, as its no longer needed for operation

6. Single phase induction motors are not self-starting because the single-phase supply produces a pulsating magnetic field which cannot generate initial torque. A phase difference is required, which is created using a starting winding and a capacitor

7. The main winding has low resistance to handle continuous current and provide efficient operation the starting the winding has high resistance to limit curre during the starting phase and create the required phase shift starting torque

XVIII References/Suggestions for further reading:

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

XIX Suggested Assessment Scheme

Performance Indicators		Weightage
Process Related : 15 Marks		**60 %**
1	Handling of the components	10%
2	Identification of components	20%
3	Measuring value using suitable instrument	20%
4	Working in teams	10%
Product Related: 10 Marks		**40%**
5	Calculated 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 %**