

UNIT V
SINGLE PHASE INDUCTION MOTORS AND SPECIAL MACHINES
PART A

1. Name the two windings of a single-phase induction motor.

- i. Running winding (main winding)
- ii. Starting winding (auxiliary winding)

1. What are the various methods available for making a single-phase motor self-starting? (Nov/Dec 2012) (May 2018)

- i. By splitting the single phase
- ii. By providing shading coil in the poles
- iii. Repulsion start method.
- iv. Capacitor start capacitor run.

3. What could be the reasons if a split-phase motor runs too slow?

Any one of the following factors could be responsible.

- (i) Short-circuited or open winding in field circuit.
- (ii) Over load.
- (iii) Grounded starting and running winding.
- (iv) Wrong supply voltage and frequency.

4. What could be the reasons that a split-phase motor fails to start and hums loudly?

It could be due to the starting winding being open or grounded or burnt out.

5. What is the main basic difference between the principle of operation of a 3-phase and single - phase induction motors?

When three-phase supply is given to 3-phase induction motor, a rotating magnetic field is produced and the rotor-starts rotating. But when single-phase supply is given to single-phase motor only a pulsating flux is produced. So motor is not self-starting. Therefore to make it self-starting split-phase arrangement is made by providing an auxiliary winding.

6. Give the main difference in construction of an A.C series motor and a D.C series motor.

- i. The entire iron structure of the field cores and yoke are laminated to reduce the eddy current loss.
- ii. Number of turns in the field winding is reduced to have large reactance and higher power factor.
- iii. A.C series motors are provided with commutating poles.

7. Differentiate between "Capacitor start" and "Capacitor start capacitor run" induction motors.

In "capacity, start" motor capacitor is connected in series with the starting winding. But it will be disconnected from the supply when the motor picks up its speed. But in capacitor start, capacitor-run motor the above starting winding and capacitor are not disconnected, but always connected in the supply. So it has high starting and running torque.

8. Why single-phase induction motor has low power factor?

The current through the running winding lags behind the supply voltage by a very large angle. Therefore power factor is very low.

9. Why a capacitor run type motor is considered as superior one?

- i. It has high starting and running torques.
- ii. Current drawn is less because of higher power factor
- iii. It can be started with some load.

10. What type of single-phase induction motors is employed in high-speed fractional KW applications?

Single phase A.C series motor.

11. How can a universal motor rotation be reversed?

- i. The direction of rotation of the concentrated-pole (or salient-pole) type universal motor may be reversed by reversing the flow of current through either the armature or field windings.

ii The direction of rotation of the distributed field compensating type universal motor may be reversed by interchanging either the armature or field leads and shifting the brushes against the direction in which the motor will rotate.

12. What is the function of centrifugal switch in a single phase - induction motor?

Its function is to automatically disconnect the starting winding from the supply when the motor has reached 70 to 80 percent of its full speed is reached.

13. Explain why a single-phase induction motor is not self-starting?

When the motor is fed from a single-phase supply, its stator winding produces an alternating or pulsating flux, which develops no torque. That is why a single-phase motor is not self-starting.

14. State some applications of universal motor.

Used for sewing machines, table fans, vacuum cleaners, hair driers, blowers and kitchen appliances etc.

15. State the advantages of capacitor-run over capacitor start motor.

- i. Running torque is more.
- ii. Power factor during running is more, thereby line current is reduced.

16. What is a universal motor?

A universal motor is defined as a motor, which may be, operated either on direct current or single phase A.C supply, at approximately, the same speed and output.

17. Why should a motor be named as universal motor?

The available supply in the universe is both A.C and D.C. So the rotor, which works on both A.C and D.C, is called universal motor.

18. What is the use of shading ring in a shaded pole motor?

The shading coil causes the flux in the shaded portion to lag behind the flux in UN shaded portion of pole. This gives in effect a rotation of flux across the pole (ace and under the influence of this moving flux a starting torque is developed.

19. State the advantages of using capacitor start motor over a resistance split phase motor.

- i. The starting current of capacitor start motor is less than resistance split phase motor
- ii. Starting torque of the capacitor motor is twice that of resistance start motor.

20. Give the names of three different types of single-phase induction motor

- i. Split-phase motor
- ii. Shaded pole motor
- iii. Single phase series motor
- iv. Repulsion motor
- v. Reluctance motor

21. How will you change the direction of rotation of a split phase induction motor?

By changing the direction of current either in the starting winding or in the running winding the direction of rotation can be changed.

22. What are the inherent characteristics of plain 1-phase Induction motor?

A plain 1-phase Induction motor is not used in practice due to the following inherent characteristics

- A plain 1-phase Induction motor does not have any starting torque
- However, if the rotor is initially given a starting torque, by some means, the motor can pick up its speed in a direction at which the initial torque is given and deliver the required output.

23. Name the two different theories with which principle of 1-phase induction motors are explained.

The two different theories employed are

- Double revolving field theory
- Cross field theory

24. State double revolving field theory.

Double revolving theory, formulated by Ferrari, states that a single pulsating magnetic field as its maximum value can be resolved into two rotating magnetic fields of as their magnitude rotating in opposite direction as synchronous speed proportional to the frequency of the pulsating field.

25. What type of motor is used for ceiling fan?

Single phase induction motor.

26. State the application of shaded pole motor.

- Low power household application because the motors have low starting torque and efficiency ratings
- Hair dryers, humidifiers and timing devices.

27. What is meant by single phasing?

Induction motor can operate in single phase supply is called as single phasing.

PART – B

1. Give the classification of single phase motors .Explain any two types of single phase induction motors
2. Explain the double field revolving theory for operation of single phase induction motor.
3. Explain the operation of shaded pole induction motor with diagram
4. Develop equivalent circuit of a single phase induction motor ignoring core losses.
5. Explain the working principle of single phase induction motor. Mention its four applications.
6. What is the principle and working of hysteresis motor and AC series motor? Explain briefly.
7. Explain the principle of operation and applications of reluctance motor.
8. Explain the principle of operation and applications of repulsion motor and hysteresis motor
9. Explain about no load and blocked rotor test of single phase induction motor.
10. Explain with a neat diagram the following types of single phase induction motor. (a). Split phase induction run motor.
11. (b).Capacitor start induction run motor and also draw the slip torque characteristics
12. Describe the working principle of any one type of stepper motor.