**I. Read the text**

**THE INDUCTION MOTOR**

An induction motor like any other motor consists of a stationary part, the stator, and a rotating part, the rotor. The rotor of an induction motor is not connected electrically to the source of power supply. The currents which circulate in the rotor conductors are the result of voltage induced in the rotor in the magnetic field set up by the stator. The rotor is fitted with a set of conductors in which currants flow. As these conductors lie in the magnetic field produced by the stator, a force is exerted on the conductors and the rotor begins to revolve. The operation of the motor depends upon the production of a rotating magnetic field. The speed at which the field of an induction motor turns is called the synchronous speed of the field or of the motor.

The induction motor is the simplest of the various types of electric motors and it has found more extensive application in industry than any other type. It is made in two forms – the squirrel cage and the wound rotor, the difference being in the construction of the rotor.

The stator of the induction motor has practically the same slot and winding arrangement as the alternator and has the coils arranged to form a definite number of poles, the number of poles being a determining factor in connection with the speed at which the motor will operate. The rotor construction, however, is entirely different.

The squirrel-cage rotor is a simpler form and has been used in many machines.

Instead of coils the winding consists of heavy copper bars.

The wound-rotor type has a winding made up of well-insulated coils, mounted in groups whose end connections are brought out to fill in rings. The purpose of this winding is to provide for variation in the amount of resistance included in the rotor circuit.

Provision for ventilation is made by leaving passageways through the core and frame, through which air is forced by fan vanes mounted on the rotor. In main cases the motors now built in as an integral part of the machine it is to drive.

There being no electrical connection between the rotor circuits of the induction motor and the stator circuits, or supply line, the currents which flow in the rotor bars or windings correspond to the induced voltages, the action being similar to that of a transformer with a movable secondary. With but a single phase winding on the stator, however, the torques produced in the two halves of the rotor would be in apposition, and the motor would not start. With more than one set of windings two for a two-phase motor, three for a three-phase motor a resultant field is produced which has the effect of cutting across the rotor conductors and induces voltages in them. This field is considered to be revolving at uniform speed.

The term “revolving field” should not be taken to mean actual revolution of flux lines. The magnetic field from the coils of each phase varies in strength with changes in current value but does not move around the stator. The revolutions are those of the resultant of the three, or two, phases, as the case may be.

A motor with a single-phase winding is not self-starting but must be provided with an auxiliary device of some kind to enable the motor to develop a starting torque. The effect of the revolving field is the same as would result from actual revolution of a stator having direct-current poles. As voltages have been induced in the bars or windings of the rotor, currants start flowing as a result of these voltages, and a torque is produced which brings the motor up to speed.

**II. Find in the text the English equivalents for the word combinations given below:**

1) асинхронный двигатель; 2) неподвижная часть; 3) вращающаяся часть; 4) проводник; 5) одновременная скорость; 6) широкое применение; 7) паз; 8) механизм обмотки; 9) трансформатор; 10) вращающий момент.

**III. Complete the following sentences according to the contents of the text**

1. The Induction Motor is …….. of electric motors and is more extensively applied in industry than any other type.

2. The purpose of this winding is …….. for variation in the amount of resistance included in the rotor circuit.

3. The effect of …. is the same as would result from actual revolution of a stator having direct-current poles.

**IV. Answer the following questions:**

1. What parts does the induction motor consist of?

2. What are the names of its rotating and stationary parts?

3. What does the motor operation depend on?

4. How can the difference between stator and rotor construction be explained?

5. What does the term “revolving field” mean?

**V. Translate the sentences from the text paying attention to the Participle Constructions:**

1. The induction motor is made in two forms – the squirrel cage and the wound rotor, the difference being in the construction of the rotor.

2. The stator of the induction motor has practically the same slot and winding arrangement as the alternator and has the coils arranged to form a definite number of poles, the number of poles being a determining factor in connection with the speed at which the motor will operate.

3. There being no electrical connection between the rotor circuits of the induction motor and the stator circuits, or supply line, the currents which flow in the rotor bars or windings correspond to the induced voltages, the action being similar to that of a transformer with a movable secondary.

**VI. Discuss the following points:**

1) The construction of an induction motor;

2) Induction motor operation principle.

**UNIT 14**

**I. Read the text**

**TYPES OF INDUCTION MOTORS**

**Text 1 Single-Phase Motor**

The single-phase induction motor differs from poly-phase type principally in the character of its magnetic field, as an ordinary single-phase winding will not produce a rotating field, but a field that is oscillating, and the induced currents and poles produced in the rotor by this field will tend to produce equal torque in opposite directions, therefore, the rotor cannot start to revolve. However, if the rotor can in some manner be made to rotate at a speed corresponding to the frequency of the current in the stator windings then the reaction of the stator and rotor flux is such as to produce a torque that will keep the rotor revolving.

In practice the starting of single-phase induction motors is accomplished by three general methods applicable to small-sized motors only.

First: the split-phase method, in which an auxiliary stator winding is provided for starting purposes only, this winding being displaced from the main stator winding by 90 electrical degrees. It has a higher inductance than the main stator winding, thus causing the currant in it to lag far enough behind the current in the main winding to produce a shifting or rotating field during the starting period, which exerts a starting torque on the rotor sufficient to cause rotation.

When nearly normal speed has been reached the auxiliary winding is out of circuit by a switch and clutch in the motor, which operates automatically by centrifugal force, and the rotor continues to run as a single-phase motor. The starting torque of such motions being limited, they are frequently constructed with the rotor arranged to revolve freely on the shaft at starting until nearly normal speed is reached, at which time the load is pitched up by the automatic action of a centrifugal clutch.

Second: an auxiliary winding may be connected to the single-phase line through an external inductance and a switch (for disconnecting the auxiliary winding from the circuit after the motor has reached normal speed), the introduction of the inductance in the auxiliary winding splitting the phase as before.

**Text 2 Three-Phase Induction Motor**

The three-phase induction motor is the most commonly used type. It has been widely used in recent years. Normally an induction motor consists of a cylindrical core (the stator) which carries the primary coils in slots on its inner periphery. The primary coils are arranged for a three-phase supply and serve to produce a revolving magnetic field. The stator encircles a cylindrical rotor carrying the secondary winding in slots on its outer periphery. The rotor winding may be one of two types: squirrel-cage and slip-ring for wound-rotor). In a squirrel-cage machine the rotor winding forms a complete closed circuit in itself. The rotor winding of a slip-ring machine is completed when the slip rings are connected either directly together or through some resistance external to the machine. The rotor shaft is coupled to the shaft of the driven mechanism.

The rotor is stationary at some instant of time. The revolving magnetic field of the stator winding cuts across the stationary rotor winding at synchronous speed and induces an e. m. f. in it. The e. m. f. will give rise to a current which sets up a magnetic field. The rotor starts rotating.

It is the interaction between the rotor current and the revolving magnetic field that has created torque and has caused the rotor to rotate in the same direction as the revolving magnetic field. Tine speed of the rotor is 98–95 per cent of the synchronous speed of the revolving magnetic field of the stator.

Hence another name for this type of motor is the asynchronous motor. As a matter of fact, the speed of the rotor cannot be equal to synchronous speed. If it were equal to the latter, the revolving magnetic field would not be able to cut the secondary conductors and there would not be any current induced in the secondary winding and no interaction between the revolving field and the rotor current, and the motor would not run.

**II. Translate the sentences, paying attention to the translation of the word -one-**

1. One should distinguish between single-phase and three-phase induction motors.

2. The new device is better the old one.

3. The three-phase induction motor type is the most commonly used one.

4. The rotor winding may be one of two types.

5. As a matter of fact the speed of the rotor cannot be equal to synchronous one.

**III. Translate the sentences from the text paying attention to the Participle Constructions:**

1. In the split-phase method an auxiliary stator winding is provided for starting purposes only, this winding being displaced from the main stator winding by 90 electrical degrees.

2. The starting torque of such motions being limited, they are frequently constructed with the rotor arranged to revolve freely on the shaft at starting until nearly normal speed is reached.

3. An auxiliary winding may be connected to the single-phase line through an external inductance and a switch, the introduction of the inductance in the auxiliary winding splitting the phase as before.

**IV. Answer the following questions:**

1. What way does the single-phase motor differ from the three-phase one?

2. What is the starting of single-phase induction motors accomplished by?

3. How can an auxiliary winding be connected to the single-phase line?

4. What parts does an induction motor consist of?

5. What are the two types of the rotor winding?

**V. Work out the plan of the text**

**VI. State 5 questions to the text**