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Subject:

Electrical Machine-2

Submitted:-

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Q No # 1:-

Write ~~int~~ introduction advantages, Disadvantages and construction of 3-Phase induction motor?

Introduction:-

The popularity of 3 Phase induction motor on board ships is because of their simple robust construction and high reliability factor in the sea environment. A three phase induction motor can be used for different application with various speed and load requirements. Electric motor can be found in almost every production process today. Getting the most out of your application is becoming more and more important in order to

ensure cost-effective operation

The three 3 phase induction motor are the most widely used electric motor in industry. They run at essentially constant speed from no-load to full-load

However the speed is frequency dependent and consequently these motor are not every adapted to speed control. We usually prefer DC motor when large speed variation are required.

only the stator winding is fed from 3 phase supply. The rotor winding derives its voltage and power from the externally energized stator winding through electromagnetic induction and the induction motor

may be considered to be a transformer with a rotating secondary it can therefore be described as a "transformer type" AC machine in which electrical energy is converted into mechanical energy.

Advantages:-

It has simple and rugged construction.

It is relatively cheap.

It requires little maintenance.

It has high efficiency and reasonably good power factor.

It has self-starting torque.

Disadvantages:-

It is essentially a constant speed motor and its speed cannot be changed easily.

Its starting torque is inferior to Dc shunt motor.

Construction:-

The induction motor is the most widely used electrical motor.

Almost 80% of the mechanical power used by industries is provided by 3-phase induction motor because of its simple and rugged construction low cost good operating characteristics absence of commutator and good speed regulation. In 3-phase induction motor the power is transferred from stator to rotor winding through induction. The induction motor is also called asynchronous motor as it runs at

a speed other than the synchronous speed.

A 3-phase induction motor has two main parts stator and rotor. The rotor is separated from the stator by a small air-gap which range from 0.4mm to 4mm depending on their power of the motor.

Shaft for transmitting the torque to the load. This shaft is made up of steel.

Bearings for supporting the rotating shaft.

One of the problem with electric motor is the production of heat during its rotation.

For receiving external connection terminal box is needed.

Q No 2 :-

Write operation
Principle of 3-Phase
Induction motor?

Ans In an AC motor there
are rings of electromagnets
arranged around the outside
which are designed to
produce a rotating
magnetic field. Inside the
stator there is a solid metal
axle, a loop of wire
a coil, a squirrel
cage made by metal bars
and interconnection, or some
other freely rotating metal
part that can conduct
electricity. Unlike in a
DC motor where you
send power to the inner
rotor, in an AC motor
send power to the outer

coil that make up the stator.

The coils are energized in pairs in sequence producing a magnetic field that rotates around the outside of the motor.

Electromagnetic induction is the key to why a motor like this spins and that's why it's called an induction motor. An electrical converts electrical energy into mechanical to different types of load.

The operation principle of 3-phase induction motor is based on the production of rotating magnetic field.

Q.No:3-

Discuss different types of starter for 3-phase induction motor?
Ans:-

There are many methods in use to start 3-phase induction motor. Some of the common methods are:-

- i) Direct on-line starter (DOL)
- ii) Star-Delta starter
- iii) Auto transformer starter
- iv) Rotor impedance starter

Direct on-line starter:-

The direct on-line starter is the simplest and the most inexpensive of all starting methods and is usually used for

squirrel cage induction motor. It directly connects the contacts of the motor to the full supply voltage. The starting current is very high, normally 6 to 8 times the rated current.

The DOL starter consists of a coil operated contactor $K1M$ controlled by start and stop push button. The contactor coil $K1M$ is energized from line 1. The 3 mains contacts are closed. The motor is thus connected to supply. The supply to motor is disconnected and the motor stop.

Star-Delta starter:-

The star Delta starter is very common type of starters and extensively used compared to the other types of the starters. The method used reduced supply voltage in starting. The method achieved low starting current by first connecting the stator winding in star configuration and then after the motor reaches a certain speed switch changed the winding arrangements from star to Delta configuration. By connecting the starter winding first in star and then in Delta the line current drawn

by the motor at starting is compared to starting current with the winding connected in delta.

Since the torque developed by an induction motor is proportional to the square of the applied voltage star-delta reduced the starting torque to one-third that obtainable by direct delta starting.

Auto Transformer starter:-

The operation principle of auto transformer method is similar to the star delta starter method. The starting current is limited by reduce the initial starter applied voltage. The auto transformer

starotor is more expensive more complicated in operation and bulkier in construction when compared with the star-Delta starter method.

It can brief operation of auto transformer as operated by a two position switch i.e. using a timer to change over from start to run position.

An starting position supply is connected to stator winding through an auto transformer which reduce applied voltage to 50, 60 and 70% of normal value depended on typing used. Starotors used in large industries it is large in size and

expensive.

- switching from start to run positions causing transient current. which can be greater in value than those obtained by DOL starting.

Rotor Impedance starter

This method allows external resistance to be connected to the rotor through slip rings and brushes initially the rotor resistance is set to maximum and is then gradually decreased as the motor speed increases until it becomes zero the rotor impedance starting mechanism is usually very bulky and expensive when

compared with other methods
It also has very high
maintenance costs.

Then the external rotor
resistance is decreased
in steps as the rotor
speed up.

However the motor
torque remain maximum
during the acceleration period
of the motor under
normal condition when
the motor develops load
torque the external
resistance is removed.