M T W T F S S H/W C/W Date: / / 20

Assignment

Electric Machines - II

Name Bilal Ahmad

Roll no 12545

Government College University
Faislabad

Question no. 1

"Three Phase Induction Motor"

Introduction:-

The Popularity of 3-Phase induction motors on board Ships is because of there Simple robust Construction, and high relibility factor in the Sea environment. A 3-Phase induction motor Can be used for different applications with various speed and load

Important:

Date: 3 /20

Considered to be a transformer with a rotating Secondary and it can Therefore be described as a Machine in which electrical energy is Converted into mechanical energy

Advantages :—

- it has Simple and rugged Construct.
- it is relatively Cheap.
- it has high frequancy and resonable good power fector.
- it has Self starting.
- it requires little maintance.

Disadvantages :—

- It is essantially a Constant Speed motor and its speed Cannot be Changed easily.
- rt starting torque is inferior to D.C motor shunt.

Construction :—

The Three-Phase induction motor is the most widely used electrical motor.

portant: Almost, 80% of the mechanical power

used by industries is provided by the 3-phase induction motor because of its simple and rugged Construction, low cost, good operating characteristics, absence of Commutator and good speed regulation.

In three-phase induction motors is also power is transfered from stator to rotor winding through induction.

A 3-phase induction motor have two main parts;

rotor is separated from air-gap which ranges from 0.4mm to 4mm depending on the power of the motor.

The main body of induction motor Compraises of two major parts of shows.

- Shaft for transmitting the torque to the load. The shift is made up of steel.
- Bearing for Supporting the rotating Shaft.

one of the problem with electrical motor is the product of heat during its

Date: 5

rotating. in order to overcome this problem we need fan for cooling.

- for recieving electrical Conned terminal box is needed.
- There is a Small distance between rotor and stator which usually various from 0.1mm to 4mm. Such a distance is called air-gap

Question no. 2

- **Operational Principal :-**

unlike toys and flashlights, most homes, offices, factories and other building aren't powered by little batteries; they not supplied with D.C current (Ac) which reverses its direction about 50 times per Second (with the frequency of 50Hz). If you want to run a motor from your household. AC electricity Supply istead of form a DC battery, you need a different design of motor.

Inside the stator, there's a Solid

metal exude, a Squrrel Cage made of metal bars and interconnections (like the rotating Cages people Somtimes get to amuse pet mice), or Some other freely rotating metal part that can Conduct electricity.

The outer Coils 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.

If the Conductor is a ring or a wire, the Current flows around it in a loop - if the Conductor is Simply a Solid piece of metal, eddy Currents Swirl around it instead.

The induced Current produces its own magnetic field and, according to another law of electromagnetism (lenz's law) tries to stop whatever it is that Causes it. The rotating magnetic field by rotating as well. (you Can think of the "Catch up" with the rotating

rtant:

Date: 1 / 7 / 20

magnetic field in an effort to eliminate the difference in motion between them)

Eledromagnetic induction is the key to why a motor like this spin and that's why its called an induction motor.

An eledrical converts electrical energy into machenical energy which is supplied to them different type of loads. Ac motors oprelor on Ac supply and they are classified into synchronous, single phase and 3-phase induction motors are most usually used for industrial applicantions mainly because they do nd require a starting device. three phase induction motor derives its name for the fact that the rotor current is induceed by the magnetic field instead of eledrical current.

Question no. 3

Important:

Direct online stator (DOL) :-

The Dired on-line stator (DOL) is the simplest and the most expensive of all starting method and usually used for squirred Coge induction motors.
It directly Connect the Contact of the motor to the full Supply voltage
The starting Current is very large, normally 6 to 8 times the roted Current. The starting torque is likely to be 0.75 to 2 times the full load torque. in order to avoid excexive voltage drops in the Supply Currents, the DOL stator is used only a rotting of less then 5kw.
The DOL stator Consists of a Coil operator Contator KIM Controlled by start push button SI, the Contactor Coil KIM is energized from line L1 The motor is thus Conneded to the Supply. when the stop push buttons S2 is pressed, the Supply through the Contactor KIM is Disconnected.

Date: 9 8 20

Since the KIM is de-energized, the main Contact (1-2)(3-4) and (5-6) are opened. The supply to motors is disconnected and the motor stops.

• Star-Delta stator :-

The star delta starting is a very common type of starter and extensively used, Compare to the other types of the starter these method used reduced supply voltage in starting. the Connections of a 3-phase induction motor with a star delta starter. The light current drown by the motor at starting current with the windings Connecting in delta. At the time of starting when the stator winding are start Connector each stator phase gets voltage $V_L/\sqrt{3}$, where V_L is the torque developed by an induction motor is propotional to the Square of applied voltage, star-delta starting torque to one third that obtainable by direct

delta starting.

• Auto Transformer stator :-

The operation principle of auto transformer method is similar to the star-Delta method is limited by (using a 3-phase auto transformer) reduced the initial stator applied voltage.

The auto transformer starter is more expensive, more Complicated in operation and Bulkier in Construction when Compared with the star-Delta starter method. But An Auto transformer starting Current Current and torque Can be adjusted to a desired value by taking the auto transformer. When the star-Delta method is Considered, voltage Can be adjusted only by factor of $1/\sqrt{3}$. It Can be adjusted only by brief operation of auto transformer as :-

- Operated by a two position switch manualy automatically using a time to change over from star to

run position.

- In starting position supply is connecting to star windings through an auto transformer which reduces applied voltage to 50, 60, and 70% of normal volume depending on tapping used.
- Reduced voltage reduces current in motor windings with 50% of tapping used motor current is halved and supply current will be half of the motor current.
- For an induction motor, torque T is developed by V^2. Thus on 50% tapping torque at starting is only $(0.5V)^2$ of the obtained by DOL starting. Hence 25% torque is produced.
- starters used in larger industries, it is larger in size and expensive.

Rotor Impedance Starter :-

This method allows external resistance to be connected to the rotor through Sliprings and burshes. Initially, the rotor resistance is

Important:

Date: 12/20

Set to maximum and is then generally decreased as the motor speed increased, until it become Zero.

The rotor impedance starting mechanism is usually very bulky and its expensive when Compare with other method. It also has very high maintenance Cost. Also, Considrable amount of heat is generated through them. the starting frequency is also limited in this method allows the motor to be started. while on load. This will decrease the starting Current, increase the starting torque and also improves the power fector.

At the time of starting of the motor the entire external resistance is added in rotor Circuit.

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.

Scanned by TapScanner

requirements.

Electric motors 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 operations.

The three-phase inducting motors are the most widely used electric motors used in industries. They run at essantially constant speed from on-load to fall-load.

However, the speed is frequency dependant and consequantly these motors are not easily adopted to speed control.

We usually prefer D.C motors when large speed variations are required. Neverthless, the 3-phase induction motors are simple, rugged, low-priced, easy to maintain and can be manufactured with characteristics is suit most industrial requirments. The rotor winding through electromagnatic induction and hence the name.

The induction motors may be

portant: