SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

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Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE NAME : 19EE01 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

I YEAR /I SEMESTER MECHANICAL ENGINEERING

Unit 2 – Electrical Machines

Three Phase Induction motor

3 PHASE INDUCTION MOTORS

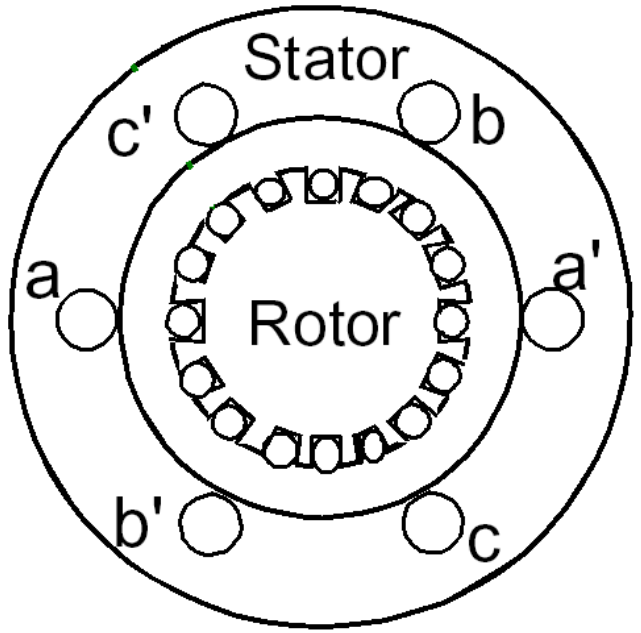
- Why do we need 3 phase motors?
- What 3 phase action motor do?
- How can I create the 3 phase motor?
- Why 3 phase motor rotates in circular motion?

ROTATING MAGENTIC FIELD

- Balanced three phase windings, i.e. mechanically displaced 120 degrees form each other, fed by balanced three phase source

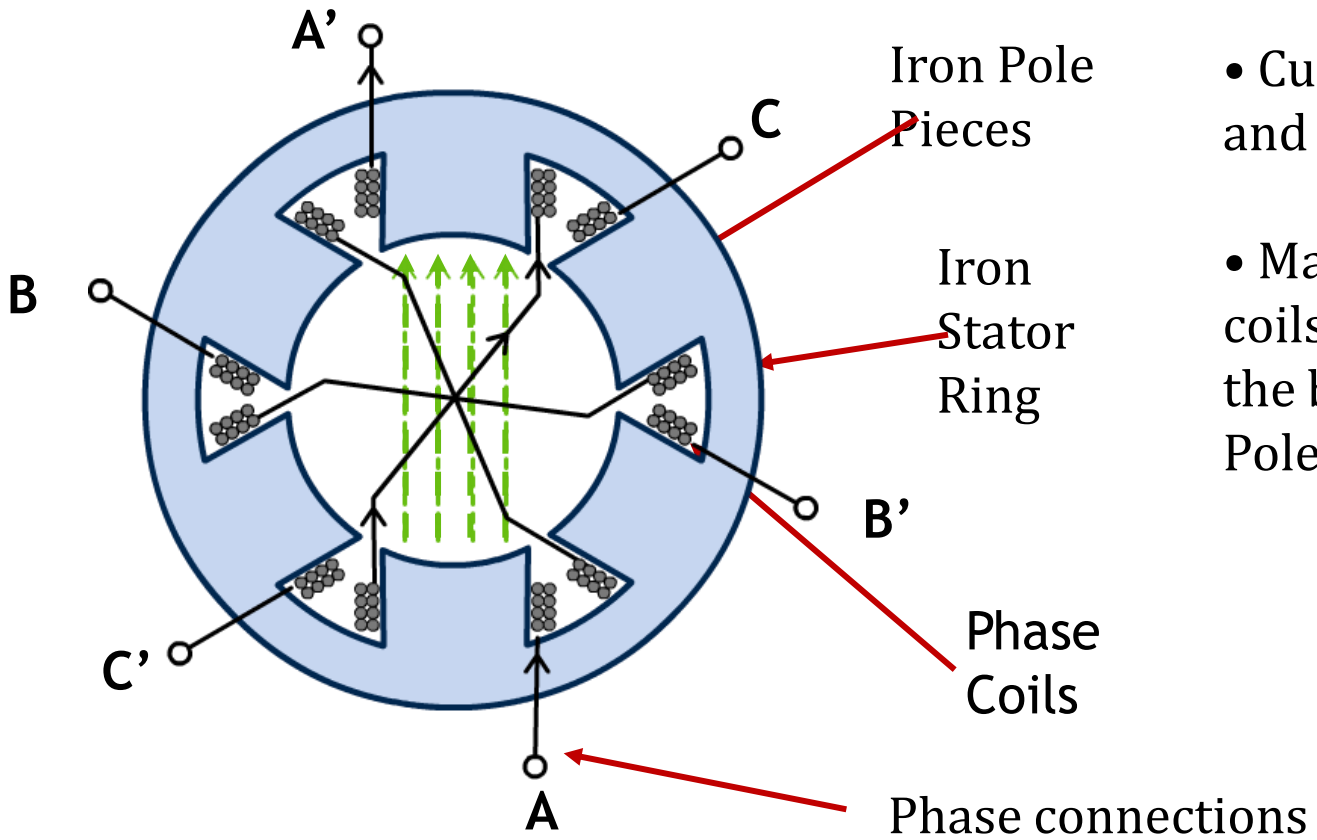
- A rotating magnetic field with constant magnitude is produced, rotating with a speed

  Where f_e is the supply frequency and P is the no. of poles and n_{sync} is called the synchronous speed in rpm (revolutions per minute)



PRINCIPLE OF OPERATION

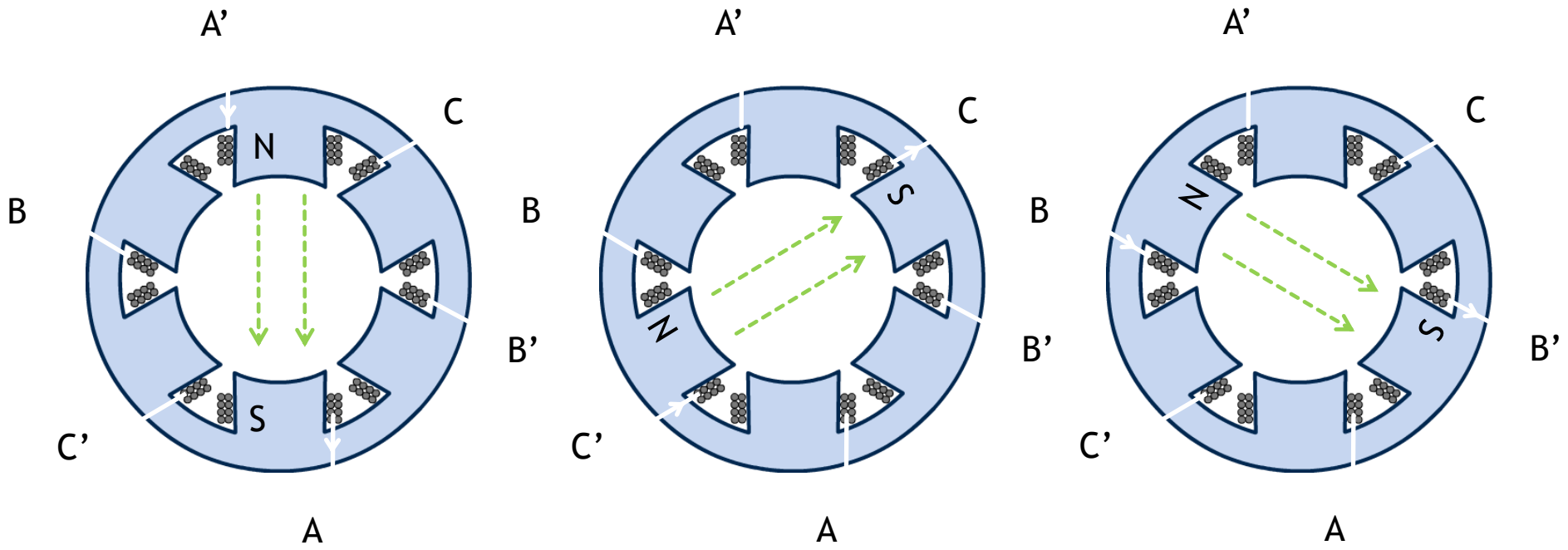
Simple stator made of 3 pole pairs of coils around iron pole pieces



- Current enters coil **A** and leaves coils **A'**
- Magnetic flux set up in coils with North Pole at the bottom and South Pole at the top

PRINCIPLE OF OPERATION

Changing which coils are energised alters direction of magnetic flux



AA’ energised CC’ energised BB’ energised

ASSESSMENT 1

1. The frame of an induction motor is usually made of

a) Silicon steel
b) Cast iron
c) Aluminum
d) Bronze

SLIP

$$s = \frac{n_{sync} - n_m}{n_{sync}}$$

Where *s* is the *slip*

Notice that : if the rotor runs at synchronous speed

$s = 0$

if the rotor is stationary

$s = 1$

Slip may be expressed as a percentage by multiplying the above eq. by 100, notice that the slip is a ratio and doesn't have units

SLIP BASED PROBLEMS

- Can you solve this

A 208-V, 10hp, four pole, 60 Hz, Y-connected induction motor has a full-load slip of 5 percent

1. What is the synchronous speed of this motor?
2. What is the rotor speed of this motor at rated load?
3. What is the rotor frequency of this motor at rated load?
4. What is the shaft torque of this motor at rated load?

Assessment 2

1. A 3-phase 440 V, 50 Hz induction motor has 4% slip. The frequency of rotor current will be

a) 50 Hz

b) 25 Hz

c) 5 Hz

d) 2 Hz

REFERENCES

1. Bhattacharya. S.K, “Basic Electrical and Electronics Engineering”, Pearson Education , (2017)
2. Muthu Subramanian R, Salivahanan S,“ Basic Electrical and Electronics Engineering”, Tata McGraw Hill Publishers, (2009)
3. V.Mittle“ Basic Electrical Engineering”, Tata McGraw Hill Publishers, (2017)
4. Nagrath. I.J, “Electronics: Analog and Digital”, Prentice Hall India Pvt. Ltd., (2013)

THANK YOU