SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

COIMBATORE-35

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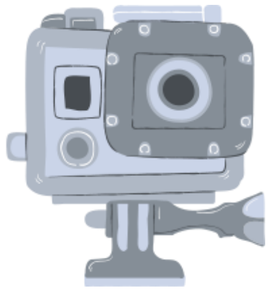
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE NAME: 19EET207/ SYNCHRONOUS AND INDUCTION MACHINES

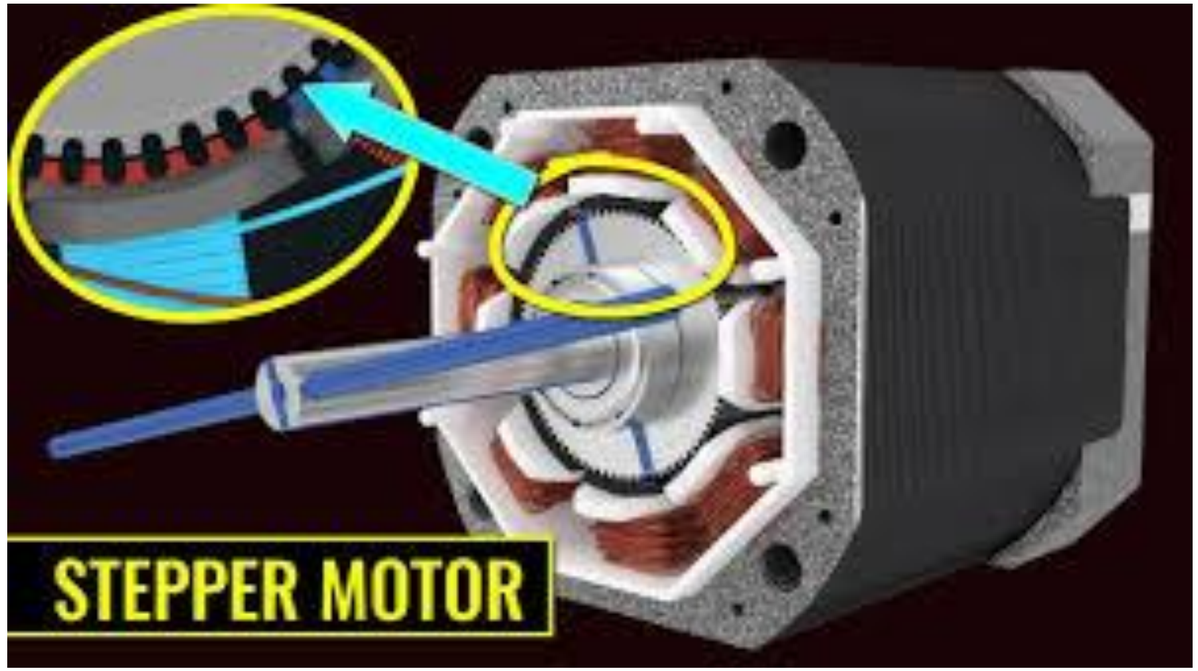
II YEAR / IV SEMESTER

Unit 5 – SPECIAL MACHINES

Topic 8: Stepper motor



GUESS THE TOPIC NAME…



Stepper motor

A stepper motor is a special electrical machine which rotates in discrete angular steps in response to a programmed sequence of input electrical pulses.

Working Principle

A magnetic interaction takes place between the rotor and the stator, which make rotor move.

Construction

.The stator has windings

•The rotor is of salient structure without any windings, and it may or may not have permanent magnets

Application

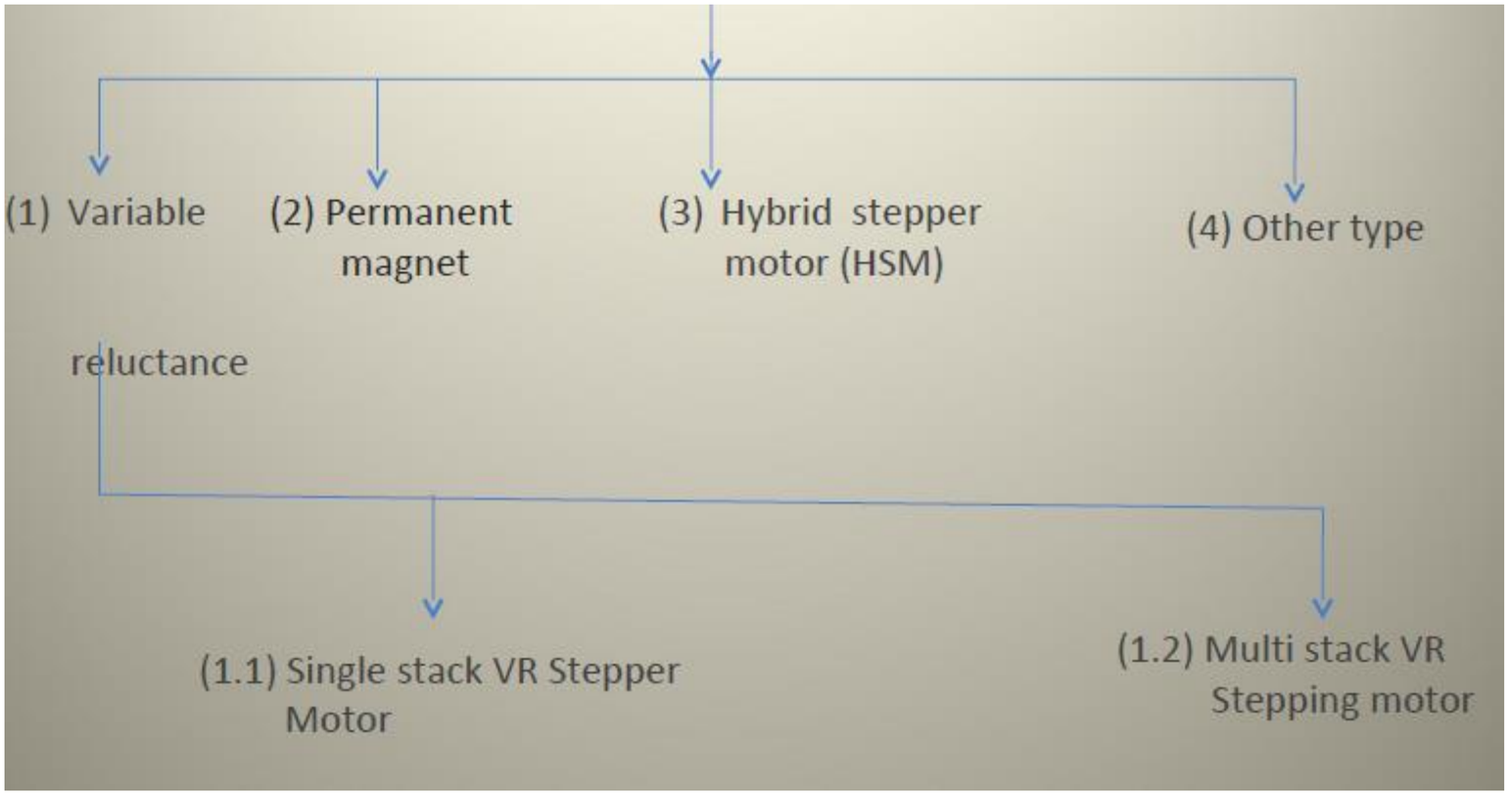
•Application of stepper motor in diverse areas

ranging from a small wrist watch to artificial satellites.

• Power range 1W to 2.5KW

•Torque range 1μN to 40 Nm

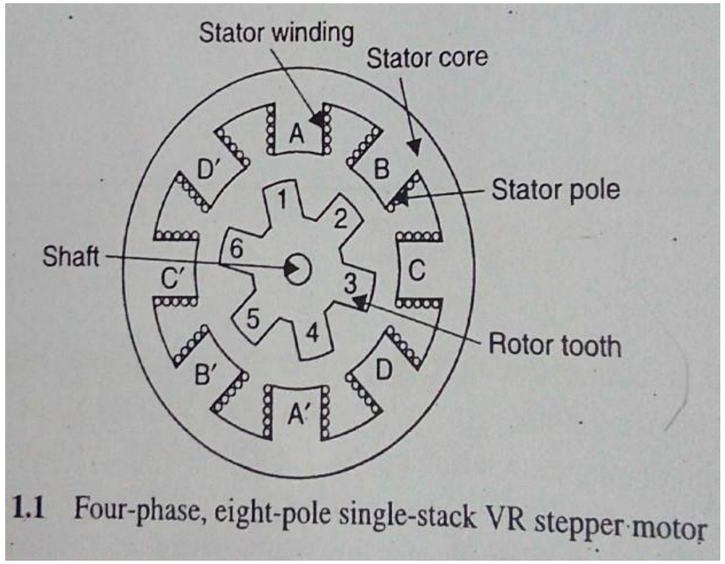
Stepper motor



Variable reluctance motor

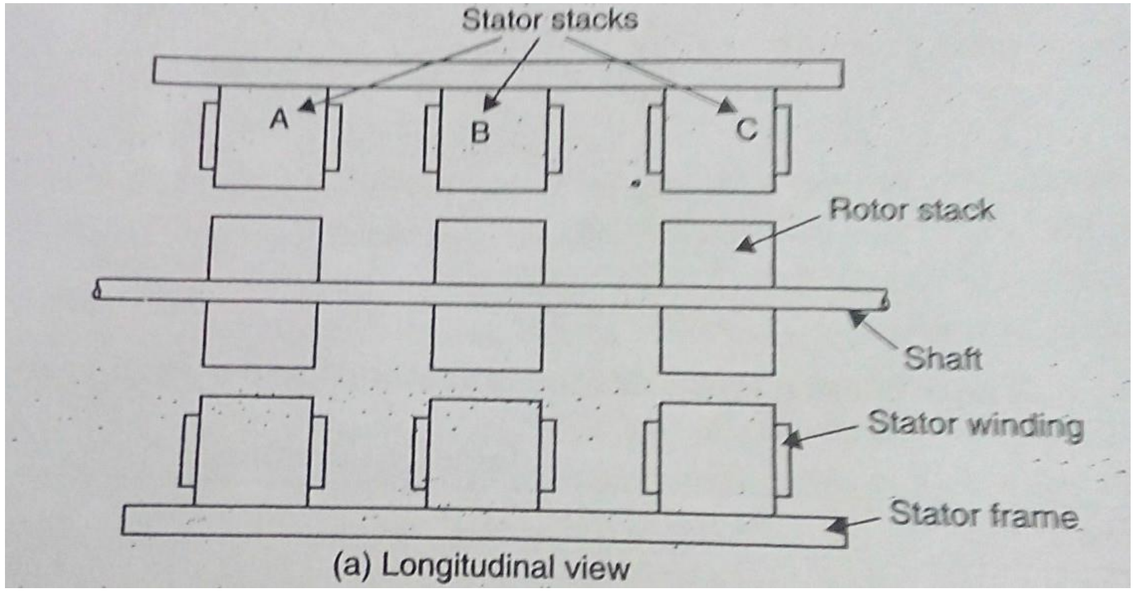
Variable reluctance stepper motor works on the principle that a magnetic material placed in magnetic field experience a force to align minimum reluctance path

Single stack VR Stepper Motor



1.1 Four-phase, eight-pole single-stack VR stepper motor

Multi stack VR reluctance Stepping



(a) Longitudinal view

Single stack VR Stepper Motor

Construction

- Stator

1. The stator made up of silicon steel stampings.
2. It has projecting poles,usaly even no of poles.
3. The pole carry concentric windings

- Rotor

1. Usually made up of silicon steel.
2. Solid silicon steel also used for core of rotor.
3. The rotor has projecting teeth on its outer periphery.

Working

Rotor teeth can be assume any position until the stator winding energised.For a four phase ,eight pole single stack VR steeper motor operation truth table given below and the angle rotate by rotor is given by

$\Phi = 360/MxNr$ degree

Where

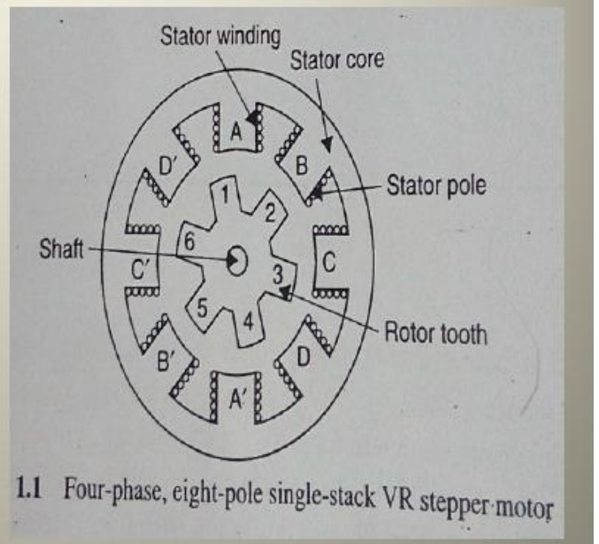
M = the number of stator phase

N= the number of rotor phase

In the present case M=4,Nr=6

$\Phi = 360/4x6$ degree

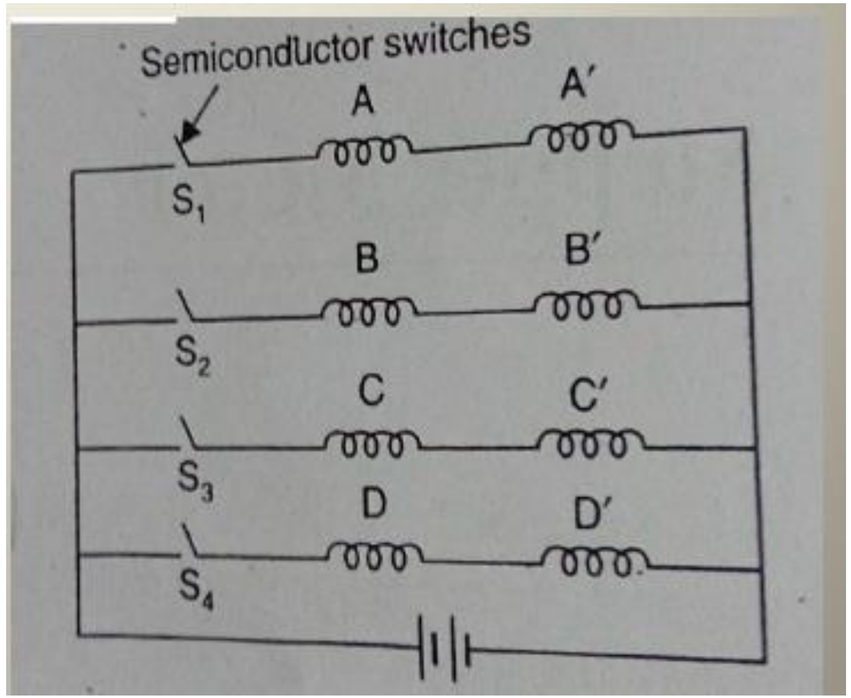
$\Phi = 15$ degree



1.1 Four-phase, eight-pole single-stack VR stepper motor

Switching sequence

Phase	S-1	S-2	S-3	S-4	Angle (Deg)
A	1	0	0	0	0
B	0	1	0	0	15
C	0	0	1	0	30
D	0	0	0	1	45
A	1	0	0	0	60



Modes of excitation

a) Single phases or full step ON mode
b) Two phase ON mode
c) Half step mode
d) Micro step mode

SUMMARY

- stepper motor

Rotor position for phase excitation

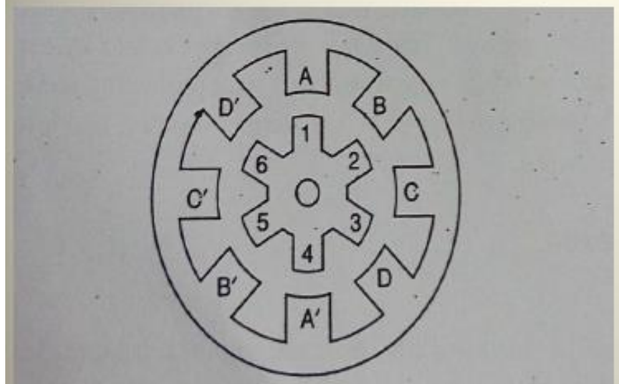


Fig. 1.3 Rotor position when phase A is excited

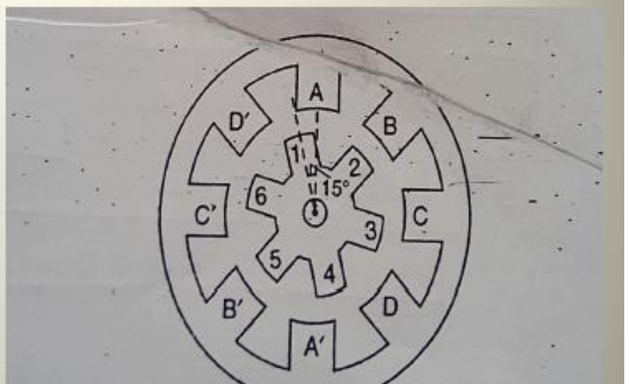


Fig. 1.4 Rotor position when phase B is energised

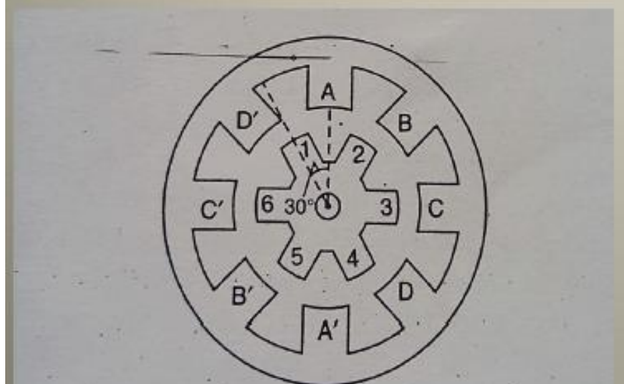


Fig. 1.5 Position of rotor after switching phase C

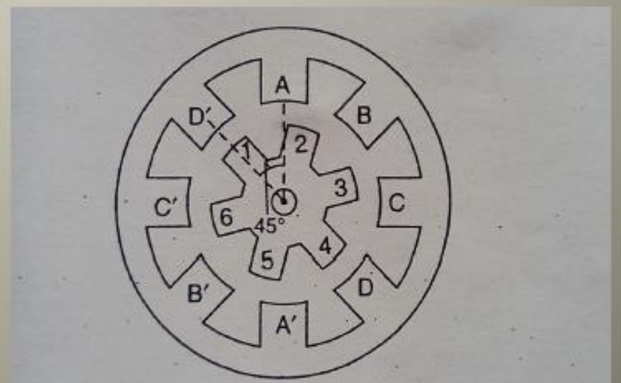


Fig. 1.6 Rotor position after switching phase D

KEEP
LEARNING..

Thank u

SEE YOU IN NEXT CLASS