## DEPARTMENT OF ELECTRICAL ELECTRONICS

## QUESTION BANK (2017-2018 AY)

**Subject: SPECIAL ELECTRICAL MACHINES**

**REGULATION : R 13**

**Year/Sem : IV/ II**

### UNIT –I

1. a) Define the terms pole arc and pole pitch. [5]
b) What is the minimum stator and rotor pole arcs to achieve self starting of a switched reluctance motor? [5]

2. a) Discuss the variation of phase inductance of an SRM with its rotor position. [5]
b) With a neat block diagram, explain the closed loop control of a S witched Reluctance motor. [5]

3. a) Derive the relationship between inductance and reluctance. [5]
b) Derive the general expression for torque of a switched reluctance motor. [5]

4. a) Discuss the basic principle of Switched Reluctance Motors [5]
b) Draw a three-phase asymmetric power converter used for switched reluctance motor and explain its operation. [5]

5. a) Draw and explain the torque-speed characteristics of a Switched Reluctance Motor. [5]
b) Explain control principle of switched reluctance motor for fraction type loads [5]

6. a) What are the advantages and disadvantages of Switched reluctance motors and mention the applications of Switched reluctance motors [5]
b) Explain the procedure in designing stator and rotor pole arc for switched reluctance motor. [5]

7. a) Explain different power converter configurations for Switched reluctance motor [5]
b) Explain briefly design aspects of Switched reluctance motor [5]



### UNIT – 2

1. a) Discuss different modes of excitation of stepper motors. [5]
b) Draw and explain the power converter for stepper motors. [5]

2. a) What is a step angle? Explain. [5]
b) Define stepping rate of a stepper motor. Calculate the stator pole pitch, rotor pole pitch and full step angle of a 12/8 Variable Reluctance stepper motor. [5]

3. a) Explain open loop and closed loop control of stepper motor? Compare them? [5]
b) What are hybrid stepper motors? Give its constructional details. [5]

4. a) Define the terms pull-in torque and pull-out torque of a stepper motor. [5]
b)What is the main principle of operation of a stepper motor? Also list their applications. [5]

5. a) Describe constructional aspects of stepper motor [5]
b) A stepper motor has a step angle of 1.8° and is driven at 400pps. Determine i) Resolution, ii) Motor speed and iii) number of pulses required to rotate the shaft through 54°. [5]

6a) Explain single stack and multi VR stepper motors.[5]
6b) What is Bifilar winding? Explain its significance. [5]

## UNIT- 3

1a) Sketch the constructional details of a permanent magnet DC motor. [5]
b) Derive the equivalent circuit of a permanent magnet DC motor. [5]

2 a) List the advantages and disadvantages of permanent magnet machines. [5]
b) What is the need for commutator in DC machines? Explain its operation. [5]

3a) Give a detailed comparison between permanent magnet DC motors and conventional DC motors. [5]
b) What is hysteresis loop? How permanent magnets can be selected for dc motors? [5]

4 a) Explain how torque generated in PMDC and derive its equation? [5]
b) Why Permanent magnet machines have high torque /weight ratio? Explain clearly [5]

5 a) List out the reasons why Permanent materials used in DC Machines [5]
b) Explain the significance of B-H characteristics of a permanent magnets [5]

6a) Explain about the moving coil motors? [5]
b) Explain the performance characteristics of PMDC motors [5]



## UNIT- 4

1 a) What is a BLDC motor? Draw the back-emf waveforms and explain the switching logic for a three phase BLDC motors in two-phase switching mode. [5]
b) With a neat block diagram, discuss the closed loop speed control of a BLDC motor drive. [5]

2 a) Differentiate between PMSM and BLDC motors. [5]
b) Prove that the PM BLDC machines have 15% more power density than the PMSM [5]

3 a) What is the need for a speed controller?
List different speed controllers suitable for BLDC motors. [5]
b) What is the need for rotor position sensing in BLDC motors? Briefly explain. [5]

4 a) Explain the use of hall sensors in the control of BLDC motors. [5]
b) With a neat schematic diagram, explain the speed control of a BLDC motor drive. [5]

5 a) Describe the switching logic of a 3-phase 4-pole BLDC. [5]
b) Explain the construction details of radial flux BLDC motor [5]

6 a) What are the advantages and disadvantages of Brushless DC machines compare to conventional DC motors. [5]
b) Explain operating principle of Brushless DC motor with the help of diagrams. [5]

7 a) Explain sensorless operation of brushless dc motor [5]
b) Explain clearly the constructional details of brushless dc motor [5]

## UNIT- 5

1a) What are linear motors? Give their applications. [5]
b) Explain consruction principle of operation of linear induction motor. [5]

2a) Draw the B-H hysteresis loop of permanent magnet material.
b) What are advantages disadvantages of Linear Induction Motor compare to conventional induction motor and also list out the application of Linear Induction Motor [5]

3 a) What are different types of LIM? [5]
b)Explain the operation of a short stator Linear Induction Motor [5]

4 a) What are different drives used in electric traction? Discuss. [5]
b) Explain different types and applications of linear motor for electric traction [5]

5a) Explain the construction of linear synchronous motor [5]
b) Explain the principle of operation of linear synchronous machine [5]

6a) what are the applications of linear synchronous machine [5]
b) compare between LIM LSM [5]



## UNIT-6

1 a) Give a detailed comparison between AC traction and DC traction. [5]
b) List the main properties of a traction drive. [5]

2 a) Explain the advantages of AC traction over DC traction. [5]
b) List and briefly explain different motors used in electric traction. [5]

3a) Why induction motors are being used in electric traction? Give their advantages and limitations. [5]
b) Explain the constructional details of a single sided linear induction motor. [5]

4a) Explain the operating principle of a single sided linear induction motor. [5]
b) Discuss in detail the application of single sided linear induction motors for traction. [5]

5 a) What is the selection criterion of motors for electric traction application? Explain [5]
b) What kind of ac motors is more suitable for traction application? Explain it clearly [5]

6a) What are the merits and demerits of ac traction motors compare to dc traction motors [5]
b)Explain the construction and working principle of single sided linear induction motor [5]