



## **QUESTION BANK**

**SUBJECT CODE/NAME: EE 1001 SPECIAL ELECTRICAL MACHINES**

**YEAR / SEM: IV / VII**

### **UNIT- I**

#### **AC COMMUTATOR MOTORS**

##### **PART- A (2 MARKS)**

1. How is the speed control affected in a 3-phase AC series commutator motor?
2. 3-phase ac series commutator motor does not need any protection against excessive speed. Why?
3. How is the speed control affected in a 3-phase AC shunt commutator motor?
4. What is a universal motor?
5. Why should a motor be named as universal motor?
6. What is the principle of operation of universal motor?
7. What is the necessity of having laminated yoke in an ac series motor?
8. Why compensating winding is provided in a universal motor for ac operation?
9. How speed variation is affected in a repulsion motor?
10. What are the specific characteristics of repulsion motor?

##### **PART- B**

1. What are uncompensated and compensated single phase series commutator motor ? develop their performance equation and related phasor diagrams . (16)
2. Derive the expression for emf and torque equation of ac series motor. (16)
3. (a).Draw the phasor diagram of single phase series motor and also explain the characteristics of single phase ac series motor (8)

- (b).What modifications are necessary in a dc series motor ,so that it may work satisfactorily on ac? Explain its operations. (8)
- 4 .Explain the construction and principle of working of a universal motor and mention its applications. (16)
5. Describe the construction and working of repulsion motor .write its merits and demerits as compared to series motors. (16)
6. Explain different types of repulsion motor (16)
7. Draw the phasor diagram and explain the performance characteristics of repulsion motor (16)
8. (a).Draw and explain the equivalent circuit of ac series motor (8)  
(b).Discuss the various methods of speed control universal motors (8)
9. Describe the constructional features of a 3-phase ac series commutator motor. How is the speed control affected in such a motor ?how does a 3-phase ac shunt commutator motor differ from a 3-phase ac series commutator motor in construction and operation? (16)
10. Explain the behavior of a commutator as a frequency changer (16)

## UNIT- II

### STEPPER MOTORS

#### PART- A (2 MARKS)

1. What is a stepper motor?
2. What are the types of stepper motor?
3. What are the advantages of stepper motor.?
4. What are the disadvantages of stepper motor?
5. Mention some applications of stepper motor.
6. What are the different modes of excitation in a stepper motor?
7. What is meant by full step operation?
8. What is meant by two phase on mode?
9. What is meant by half step operation?
10. What are the limitations of stepper motor?
11. What is meant by micro stepping in stepper motor?
12. What are the advantages of micro stepping?
13. What is a multi stack VR motor?

14. What are the advantages and disadvantages of VR stepper motor?
15. Differentiate between VR, PM and hybrid stepper motor.
16. Define step angle and give its formula.
17. Define resolution.
18. Define slewing.
19. Write down the formula for motor speed of the stepper motor.
20. Define holding torque.
21. Define detent torque.
22. Define torque constant.
23. Define pull in torque.
24. Define pull out torque.
25. Define pull out rate.
26. What is meant by pull in range?
27. What is meant by pull out range?
28. What is synchronism in stepper motor?
29. What is mid frequency resonance in stepper motor?
30. Define static stiffness?
31. Define band width in stepper motor?
32. What is logic sequencer?
33. What is meant by power drive circuit in stepper motor?
34. Give the types of driver circuits.
35. What is the use of current suppression circuits?
36. What are types of current suppression circuits?

### **PART-B**

1. Explain the construction and various modes of excitation of VR stepper motor. (16)
2. Explain the construction and various modes of excitation of PM stepper motor. (16)
3. Explain the construction and working principle of Hybrid Stepper motor. (16)
4. State and explain the static and dynamic characteristics of a stepper motor. (16)
5. Explain in detail about different types of power drive circuits for stepper motor. (16)
6. Explain the mechanism of torque production in VR stepper motor. (16)
7. Draw and explain the drive circuits for stepper motor. (16)

### UNIT- III

## SWITCHED RELUCTANCE MOTORS

### PART- A (2 MARKS)

1. What is switched reluctance motor?
  2. What are the advantages of SRM?
  3. What are the disadvantages of a switched reluctance motor?
  4. Why rotor position sensor is essential for the operation of- switched reluctance motor?
  5. What are the essential difference between SRM and stepper motor?
  6. What is phase winding?
  7. What are the different power controllers used for the control of SRM?
  8. What are the basic requirements of power semiconductor switching circuits?
  9. What are the merits and demerits of the converter circuit having two power semiconductor devices and two diodes per phase?
  10. What the merits and demerits of  $(n + 1)$  power semiconductor switches and  $(n + 1)$  diodes per phase converter.
  11. What are the merits and demerits of converter having phase winding with bifilar wires.
  12. What are the merits and demerits of split link converter?
  13. What the .merits and demerits of 'c' dump converter.
  14. Draw the  $\tau - i$  curve of SRM?
  - 15, What are the two types of control techniques in SRM?
  16. What are the modes of operation of SRM?
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1. Explain the construction and working principle of switched reluctance motor. (16)
  2. Describe the various power controller circuits applicable to switched reluctance motor and explain the operation of any one scheme with suitable circuit diagram.(16)
  3. Draw a schematic diagram and explain the operation of a 'C' dump converter used for the control of SRM. (16)
  - 4.(a). Derive the torque equation of SRM. (8)  
(b). write note on the power controllers used in switched reluctance motors (8)

5. Draw and explain the general torque-speed characteristics of SRM and discuss the type of control strategy used for different regions of the curve. Sketch the typical phase current waveforms of low speed operation. (16)
6. Describe the hysteresis type and PWM type current regulator for one phase of a SRM with relevant circuit diagrams (16)
7. With neat diagram, explain the microprocessor based control of switched reluctance motor (16)

## UNIT- IV

### PERMANENT MAGNET MOTORS

#### PART- A (2 MARKS)

1. What are the advantages and disadvantages of brushless dc motor drives?  
advantages :
2. List the various permanent magnetic materials.
3. Write the torque and emf equation of square wave brushless motor.
4. Mention some applications of PMBL DC motor.
5. Why is the PMBLDC motor called electronically commutated motor?
6. What are the classification of BLPM DC motor?
7. What are the two types of BLPM SQW DC motor?
8. Name the position sensors that are used for PMBL DC motor.
9. What is the permanent magnet?
10. What are the features of permanent magnet synchronous motor?
11. What are applications of PMSM?
12. What are the advantages of load commutation?
13. What are the merits and demerits of PMSM?
14. Write the EMF equation of PMSM.
15. What is load commutation?
16. What is meant by self control?
17. How are PMBLDC motor and PMSM different?
18. State the two classifications of PM synchronous machines and the types in each
19. What is meant by slot less motor?
20. Distinguish between self control and vector control of PMSM.

#### PART- B

1. Explain the construction and principles of operation of PMBL dc motor with neat diagram (16)
2. Describe the operation of power controllers for PMBLDC motor with neat diagram. (16)

3. Explain the construction and performance of a permanent magnet synchronous motor with neat diagram (16)
4. Derive the emf and torque equations permanent magnet synchronous motor (16)
5. (a). Explain the speed -torque characteristics of PMDC. (8)  
(b). Explain with phasor diagram & measurement of  $L_d$  and  $L_q$  in PMSM. (8)
6. (a). Explain the speed- torque characteristics of PMSM. (8)  
(b). Explain the working of microprocessor based control in PMSM. (8)
7. Drive the expressions for the emf and torque of a PMBLDC motor. (16)
8. (a). Explain the vector control method for a PMSM with a block diagram and phasor diagram (8)  
(b). Explain the vector control method for a PMSM (8)
9. Explain the closed loop control scheme of a permanent magnet brushless DC motor drive with a suitable schematic diagram (16)
10. Draw the diagram of electronic Commutator. Explain the operation of electronic Commutator. (16)
11. (a). Explain with neat diagram and wave forms of the full wave inverter based PMBLDC motor (8)  
(b). Draw and explain the speed –torque characteristics of PMBLDC motor (8)

## UNIT-V

### LINEAR MOTORS

#### PART- A (2 MARKS)

1. What is the principle of operation of linear induction motor?
2. How can the speed of a linear induction motor be controlled?
3. List some applications of linear induction motors.
4. What are the advantages and disadvantages of linear induction motor?
5. Write two types of effect in linear induction motor
6. Define transverse edge effect.
7. Define end effect.
8. What are the three types of BLDC linear motor?
9. What are the special types of DC linear motor?
10. List out the comparison of three BLDC linear motor.



### **PART- B**

1. Explain the principle of operation of a linear induction motor draw its characteristics.  
state its important applications (16)
2. Explain the principle of operation and constructional details of DC linear motor (16)
3. (a). Explain the different types of BLDC linear motors (8)  
(b). Explain the characteristics of DC linear motor (8)
4. Explain the different special types of DC linear motors (16)
5. Explain the principle of operation and constructional details of linear synchronous motor (16)
6. Explain the different types of linear synchronous motor and mention its applications. (16)