Question Paper Code	12301

M.E. / M.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2023
First Semester
M.E. - Power Electronics and Drives
20PPEPC105 - SPECIAL MACHINES AND CONTROLLERS
(Regulations 2020)

Duration: 3 Hours   Max. Marks: 100

PART - A (10 × 2 = 20 Marks)
Answer ALL Questions

Marks, K-Level, CO

1. Compare conventional DC motor and PMBLDC motor. — *2,K2,CO1*
2. List any four permanent magnet materials. — *2,K1,CO1*
3. Draw the phasor diagram of permanent magnet synchronous motor. — *2,K1,CO2*
4. State the power controllers for permanent magnet synchronous machines. — *2,K1,CO2*
5. Draw the speed- torque characteristics of Switched Reluctance Motor. — *2,K1,CO3*
6. Why rotor position sensor essential for the operation of Switched Reluctance Motor? — *2,K2,CO3*
7. The stepper motor has a step angle of 1.8˚ and is driven at 4000 pps. Determine Resolution & Rotor speed. — *2,K2,CO4*
8. Mention the advantages of closed loop operation of stepper motor. — *2,K1,CO4*
9. Define cogging. — *2,K1,CO5*
10. Classify the types of rotor available synchronous reluctance motor. — *2,K2,CO5*

PART - B (5 × 13 = 65 Marks)
Answer ALL Questions

11. a) With relevant waveforms, derive the expression for torque and emf of permanent magnet brushless DC motor. — *13,K2,CO1*

OR

    b) Discuss in detail about magnetic circuit analysis of permanent magnet brushless DC motor. Also draw its characteristics. — *13,K2,CO1*

12. a) Describe the construction of phasor diagram of surface magnet sine wave motor. — *13,K3,CO2*

OR

    b) With a neat sketch, explain the microprocessor based speed control of permanent magnet synchronous motor. — *13,K2,CO2*

13. a) Draw a schematic diagram and explain the operation of a "C" dump — *13,K2,CO3*

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create   **12301**

converter used for the control of SRM.

OR

b) (i) Draw and explain the characteristics of switched relsuctance motor.   *7,K2,CO3*

(ii) Derive the expression of static torque in SRM.   *6,K2,CO3*

14. a) (i) A stepper motor has a resolution of 180 steps per revolution. Find the pulse rate required in order to obtain a rotor speed of 2400 rpm.   *7,K3,CO4*

(ii) Explain the dynamic characteristics of a variable reluctance stepper motor.   *6,K2,CO4*

OR

b) Describe in detail about the drive circuits and their performance characteristics of stepper motor.   *13,K2,CO4*

15. a) Explain in detail about the construction, principle and operation of hysteresis motor and also mention its applications.   *13,K2,CO5*

OR

b) (i) Summarize the applications of linear induction motor.   *7,K2,CO5*

(ii) Describe briefly about the repulsion motor.   *6,K2,CO5*

PART - C (1 × 15 = 15 Marks)

16. a) Derive the relationship between magnetizing force and flux density by performing the magnetic circuit analysis of brushless DC motor.   *15,K3,CO1*

OR

b) A variable reluctance stepper motor has a step angle of 3°. Determine the following   *15,K3,CO4*

    (i) Resolution.

    (ii) No. of steps per shaft to make 10 revolutions.

    (iii) Shaft speed if stepping frequency is 2400 pulse/sec.