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Question Paper Code : 70531

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2023.

Sixth Semester

Electrical and Electronics Engineering

EE 8005 – SPECIAL ELECTRICAL MACHINES

(Regulations 2017)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is holding torque in stepper motors?
2. Define slewing and resolution in stepper motor.
3. Find the step angle of a three phase switched reluctance motor having 12 stator poles and 8 rotor poles.
4. Why rotor position sensor is essential for the operation of SRM.
5. List the types of permanent magnet materials used in PMDC motor.
6. What is the effect of demagnetization in brushless PMDC motor?
7. How permanent magnet synchronous motor is started?
8. Mention the applications of permanent magnet synchronous motor?
9. Define transverse edge effect.
10. Give the unique features of hysteresis motor.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Explain the constructional feature and working of a stepping motor. (7)
(ii) Draw and explain the static and dynamic characteristics of stepping motor. (6)

Or

- (b) (i) Explain with neat diagram the bipolar drive circuits in stepper motor. (7)
(ii) Describe the operation of a variable reluctance type stepper motor. (6)

12. (a) (i) Discuss the type of control strategy used in different regions of the torque speed characteristics of switched reluctance motor. (7)
- (ii) Draw and explain the torque-speed characteristics of switched reluctance motor. (6)

Or

- (b) (i) Explain the importance of shaft position sensing of SR motor. (7)
- (ii) Discuss the necessity of power electronic circuit in SR motor. (6)
13. (a) (i) Explain the constructional features and principle of operation of permanent magnet DC. (7)
- (ii) Derive the EMF equation of brushless DC motor. (6)

Or

- (b) (i) Discuss in detail the various driving circuits used in permanent brushless magnet DC motor. (7)
- (ii) Explain the magnet characteristics of permanent magnet brushless DC motor. (6)
14. (a) (i) Explain the construction and principle of operation of permanent magnet synchronous motor. (7)
- (ii) Derive the emf equation of permanent magnet synchronous motor. (6)

Or

- (b) (i) With neat sketch explain the current control and vector control schemes of PMSM. (7)
- (ii) Derive the expression for the d-axis synchronous reactance of the PM synchronous reluctance motor. (6)
15. (a) (i) Explain in detail the working of Hysteresis motor. (7)
- (ii) Explain the principle and operation of a linear induction motor and draw its characteristics. (6)

Or

- (b) (i) Explain the constructional features and principle of operation of synchronous reluctance motor. (7)
- (ii) Explain with diagram the magnetic Levitation. (6)

PART C — (1 × 15 = 15 marks)

16. (a) (i) Discuss about the power controllers used in PMBDC motor. (8)
- (ii) A PMBLDC motor has a torque constant 0.12Nm/A referred to DC supply. Find no load speed when connected to 48V DC supply. Find stall current and stall torque if armature resistance = 0.15 Ω phase and drop in controller transistors is 2V. (7)

Or

- (b) (i) Describe the operation of a variable reluctance type stepper motor. (8)
- (ii) What is the motor torque T_m required to accelerate the initial load of 10^{-4} kgm² from $\omega_1=200$ and $\omega_2=300$ rad/sec during 0.2sec. Frictional load torque is 0.06 Nm. (7)