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B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2022.

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 stepping motors?
2. Why does stepper motor work in external logic circuit?
3. What is the significance of closed loop control in switched reluctance motor?
4. Write the torque equation of switched reluctance motor.
5. What is the effect of demagnetization in brushless PMDC motors?
6. List the types of materials used in PMSBLDC motors.
7. How is permanent magnet synchronous motor started?
8. What are slotless motors?
9. Define transverse edge effect.
10. State the advantages of linear induction motor.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Describe the operation of a variable reluctance type stepper motor. (6)
(ii) What is stepping angle? Calculate the stepping angle for a 3-phase, 24-pole permanent magnet type stepper motor. (7)

Or

- (b) (i) Explain with neat diagram the bipolar drive circuits in stepper motor. (6)
(ii) Explain the working of hybrid motor. (7)
12. (a) (i) Discuss the type of control strategy used in different regions of the torque speed characteristics of switched reluctance motor. (6)
(ii) Explain the importance of shaft position sensing of SR motor. (7)

Or

- (b) Discuss the necessity of power electronic circuit in SR motor. Explain the different types.

13. (a) (i) Explain the magnetic characteristics of permanent magnet brushless DC motor. (6)
(ii) Derive the Torque equation of brushless DC motor. (7)

Or

- (b) (i) Discuss about the power controllers used in PMBDC motor. (6)
(ii) A PMSBLDC 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 = 0.15Ω/phase and drop in controller transistors is 2V. (7)

14. (a) (i) Derive the emf equation of permanent magnet synchronous motor. (6)
(ii) A three phase 16 pole synchronous motor has a star connected winding with 144 slots and 10 conductors per slot. The flux per pole is 0.03 wb, sinusoidally distributed and speed is 375 rpm. Find the frequency and phase and line emf. Assume full pitched coil. (7)

Or

- (b) Explain about (i) Torque speed characteristics (ii) Microprocessor based control system, in permanent magnet synchronous motor. (6+7)

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15. (a) (i) Explain the principle and operation of a linear induction motor and draw its characteristics. (9)
- (ii) Explain with diagram the magnetic Levitation. (4)

Or

- (b) Explain the principle and operation of a DC linear motor and also explain its control techniques.

PART C — (1 × 15 = 15 marks)

16. (a) (i) What is the motor torque T_m required to accelerate the initial load of 10^{-4} kgm^2 from $\omega_1=200$ and $\omega_2=300$ rad/sec during 0.2 sec. Frictional load torque is 0.06 Nm. (7)
- (ii) Explain the function of digital controllers in PMSM with an application. (8)

Or

- (b) Explain the working of linear induction motor with reference to an application in detail.

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