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Question Paper Code : 60546

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2026.

Sixth Semester

Electrical and Electronics Engineering

EE8005 – SPECIAL ELECTRICAL MACHINES

(Regulations 2017)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Define slewing and resolution in stepper motor.
2. Calculate the stepping angle for a 3-phase, 24-pole permanent magnet stepper motor.
3. Find the step angle of a three phase switched reluctance motor having 12 stator poles and 8 rotor poles.
4. Write any two applications of switched reluctance motor.
5. What is the effect of demagnetization in permanent magnet BLDC motor.
6. Why is PMBLDC motor called as electronically commutated motor?
7. What is meant by field oriented control of permanent magnet synchronous motor?
8. How permanent magnet synchronous motor is started?
9. List the unique features of hysteresis motor.
10. State the advantages of using repulsion motor.

PART B — ($5 \times 13 = 65$ marks)

11. (a) With relevant diagram describe the constructional features and the operation of a stepper motor.

Or

- (b) Explain in detail with neat diagram the bipolar drive circuits in stepper motor.

12. (a) Discuss in detail the type of control strategy used in different regions of the torque speed characteristics of switched reluctance motor.

Or

- (b) Discuss the necessity of power electronic circuit in SR motor. Explain the different types of converter circuits in detail.
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 PMBLDC motor has a torque constant 0.12 Nm/A referred to DC supply. Find no load speed when connected to 48 V DC supply. Find stall current and stall torque if armature resistance = $0.15 \Omega/\text{phase}$ and drop in controller transistors is 2 V . (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) Derive the expression for Self and Mutual inductance of permanent magnet synchronous motor and also derive the torque equation of PMSM.
15. (a) Draw and explain the constructional features and principle of operation of synchronous reluctance motor.

Or

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

PART C — ($1 \times 15 = 15$ marks)

16. (a) What is the role of suppressors in drive circuit of stepping motors? Explain the concept of lead angle with neat circuit diagrams.

Or

- (b) (i) Derive the expression for the EMF of a permanent magnet brushless DC motor. (7)
- (ii) A PMDC commutator motor has a no load speed of 6000 rpm when connected to a 120 V supply. The armature resistance is 2.5Ω and rotational and iron losses are Determine the speed when the supply voltage is 60 V and torque is 0.5 Nm . (8)