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| Question Paper Code : 86587 |
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B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2021.

Seventh Semester

Electrical and Electronics Engineering

EE 1001 – SPECIAL ELECTRICAL MACHINES

(Regulations 2008)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is meant by rotational voltage in AC commutator motors?
2. Draw the Torque Vs Brush position characteristics of a Repulsion motor.
3. Classify the stepper motor based on the type of construction.
4. What is step angle and step number?
5. Mention some applications of SRM.
6. What are the essential differences between a stepper motor and SRM?
7. Draw the magnetic equivalent circuit of a BLDC motor.
8. Sketch the torque-speed characteristics of a PMSM.
9. What is the principle of operation of Linear induction motor?
10. What are the special types of DC Linear motor?

PART B — (5 × 16 = 80 marks)

11. (a) (i) What modifications have to be done on a DC series motor to make it to work with single phase AC supply? (4)
- (ii) With neat sketches, describe the principle of operation, operating characteristics, equivalent circuit model, and phasor diagram of a Universal motor. (12)

Or

- (b) Explain the construction, principle of operation and the equivalent circuit model of a single-phase repulsion motor. Mention some applications of repulsion motors. (16)
12. (a) (i) With neat sketches, describe the working principle of a 3-tack variable reluctance stepper motor. (10)
- (ii) Explain briefly about the types of windings used in stepper motors. (6)

Or

- (b) (i) Describe the mechanism of torque production in a variable reluctance stepping motor. (8)
- (ii) Draw any one type of logic sequencer for a hybrid stepper motor and explain its operation with truth table. (8)
13. (a) A switched reluctance motor with 6 stator poles and 4 rotor poles has stator pole arc of 30° and rotor pole arc of 32° . The aligned inductance is 10.7 mH and unaligned inductance is 1.5 mH. Saturation can be neglected. Calculate the instantaneous torque when the rotor is 30° before the aligned position and the phase current is 7 A. What is the maximum energy conversion for one stroke if the current is limited to 7 A? Determine the average torque corresponding to this energy conversion. (16)

Or

- (b) (i) Explain the two types of current control strategy of switched reluctance motors. (10)
- (ii) Describe briefly about the nonlinear analysis of switched reluctance motors. (6)
14. (a) (i) Derive the expressions for the emf and torque of a PM brushless dc motor. (8)
- (ii) Draw the speed torque characteristics of ideal brushless dc motor and explain. (8)

Or

- (b) Sketch the structure of controller for PMBLDC motor and explain their functions. (16)
15. (a) Explain the different special types of DC linear motors. (16)

Or

- (b) Explain the principle of operation of a linear induction motor draw its characteristics. State its important application. (16)