C 20569 (Pages : 2) Name.....

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, JUNE 2006

EE 2K 606 (B)—SPECIAL MACHINES AND LINEAR MACHINES

Time : Three Hours Maximum : 100 Marks

Answer **Question I** *and* **either** *(A)* **or** *(B) in questions II to V.*

I. (a) Give complete specifications of servomotor.

(b) Explain the need of damping in servomotors and list the methods of providing it.

(c) What is slew in stepper motors ? How can it be reduced ?

(d) What is a stepper motor ? Give a general classification of this type of motors.

(e) Draw a schematic diagram of universal motor and name all essential parts.

(f) Define reluctance motor and explain its principle of operation.

(g) Explain the magnetic levitation principle. What are the fields of application of this principle ?

(h) A train moves at 20 kmph. when the stator frequency is 105 Hz. By supposing a zero slip, calculate the pole pitch of linear motor. Discuss the effect of slip on pole pitch.

(8 × 5 = 40 marks)

II. (A) (i) With relevant torque-speed characteristic, explain the operation of viscous damped servomotor.

(ii) Draw a cross-sectional view of drag-up a.c. servo motor and name the parts.

(8 + 7 = 15 marks)

Or

(B) (i) Explain how the mechanical inertia is reduced in moving-coil servomotors. What are the problems with high inertia ?

(ii) Describe how symmetrical component method is helpful in the performance analysis of two phase servomotor.

(7 + 8 = 15 marks)

III. (A) (i) With a neat schematic diagram, explain the constructional details and working of permanent magnet stepper motor.

(ii) A stepper motor rotates 1·8° per step. It drives a lead screw having a pitch of 20 threads per 2·5 cm. The lead screw, in turn, produces a linear motion of a cutting tool. If the motor is pulsed 8 times, by how much the cutting tool would move ?

(9 + 6 = 15 marks)

Or

(B) Give half step switching sequence for clockwise rotation and corresponding resulting flux positions in each step using 8 transistors Q_1 to Q_8. Explain how it improves the resolution and reduces the problem of resonance. How does this motor compares with wave drive ?

(15 marks)

Turn over

IV. (A) (i) Suggest the modifications required in a universal motor to achieve comparable performance with a.c. supply with that on d.c. supply.

(ii) A small 60 Hz hysteresis clock motor has 22 poles. In making one complete turn with respect to the revolving field, the hysteresis loss in the motor is 0·8 J. Calculate

(a) the pull-in and pull-out torques ;

(b) the maximum power output before the motor stalls ;

(c) the rotor losses when motor is stalled ; and

(d) the rotor losses when the motor runs at synchronous speed.

(6 + 9 = 15 marks)

Or

(B) (i) Explain with relevant schematic diagram the principle of operation of shaded pole motor. How can the direction of rotation be reversed ?

(ii) Discuss the purpose of flux barrier slots and the effects of inertia, rotor resistance and the frequency on the operation of synchronous reluctance motor.

(7 + 8 = 15 marks)

V. (A) (i) Explain the basic differences in constructional details and the operation of rotating machine and linear machine.

(ii) With relevant diagrams, explain (a) edge effect ; and (b) end effect in the operation of linear motor.

(7 + 8 = 15 marks)

Or

(B) (i) Draw a diagrammatic view of a 3-phase linear induction motor and explains its operation.

(ii) Compare the performance of linear synchronous motor and DC linear motor of equal power rating.

(7 + 8 = 15 marks)

[4 × 15 = 60 marks]