D 2392 (Pages : 2) Name.....

Reg. No.....

FIFTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION DECEMBER 2009

EE 04 505—ELECTRICAL MACHINES—II

(2004 admissions)

Time : Three Hours Maximum : 100 Marks

1. (a) Explain the following terms :

   (i) Distribution factor ; and

   (ii) Pitch factor.

   (b) Explain the two-reaction theory pertaining to a salient pole synchronous machine and show how it can be used to pre-determine the regulation of Alternators.

   (c) Explain how the active and reactive power delivery of synchronous generator on infinite bus are varied.

   (d) Explain V and inverted V-curves of a synchronous motor.

   (e) Establish that the maximum torque developed in an induction motor is independent of the resistance of the rotor circuit.

   (f) Explain the principle of operation of an induction generator and describe how it can be self-excited ?

   (g) Explain the principle of pole changing in order to vary the speed of a 3-phase induction motor. Comment on the limitation of this method.

   (h) Explain the operation and constructional features of a capacitor start single-phase induction motor.

   (8 × 5 = 40 marks)

2. (a) A 50 kVA, 415 V, 50 Hz, star-connected Alternator has an effective resistance of 0.02 Ω per phase. A field current of 8 A causes an e.m.f. of 415 V on open circuit and a current 185 A on short circuit. Calculate (i) the synchronous impedance ; (ii) the synchronous reactance ; and (iii) the full-load voltage regulation at 0.8 p.f. lagging.

   (15 marks)

   Or

   (b) (i) Explain briefly how the effect of saliency in armature reaction is taken care by Blondel's two reaction theory.

   (6 marks)

   (ii) Discuss briefly the various types of excitation used for alternator. (9 marks)

3. (a) Show that the parallel operation of two alternators is affected by (i) alteration in prime-mover input of one of the alternator ; and (ii) alteration in the excitation of one of the alternator.

   (15 marks)

   Or

   (b) Discuss briefly why synchronous motors are inherently not self-starting. Explain the different methods used for starting of synchronous motors.

   (15 marks)

Turn over

4. (a) A 6-pole, 50 Hz, 3-phase Induction motor has rotor resistance of 0.09 Ω/phase. If its stalling speed is 850 r.p.m., find the value of the resistance to be added to the rotor circuit to develop maximum torque of the time of starting. Neglect stator parameters.

(8 marks)

(b) Explain the phenomenon of cogging and crawling in induction motors. (7 marks)

Or

(c) (i) Explain how the parameters of the equivalent of a 3-phase induction can be determined experimentally.

(8 marks)

(ii) 'A single-phase induction motor is not self starting'—Explain this statement using the double resolving field theory.

(7 marks)

5. (a) Describe with a neat diagram, the principle and working of a star-Delta starter for a 3-phase induction motor.

(15 marks)

Or

(b) (i) Discuss how the synchronous speed of an induction motor can be controlled in a gradual manner over a range of values by changing the supply frequency.

(7 marks)

(ii) Explain the split-phase method of starting of 1-phase induction. Why is the starting torque of such motor relatively small.

(8 marks)

[4 × 15 = 60 marks]

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