D 27094 (Pages : 2) Name.....

Reg. No.....

FIFTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, DECEMBER 2006

EE 04 505—ELECTRICAL MACHINES—II

(2004 admissions)

Time : Three Hours Maximum : 100 Marks

I. (a) Briefly explain how the regulation of an alternator is determined by MMF method.

(b) What is meant by short circuit Ratio of an alternator ?

(c) What is meant by synchronising power of an alternator ?

(d) What is meant by Hunting in synchronous machines ?

(e) State the effect of rotor resistance on the starting torque of an induction motor.

(f) Enumerate the various losses taking place in an induction motor.

(g) What are the methods used for the speed control of 3-phase induction motor ?

(h) Explain why a single phase induction motor does not develop starting torque.

(8 × 5 = 40 marks)

II. (a) Derive the e.m.f. equation of an alternator. (7 marks)

(b) A 3-phase, 50 Hz alternator has 12 poles. The armature has 180 slots containing a double layer winding with 4 conductors per slot. The flux per pole is 0.5 wb. If the civil span is 12 slots, determine the line voltage generator.

(8 marks)

Or

(a) What is meant by direct axis and quadrature axis reactance in a salient pole synchronous machine ?

(7 marks)

(b) Explain how the strip test is conducted in a salient pole alternator to determine the direct axis and quadrature axis reactances.

(8 marks)

III. (a) Explain how a 3-phase alternator can be synchronised to an infinite bus by dark lamp method.

(8 marks)

(b) A 3000 kVA, 6 pole alternator runs at 1000 r.p.m. in parallel with other machines on 3300 V bus bars. The synchronous reactance is 20%. Calculate the synchronising power for one mechanical degree of displacement and the corresponding synchronising torque.

(7 marks)

Or

(a) Giving phasor diagram explain the effect of variation of excitation on the armature current and power factor of a synchronous motor working on constant voltage lines.

(7 marks)

Turn over

(b) A 25 hp ; 230 V ; 3-phase 50 Hz, 4 pole star connected synchronous motor has an armature resistance per phase of 0.12 ohms ; and a synchronous reactance per phase of 1.6 ohm. The angle between the rotor and stator field is 10°. The generator voltage per phase is 110 V. Find (i) armature current ; (ii) power factor angle ; and (iii) power input to the motor.

(8 marks)

IV. (a) Derive the torque-slip characteristics of an induction motor and prove that the maximum torque developed is independent of the rotor resistance.

(8 marks)

(b) A 3-phase, 4-pole, 50 Hz induction motor has rotor resistance of 0.04 ohms/phase. The maximum torque occurs at a speed of 1200 r.p.m. Calculate the starting torque as a percentage of maximum torque. Find the additional rotor resistance to be added so as to develop maximum torque at starting.

(7 marks)

Or

(a) Explain the no load and blocked rotor test on induction motor and show how the equivalent circuit of the motor can be developed from the test data.

(9 marks)

(b) Explain the double revolving field theory applied to single phase induction motor.

(6 marks)

V. Explain clearly various methods adopted for starting of 3-phase induction motors.

(15 marks)

Or

Derive the equivalent circuit of a single phase induction motor and explain the significance of each element of the network.

(15 marks)

[4 × 15 = 60 marks]