[06 – 3221]

III/IV B.E. DEGREE EXAMINATION.

Second Semester

Electrical and Electronics Engineering

PERFORMANCE AND DESIGN OF ELECTRICAL MACHINES — III

(Effective from the admitted batch of 2006–2007)

Time : Three hours Maximum : 70 marks

Question No. 1 is compulsory.

Answer any FOUR from the remaining.

All questions carry equal marks.

$(7 \times 2 = 14)$

1. (a) What is Hunting in synchronous motors?

(b) Justify whether synchronous motors are self starting. List out various methods of starting.

(c) What are the general principles governing windings for a synchronous generator. State various types of armature windings.

(d) What is Short Circuit Ratio (SCR) of a synchronous machine?

8. (a) Explain the types of induction motors based on their construction in detail. (8)

(b) Write a brief note on design of windings of an induction motor. (6)

(e) Write the differences between squirrel cage rotor and wound rotor of an induction motor.

(f) What is the significance of air gap length in induction machines?

(g) Write the special features of salient pole synchronous machine.

2. (a) Calculate the distribution factor for a single layer 18-slot, 2-pole, three phase stator winding. (6)

(b) A 500 kVA, three-phase, star connected alternator has a rated line-to-line terminal voltage of 3300 V. The resistance and synchronous reactance per phase are 0.3 and 4.0 ohms respectively. Calculate the voltage regulation at full-load, 0.18 power-factor lagging. (8)

3. (a) Explain methods of synchronizing of alternators. (6)

(b) Two alternators A and B operate in parallel and supply a load of 8 MW at 0.8 lagging. The power output of A is adjusted to 5000 kW by changing its steam supply and its pf is adjusted to 0.9 lagging by changing its excitation. Find the pf of alternator B. (8)

4. (a) Explain the effect of change of excitation of a synchronous motor driving a constant load. (8)

(b) Explain the concept of synchronous machine working as a motor. (6)

5. (a) An industrial plant has a load of 800 kW at of power factor of 0.8 lagging. It is desired to install a synchronous motor to deliver a load of 200 kW and also serve as a synchronous condenser to improve the overall power factor of the plant to 0.92. Determine the kVA rating of the synchronous motor and its power factor. Assume that the synchronous motor has an efficiency of 90 percent. (8)

(b) Explain how synchronous condenser is operated. (6)

6. With neat sketches explain the constructional features of a salient pole and non salient pole type synchronous machines. (14)

7. (a) Derive the expressions for pitch factor and distribution factor there by getting the expression for winding factor. (8)

(b) Calculate the distribution factor for a 36-slot, 4-pole, single layer 3-phase winding. (6)