Code: 13A02504

R13

B.Tech III Year I Semester (R13) Regular Examinations December 2015

ELECTRICAL MACHINES – III

(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) What is breadth factor? Explain its effect on synchronous machine.
(b) Draw and explain phasor diagram of cylindrical rotor alternator for lagging power factor.
(c) Define voltage regulation and mention list of methods to find regulation of alternator.
(d) What is meant by SCR? Explain its importance on performance of the machine.
(e) Explain the effect of field current on performance of synchronous motor with variation of I_a and p.f.
(f) Define synchronizing power and torque.
(g) What is a synchronous condenser and write its applications?
(h) What is hunting and list out its methods to eliminate hunting?
(i) List out different starting methods of single phase induction motor.
(j) Write down the types and applications of stepper motors.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 (a) Derive an emf equation of an synchronous generator.
(b) Explain the effect of armature reaction on the operation of synchronous generator.

OR

3 (a) Explain the sources of harmonics. What are the various effects of harmonics on generated emf in an alternator?
(b) An alternator is operating at no load has an induced EMF of 346.4 V/ph and a frequency of 60 Hz. If the pole flux is decreased by 15% and the speed is increased by 6.8%. Determine: (i) The induced EMF. (ii) Frequency.

UNIT – II

4 Describe the procedural steps to find regulation of an alternator using Z.P.F method.

OR

5 (a) Explain the two reaction theory of salient pole machine. Draw the phasor diagram and obtain regulation of an alternator using this theory.
(b) Find the voltage regulation for a load of 1280 kW at 0.8 pf leading for a 3-phase 1600 kVA, 13500 V, star connected alternator having an armature resistance of 1.5 ohm per phase and a synchronous reactance of 30 ohm/phase.

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UNIT – III

6 (a) Two generators rated 420 MW and 580 MW are operating in parallel. The drop characteristics of their governors are 3% and 4% respectively from no-load to full-load. If they are operating at 60 Hz at no-load, how will they share 1000 MW load and what will be the system frequency?

(b) Give procedural steps to determine sub-transient, transient and steady state reactance of an alternator.

OR

7 (a) Discuss the operation of synchronization of an alternator with an infinite bus

(b) A lighting load of 600 kW and a motor load of 707 kW at 0.707 p.f. are supplied by two alternators running in parallel. One of the machines supplies 900 kW at 0.9 p.f. lagging. Find the load & p.f. of the second machine.

UNIT – IV

8 (a) Explain the methods of starting the synchronous motor against the light loads and high load torques.

(b) A 400 V synchronous motor gives a net output mechanical power of 7.35 kW and operates at 0.9 p.f lagging. Its effective resistance is 0.7 ohm. If the iron and mechanical losses are 550 W and excitation losses are 750 W. Calculate armature current and commercial efficiency.

OR

9 (a) Explain bout the operation of synchronous induction motor.

(b) A3300 V delta connected synchronous motor has X_s = 18 ohms/phase. It operates at a leading power factor of 0.707 when drawing 800 kW from mains. Find the excitation e.m.f.

UNIT – V

10 (a) What is universal motor? Draw its phasor diagram and discuss its operation.

(b) A universal motor has an inductance of 0.5H and a resistance of 30 ohms. When loaded and connected to 250 V dc supply, it takes 0.8 A and runs at 2000 rpm. Find the speed when it's operating on 250 V, 50 Hz ac supply and drawing the same current.

OR

11 Draw the phasor diagram of an ac series motor. How can its performance be analyzed? Draw its typical characteristics.

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