B.Tech III Year I Semester (R13) Supplementary Examinations June 2016

**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) Write main parts of a rotating machine.

(b) The coil span for the stator winding of an alternator is $120^0$ (Electrical), compute the chording factor of the winding.

(c) Explain how the Potier triangle can be drawn with the help of O.C.C and any two points on the ZPFC.

(d) Distinguish between salient pole and cylindrical rotor synchronous generators.

(e) Define sub-transient, transient and steady-state reactance of AC generator.

(f) State conditions to be satisfied before connecting an alternator to the infinite bus-bars for parallel operation.

(g) Describe different methods of starting a synchronous motor.

(h) Why a 3-phase synchronous motor will always run at synchronous speed?

(i) List the common applications of single-phase series motors.

(j) Explain stepper motor.

**PART – B**

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

**UNIT – I**

2 (a) Explain the different characteristics of synchronous generator.

(b) Write the differences in construction of rotors of alternators used in hydroelectric plants and steam plants.

**OR**

3 (a) Explain armature reaction and write its effect on the terminal voltage of an alternator at unity power factor load.

(b) Derive coil span factor and distribution factor of an alternator.

**UNIT – II**

4 (a) Write different methods of voltage regulation of an alternator and Explain EMF method.

(b) Explain voltage regulation by ZPF method.

**OR**

5 (a) A 3-phase star connected, 50 Hz synchronous generator has a direct axis synchronous reactance of 0.6 p.u. and quadrature axis reactance of 0.45 p.u. The generator delivers a rated KVA at rated voltage. Draw the phasor diagram at full load 0.8 p.f lagging and hence calculate the open circuit voltage and voltage regulation. Resistive drop at full load is 0.015 p.u.

(b) Briefly Describe how Slip test is conducted on salient pole machine to find the $X_d$ and $X_q$ experimentally.

**UNIT – III**

6 (a) Write the conditions for paralleling alternators and Explain one dark and two bright lamp methods with necessary electrical circuit diagram.

(b) A 750 KVA, 11 KV, 4-pole, 3-ø Star connected alternator has percentage resistance and reactance of 1 and 15 respectively. Calculate the synchronizing power per mechanical degree of displacement at: (i) No-load. (ii) At full load 0.8 p.f. lag. The terminal voltage in each case is 11 KV.

**OR**

7 (a) Write about the effect of change of excitation at constant load when the alternators running parallel.

(b) Two identical 3-phase alternators work in parallel and supply a total load of 1600 kW at 11000 V at a power factor of 0.92. Each machine supplies half the total power. The synchronous reactance of each is 50 ohms/phase and resistance is 2.5 ohms/phase. The field excitation of the first machine is adjusted so that armature current is 50 A lagging. Determine the armature current of the second alternator, the power factor at which each machine is working and generated voltage of the first alternator.

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**UNIT – IV**

8 (a) Explain why synchronous motor is not self starting.
(b) Explain the phasor diagrams of a 3-phase synchronous motor for lagging, leading and unity power factor conditions.

**OR**

9 (a) Briefly describe synchronous condenser along with its phasor diagram.
(b) A 2.3 kV, 3-phase, star-connected synchronous motor has Zs = (0.2+j2.2) Ω/phase. The motor is operating at 0.5 power factor leading with a line current of 200 A. Determine the generated emf per phase.

**UNIT – V**

10 (a) Explain double field revolving theory of single phase induction motor.
(b) Explain about "Capacitor start" and "Capacitor start capacitor run" induction motors.

**OR**

11 (a) With a neat sketch, discuss about the operation of shaded pole motor with squirrel cage rotor.
(b) Write short notes on Universal motor and write some applications of universal motor.

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