R09

Code: 9A02505

B.Tech III Year I Semester (R09) Regular & Supplementary Examinations December 2014

ELECTRICAL MACHINES – III

(Electrical and Electronics Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 (a) Explain the differences between stationary armature and rotating armature. What are the advantages of rotating armature over stationary armature?

b) (A 4-pole alternator has an armature with 25 slots and 8 conductors per slot and rotates at 1500 rpm and the flux per pole is 0.05 Wb. Calculate the EMF generated, if winding factor is 0.96 and all the conductors in a phase are in series.

2 (a) Explain the nature of the external characteristics of alternator for unity, lagging and leading power factors.

(b) The phase emf of a 3-phase, 50 Hz alternator consists of a fundamental, a 20% third harmonic and 10% fifth harmonic. The amplitude of the fundamental voltage is 1000 V. Calculate the rms, line voltage with star and delta connected armature connected windings.

3 (a) Discuss the MMF method of calculating voltage regulation.

(b) A 3-phase, star-connected alternator is rated at 1600 kVA and 13500 V the armature effective resistance and synchronous reactance per phase are 1.5Ω and 30 Ω respectively, calculate the percentage regulation for a load of 1280 kW at P.F of, (i) 0.8 lagging. (ii) unity and (iii) 0.8 leading.

4 (a) Prove that sharing of common load by the alternators in parallel depends upon input to the prime movers.

(b) Two single phase alternators operate in parallel and supply a load impedance of (3+j4) ohm. If the impedance of the machine (0.2+j2) and e.m.fs are (220+j0) and (220+j0) volts respectively, determine for each machine (i) terminal voltage. (ii) power factor and (iii) output.

5 (a) A sub-station operating at full load of 1200 kVA supplies a load at 0.7 power factor lagging. Calculate the permissible additional load at this power factor and the rating of synchronous condenser to raise the substation power to 0.9 lagging.

(b) Derive the expression for the maximum power developed by a synchronous motor.

6 (a) Explain the circumstances leading a synchronous motor to work as an ideal synchronous condenser.

(b) A 400 V synchronous motor gives a net output mechanical power of 7.35 kW and operates at 0.92 power factor lagging. Its effective resistance is 0.7 Ω. If the iron and mechanical losses are 550 W and excitation losses are 750 W. Calculate armature current and commercial efficiency.

7 (a) Explain the construction and give the applications of single-phase induction motor.

(b) Why single phase motors are not self starting?

8 (a) Explain the torque-speed characteristics of a. A.C series motor.

(b) The resistance and total inductance of a single phase A.C series motor are 36 ohms and 0.58H respectively. It draws 0.92 A current and runs at 2000 r.p.m when connected across 230 V D.C supply. Calculate the speed and power factor when connected to 230 V, 50 Hz A.C supply drawing the same current.

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