

Code: EE5T1

III B.Tech - I Semester – Regular Examinations - November 2014

**ELECTRICAL MACHINES-III
(ELECTRICAL & ELECTRONICS ENGINEERING)**

Duration: 3 hours

Marks: 5x14=70

Answer any FIVE questions. All questions carry equal marks

1. a) With neat diagram explain the characterization of salient pole rotors. Give limitations & applications of it. 7 M
- b) A 3- ϕ , 20 pole, star connected alternator has the following data: Number of slots = 240, Conductors per slot = 10, Coil span = 150° (Electrical) Speed of alternator = 300 rpm Flux/pole = 56 mwb. Calculate:
 - i. Frequency of induced EMF
 - ii. Pitch Factor
 - iii. Distribution Factor
 - iv. Winding Factor
 - v. Number of turns/phase
 - vi. Phase and Line voltages. 7 M
2. a) Explain the leakage reactance and armature reactance of an alternator. 7 M
- b) A 3- ϕ , star connected alternator is rated 1600KVA, 13500V. The effective armature resistance and reactance are $1.5 \Omega/\text{ph}$ and $30 \Omega/\text{ph}$ respectively. Calculate the percentage regulation for a load of 1280KW at a power factor of

- (i) 0.8 leading
- (ii) 0.8 lagging.

7 M

3. a) Explain the procedure to find out X_d and X_q of salient pole machine through an experiment. 7 M

b) A 3 phase 17.32KVA, 400V, star connected alternator is delivering rated load at 400V and at p.f. 0.8lag. Its synchronous impedance is $0.2 + j2$ per phase. Find the load angle at which it is operating. 7 M

4. a) Define the infinite bus – bar? What are the characteristics of an infinite bus – bar? 7 M

b) A 3000 KVA, 6 pole alternator runs at 1000 rpm in parallel with other machines on 3300 V bus – bars. The synchronous reactance is 20 %. Calculate the synchronizing Power for one mechanical degree of displacement and the corresponding torque. 7 M

5. a) Draw the excitation circle for a synchronous motor. How is it derived? 7 M

b) A 3- \emptyset , 6600 V, star connected synchronous motor works on constant voltage and constant excitation. Its effective per phase synchronous reactance is 18Ω & has negligible armature resistance. For a certain load, the input is 1111.145 kW & power factor is 0.8 leading. Find the power factor when the input is changed to 1500 kW. 7 M

6. Explain different methods of starting of a synchronous motor. 14 M
7. Describe constructional features and operating characteristics of an AC Series Motor and mention its uses. 14 M
8. a) What is the reluctance torque? Draw the torque – speed curve of a reluctance motor. 7 M
- b) Explain, how a stepper motor works with variable reluctance principle. 7 M