

Code: EE5T2

**III B.Tech - I Semester – Regular/ Supplementary Examinations  
March 2021**

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

Duration: 3 hours

Max. Marks: 70

**PART – A**

Answer *all* the questions. All questions carry equal marks

11 x 2 = 22 M

1.

- a) Define winding factor and write the formula for the same.
- b) What do you mean by single layer and double layer winding?
- c) With proper explanation, justify the statement m.m.f method of estimating voltage regulation is optimistic and e.m.f. method of estimating the voltage regulation is pessimistic.
- d) Why voltage regulation of an alternator is negative for leading power factor?
- e) How does change in excitation affects the load sharing.
- f) What is meant by infinite bus-bar?
- g) A machine with a large air-gap has a higher synchronizing power. Why?
- h) Why a 3-phase synchronous motor will always run at synchronous speed?

- i) What are the uses of damper winding in synchronous motor?
- j) List any four applications of linear induction motor.
- k) Define step angle and write the expression for the same.

## PART – B

Answer any *THREE* questions. All questions carry equal marks.

3 x 16 = 48 M

- 2. a) What is meant by harmonics? Explain various effects of harmonics on generated e.m.f of an alternator. 8 M
  
- b) A 3-phase, 16 pole synchronous generator has a resultant air gap flux of 0.06 Wb/pole. The flux is distributed sinusoidally over the core. The stator has 2 slots per phase and 4 conductors per slot are accommodated in layers. The coil span is  $150^\circ$  electrical. Calculate the phase and line induced voltages when the machine runs at 375 rpm. 8 M

3. The following table gives data for open circuit test on a 6600V alternator.

Field current in A	16	25	37.5	50	70
OC line voltage in V	3100	4900	6600	7500	8300

A field current of 20A is found necessary to circulate full load current on short circuit of the armature. Find the full load regulation at 0.8 p.f lagging using (i) Synchronous impedance method, and (ii) MMF method. Neglect armature resistance and reactance.

16 M

4. a) Why parallel operation of alternators is necessary? What are the advantages of connecting alternator in parallel? Mention all necessary conditions for successful parallel operation of alternators.

8 M

b) Two alternators operating in parallel supply a total load of 40 MW at p.f. 0.8 lagging, and the load on one machine is 20 MW at 0.9 p.f. lagging. Find the load on the other machine and at what p.f. it is operating?

8 M

5. a) Explain how a synchronous motor can be operated as synchronous condenser? Explain how it can be used for power factor improvement?

8 M

b) For a 3-phase salient pole synchronous motor running as a reluctance motor, derive the following relation under max

power condition  $\tan \phi = \frac{X_d + X_q}{X_d - X_q}$ ? where  $\phi$  = power factor

angle of reluctance motor.

8 M

6. a) How the stepper motors differ from other motors? List the applications of stepper motors.

8 M

b) Explain the principle of operation and applications of reluctance motor.

8 M