

2054

B.E. (Electrical and Electronics Engineering)  
Fourth Semester  
PC-EE-401: Electrical Machine - II ✓

Time allowed: 3 Hours

Max. Marks: 50

**NOTE:** Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Part. Missing data (If any) can be appropriately assumed.

x-x-x

**Q1 Explain briefly**

- A) Explain the concept of alignment torque. Using this concept discuss the condition (2)  
under which reluctance torque will be developed in an electrical machine having  
cylindrical stator and salient-pole rotor.
- B) What is meant by load angle of an Alternator? (2)
- C) What do you mean by armature reaction reactance? (2)
- D) State why small fractional kilowatt ac series motors are called universal motors. (2)
- E) Explain need of drooping characteristics for parallel operation of alternators. (2)

**Part A**

- Q2 A) Develop and draw' space and time-phasor diagrams for a cylindrical-rotor machine in (5)  
case the alternator operates at an internal power factor of (i) zero lagging (ii) zero  
leading and (iii) lagging.
- B) A 2000 kVA, 11 kV, 3-phase star-connected alternator has synchronous impedance of (5)  
 $Z_s = 0.3 + j 5 \Omega$  per phase. It delivers full load current at a power factor of 0.8 lagging  
and normal rated voltage. Compute the terminal voltage for the same excitation and  
current at 0.8 Pf leading.
- Q3 A) A 100 H.P., 500V, three phase star connected synchronous motor has a resistance and (5)  
synchronous reactance of  $0.03 \Omega$  and  $0.3 \Omega$ , per phase respectively. Calculate for full  
load and 0.8 power factor leading, emf per phase and total mechanical power  
developed assuming an efficiency of 93%.
- B) Explain the operation of synchronous motor at constant load variable excitation with (5)  
phasor diagram.
- Q4 A) Draw external and internal characteristics of an alternator. Explain the shape of these (5)  
characteristics with the help of phasor diagrams.
- B) Explain two reaction theory applicable to salient pole synchronous machine. (5)

**Part B**

- Q5 A) Show that for alternators running in parallel, the division of load between them is (5)  
governed mainly by the speed load characteristics of their prime movers.
- B) What do you mean by the synchronization of the alternators? Describe any one method (5)  
of synchronization in detail.
- Q6 Explain the construction of the brushless synchronous motor in detail with the help of (10)  
suitable circuit diagram. Derive the expressions for torque and speed of a BLDC motor  
with appropriate phasor and equivalent circuit representations.
- Q7 A) Briefly explain the working of different types of Linear Induction Motor and its (5)  
applications.
- B) Explain the construction, principle of operation and applications of stepper motor. (5)

x-x-x