Roll No. | | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (EE/EEE) (Sem.–6)

SYNCHRONOUS MACHINE

Subject Code : EE-302

M.Code : 57036

Time : 3 Hrs. Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

Q1. Write briefly :

a. Write down the conditions for parallel operation of alternators.

b. State the purpose of using damper winding in synchronous machines.

c. Define Pitch Factor.

d. Differentiate between cylindrical and salient pole motors.

e. How power factor can be controlled with the help of synchronous machines?

f. Write two applications of reluctance motors.

g. What is hunting in synchronous motors?

h. Write down the condition of maximum power developed by a synchronous motor.

i. Draw and explain the V-curve of synchronous motors.

j. Explain the significance of voltage regulation of synchronous machines.

SECTION-B

Q2. Derive the emf equation of a synchronous machine.

Q3. Explain the two-reaction theory of salient pole synchronous machines.

Q4. Discuss the methods of starting of synchronous motors.

Q5. Obtain the synchronous machine reactance from the equivalent circuit of a synchronous machine.

Q6. Draw and discuss the power angle characteristics of cylindrical rotor synchronous machines.

SECTION-C

Q7. How are sinusoidal emf, flux and MMF phasors produced in synchronous machines?

Q8. A 480V, 50Hz, Y-connected, 6-pole synchronous generator has a per-phase synchronous reactance of 1Ω. Its full-load armature current is 60A at 0.8PF lagging. This generator has friction and windage losses of 1.5kW and core losses of 1 kW at 60Hz at full load. Since the armature resistance is being ignored, assume that the I2R losses are negligible. The field current has been adjusted so that the terminal voltage is 480V at no load.

a. What is the speed of rotation of this generator?

b. What is the terminal voltage of this generator if the following are true?

1. It is loaded with the rated current at 0.8 PF lagging.
2. It is loaded with the rated current at 1.0 PF.
3. It is loaded with the rated current at 0.8 PF leading.

c. What is the efficiency of this generator (ignoring the unknown electrical losses) when it is operating at the rated current and 0.8 PF lagging?

d. How much shaft torque must be applied by the prime mover at full load? How large is the induced counter-torque?

e. What is the voltage regulation of this generator at 0.8 PF lagging, 1.0 PF and 0.8 PF leading?

Q9. Write short notes on :

a. Synchronous condensers

b. Hysteresis motors.

NOTE : Disclosure of identity by writing mobile number or making passing request on any page of Answer sheet will lead to UMC case against the Student.