

B.Tech. (Sem. - 6th)
SYNCHRONOUS MACHINES

SUBJECT CODE : EE - 302

Paper ID : [A0419]

[Note : Please fill subject code and paper ID on OMR]

Time : 03 Hours

Maximum Marks : 60

Instruction to Candidates:

- 1) Section - A is **Compulsory**.
- 2) Attempt any **Four** questions from Section - B.
- 3) Attempt any **Two** questions from Section - C.

Section - A

Q1)

(10 × 2 = 20)

- a) Why does an alternator's voltage rise, when it is loaded down with leading load?
- b) Why must a 60 Hz generator be derated if it is to be operated at 50 Hz?
- c) What constraints an infinite bus imposes on a generator paralleled with it?
- d) Why overheating is a serious matter for a synchronous generator?
- e) Mention the types of losses in synchronous machines.
- f) What is the speed regulation of a synchronous motor?
- g) Why can't a synchronous motor start by itself?
- h) What are synchronizing power and synchronizing torque?
- i) What is meant by short circuit oscillogram?
- j) Distinguish between transient and sub-transient reactance.

Section - B

(4 × 5 = 20)

Q2) Derive EMF equation of an alternator. Give importance of pitch factor and distribution factor.

- Q3) Explain the constructional features of salient pole alternator. What are V curves?
- Q4) Discuss why a synchronous motor is not self starting and give one method of starting this motor.
- Q5) Explain hunting phenomenon in synchronous machines. Why it is objectionable? What are its causes and how can it be reduced?
- Q6) What conditions are necessary for paralleling two synchronous generators? Give importance of short time ratings in regular operation of generators.

Section - C

(2 × 10 = 20)

- Q7) What is meant by term 'synchronous impedance'?

A turbo alternator having a reactance of 10 ohms has an armature current of 220A at unity power factor, when running on 11 KV constant frequency bus bars. If the steam admission be unchanged and the emf raised by 25%, determine the new value of machine current and power factor. If this higher value of excitation were kept constant and steam supply gradually increased, at what power output would the alternator break from synchronism. Find also the current and power factor to which this maximum load corresponds and state whether this power factor is lagging or leading.

- Q8) (a) What do you understand by synchronous condenser? Explain with the help of phasor diagram its operation and applications.
- (b) What is SCR? How size of synchronous machine is related with SCR?
- Q9) Write short notes on the following :
- (a) Transient stability of the synchronous machines.
- (b) Reluctance motor.
