

**B.TECH SEM – VI (2007 COURSE) (ELECTRICAL ENGG.) :**  
**WINTER - 2017**  
**SUBJECT: SYNCHRONOUS MACHINE THEORY & DESIGN**

**Day: Friday**  
**Date: 24/11/2017**

**W-2017-2513**

**Time: 10.00 AM TO 01.00 PM**  
**Max.Marks: 80**

**N.B.**

- 1) **Q. No 1 and Q.No.5 are COMPULSORY.** Out of the remaining attempt **any TWO** questions from each Section.
- 2) Answer to the two sections should be written in **SEPARATE** answer books.
- 3) Figures to the **RIGHT** indicate full marks.
- 4) Draw neat labeled diagram **WHEREVER** necessary.
- 5) Assume suitable data if necessary.

**SECTION – I**

- Q.1 (a)** What is armature reaction? Explain its effect at zero power factor lagging in case of synchronous generator. **(05)**
- (b)** Explain two reaction theory for salient pole machines. **(05)**
- (c)** Explain any one method of starting 3 phase synchronous motor. **(04)**
- Q.2 (a)** Explain the mmf method of finding voltage regulation of an alternator. **(06)**
- (b)** A 3 phase, 8 pole, 750 rpm star connected alternator has 72 slots on the armature. Each slot has 12 conductors and winding is shorted by 2 slots. Find the induced emf (phase value) if flux per pole is 0.06 weber. **(07)**
- Q.3 (a)** Describe slip test to determine  $X_d$  &  $X_q$  of salient pole alternator. **(06)**
- (b)** A salient pole alternator is operated at 0.8 pf lag. It is delivering related current at rated voltage. Resistance of alternator per phase is 0.02 per unit,  $X_d = 1.2$  PU,  $X_q = 0.8$  PU Calculate the excitation emf and regulation at full load, 0.8 pf lag. Assume rated voltages current as 1PU each. **(07)**
- Q.4 (a)** Explain the operation of 3 phase synchronous motor at constant load and variable excitation condition. **(06)**
- (b)** Briefly explain the phenomenon of hunting in synchronous motor. How it can be prevented. **(07)**

**SECTION – II**

- Q.5 (a)** What is the necessity of parallel operation of alternators? State the conditions necessary for paralleling alternators. **(05)**
- (b)** What are the factors those limit the design of a machine? **(05)**
- (c)** Explain the Rotor construction of a Hysteresis Motors. **(04)**
- Q.6 (a)** What do you mean by synchronizing of alternators? Describe any one method of synchronizing. **(07)**
- (b)** Two Station generators A&B operate in parallel. Station capacity of A is 50 MW and that of B is 25 MW. Full-load speed regulation of station A is 3% and full- load speed regulation of B is 3.5%. Calculate the load sharing of the connected load is 50 MW. No- load frequency is 50 HZ. **(06)**
- Q.7 (a)** A 1250 kVA, 3- phase 50 HZ, 3300 V, 300 rpm synchronous generator with a concentric winding has the following design data. Specific magnetic loading  $B_{av} = 0.58$  wb/m<sup>2</sup>, Specific electric loading  $a_c = 3300$ A/m. peripheral speed is 30m/s. Find stator core length. Stator bore, Area per pole, Flux per pole. **(07)**
- (b)** Discuss the factors that govern the choice of average gap density for synchronous machine. **(06)**
- Q.8** Explain the construction operating principles characteristics and applications of **(13)**
- I) Universal Motor II) Linear Induction Motor.