

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VI • EXAMINATION – SUMMER 2013****Subject Code: 160901****Date: 24-05-2013****Subject Name: Electrical Machine - III****Time: 10.30 am - 01.00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

Q.1 (a) Explain Hopkinson's test for determination of efficiency of DC shunt machine. **07**

(b) Explain V and inverted V curve of synchronous motor. **07**

Q.2 (a) List different methods for finding voltage regulation of an alternator and explain any one method. **07**

(b) A 3.5 MVA, 3-phase synchronous generator rated at 6.6 KV has 32 poles. Its direct and quadrature axis synchronous reactance as measured by the slip test are 9.6 ' and 6 ' respectively. Neglecting armature resistance, determine the regulation and excitation emf needed to maintain 6.6 KV at the terminals when supplying a load of 2.5 MW at 0.8 p.f. lagging. What maximum power can generator supply at the rated terminal voltage, if the field becomes open circuited? **07**

OR

(b) Derive the expression for the input and output power developed by synchronous motor. Also derive the maximum input and output power developed by synchronous motor. **07**

Q.3 (a) What is armature reaction? Explain the effect of armature reaction on the terminal voltage of an alternator. **07**

(b) A 4 KVA, 3 phase, 110V, 50Hz, star connected alternator has $X_d = 3 \text{ ohm}$ and $X_q = 2 \text{ ohm}$. The machine is delivering full load current of 0.8 p.f lagging at rated voltage. Find the induced emf, load angle and maximum power output of the alternator. **07**

OR

Q.3 (a) Briefly explain the principles of operation of DC servo motor and PM synchronous motor. **07**

(b) Two identical DC machines when tested by Hopkinson's test gave the following test results: **07**

Field currents are 2.5 A and 2 A. Line voltage is 220 V. Line current including both the field currents is 10 A. Motor armature current is 73 A. The armature resistance of each machine is 0.05 ohm. Calculate the efficiency of both machines

Q.4 (a) Explain circle diagram of auto synchronous motor. **07**

(b) State the conditions necessary for paralleling alternators. Explain one dark and two bright lamp methods with necessary electrical circuit diagram. **07**

OR

- Q.4** (a) Write short note on AC servo motor. **07**
(b) A 3 phase star connected 1000KVA, 11000V alternator has rated current of **07**
52.5 A. The ac resistance of the winding per phase is 0.45 ohm. The test
results are given below:
O.C. Test: field current = 12.5 A, voltage between lines = 422 V
S.C. Test : field current = 12.5A, line current = 52.5A
Determine the full load voltage regulation of the alternator for (i) 0.8 p.f
lagging and (ii) 0.8 p.f leading loads with synchronous impedance method.
- Q.5** (a) Why synchronous motor is not self starting? Explain the methods of starting **07**
of synchronous motor.
(b) Explain the effect of varying excitation at constant load on synchronous **07**
motor.

OR

- Q.5** (a) Explain construction, working & applications of SRM (Switched Reluctance **07**
Motor)
(b) Derive emf equation of alternator. Explain distribution factor with effect of **07**
harmonics.
