Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
BE SEM-VI Examination-Nov/Dec-2011

Subject code: 160901   **Date: 21/11/2011**
Subject Name: Electrical Machine - III
Time: 10.30 am -1.00 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)** With necessary diagram explain the effect of leading power factor on alternator.   **07**
(b) Explain the slip test for measurement of Xd and Xq of synchronous machines.   **07**

Q.2 **(a)** Explain hunting of synchronous machines and methods of its prevention.   **07**
(b) Explain brake test for DC machine.   **07**
OR
(b) Explain the construction & operation of auto synchronous motor.   **07**

Q.3 **(a)** A 220V, 50Hz, 6 pole star connected alternator with ohmic resistance 0.06 ohm per   **07**
phase, gave following data for open circuit and full load zero power factor
characteristics:

Field current, A	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.8	2.2	2.6	3.0	3.4
Open circuit voltage, Ef in V	29.0	58.0	87.0	116	146	172	194	232	261.5	284	300	310
Zpf terminal voltage in V	--	--	--	--	--	0	29	88	140	177	208	230

Find the percentage voltage regulation at full load current of 40A at power factor of
0.8 lag by ZPF method.

(b) A 4 KVA, 3 phase, 110V, 50Hz, star connected alternator has Xd = 3 ohm and Xq = 2   **07**
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.
OR
Q.3 **(a)** A 3 phase star connected 1000KVA, 11000V alternator has rated current of 52.5 A.   **07**
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.

(b) A 3 phase, 6 pole, 2.3 KV, 200KVA, star connected synchronous motor has **07** synchronous reactance of 12 ohm per phase and negligible resistance. The motor is initially operating at a load of 120KW with the field current adjusted such that the armature current is minimum. The field current is now increased such that the armature current is increased by 50%. With this field current, the load is reduced to 60KW. Calculate the new values of armature current and power factor.

Q.4 **(a)** Derive emf equation of alternator. Explain distribution factor with effect of **07** harmonics.

(b) Explain the effect of varying excitation at constant load on synchronous motor. **07**

OR

Q.4 **(a)** Explain V and inverted V curves of synchronous motor. **07**

(b) Why synchronous motor is not self starting? Explain the methods of starting of **07** synchronous motor.

Q.5 **(a)** Explain the operation of a.c servo motor **07**

(b) Explain construction, working & applications of switched reluctance motor. **07**

OR

Q.5 **(a)** Explain brushless DC motor. **07**

(b) Explain 3 phase induction regulator. **07**

****