

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- VIth SEMESTER-EXAMINATION – MAY- 2012****Subject code: 160901****Date: 09/05/2012****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 the field's test for d.c. series motor. **07**
(b) Calculate the r.m.s. value of the induced emf per phase of a 10-pole, 3-phase, 50 Hz, star connected alternator with 2 slots per pole per phase and 4 conductors per slot in two layers. The coil span is 150 degree. The flux per pole has a fundamental component of 0.12 Wb and 20% third harmonic component. **07**

- Q.2** (a) Draw the combined Space and Time Phasor Diagram of Cylindrical rotor alternators for the following conditions (i) lagging p.f. (ii) leading p.f. and (iii) unity p.f. **07**
(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**

OR

- (b) Explain V and inverted V curve of synchronous motor. **07**
- Q.3** (a) List different methods for finding voltage regulation of an alternator and explain Potier method. **07**
(b) A star connected, 11 KV alternator, with synchronous impedance of $1+j10$ per phase is connected to infinite bus at rated voltage. The alternator delivers an armature current of 100 A at unity power factor to the bus bar. With the alternator output remaining constant, the alternator excitation is increased by 15%. Find the new values of armature current, load angle and p.f. **07**

OR

- Q.3** (a) Explain the two reaction theory of salient pole machine in detail with phasor diagram. **07**
(b) A 3.5 MVA, 3-phase synchronous generator rated at 6.6 KV has 32 poles. Its direct and quadrature axis synchronous reactances as measured by the slip test are 9.6Ω and 6Ω 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**

- Q.4** (a) State the conditions necessary for paralleling alternators. Explain one dark and two bright lamp method with necessary electrical circuit diagram. **07**
(b) Explain the effect of varying the excitation and torque of the prime-mover of synchronous machine connected to infinite bus-bar. **07**

OR

- Q.4** (a) Why synchronous motor is not self starting? Explain the methods of starting of synchronous motor. **07**
(b) A 2,000 KVA, 3-phase, 8-pole alternator runs at 750 rpm in parallel with other machines on 6,000 V bus-bars. Find synchronising power on full load 0.8 p.f. lagging per mechanical degree of displacement and the corresponding synchronising torque. The synchronous reactance is 6 ohm per phase. **07**

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| Q.5 | (a) | Explain the working of synchronous phase modifier. | 07 |
| | (b) | Explain the operation of d.c servo motor | 07 |
| OR | | | |
| Q.5 | (a) | Explain construction, working & applications of switched reluctance motor. | 07 |
| | (b) | Explain single phase induction regulator. | 07 |
