

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-III • EXAMINATION – WINTER 2013****Subject Code: 130904****Date: 30-11-2013****Subject Name: Electrical Machines-I****Time: 02.30 pm - 05.00 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 the help of circuit diagram explain the working of 4 point starter of D.C motor in detail. **07**
- (b) Explain the process of voltage build up in a DC shunt generator. What is the field circuit critical resistance? **07**
- Q.2** (a) Explain the Swinburne's test to determine no-load losses of a DC machine. What are the limitations of this test? **07**
- (b) A 240V dc shunt motor has an armature resistance of 0.4 ohm and is running at the full-load speed of 600 r.p.m. with a full load current of 25A. The field current is constant; also a resistance of 1 ohm is added in series with the armature. Find the speed (i) at the full-load torque and (ii) at twice the full-load torque **07**
- OR
- (b) With the help of sketches, describe the main construction and working principle of a DC generator. **07**
- Q.3** (a) Explain the speed control of dc series motor by (i) field diverters (ii) Variable resistance in series with motor. **07**
- (b) A 400V, 4-pole, 50 Hz, 3-phase, 10 hp, star connected induction motor has a no load slip of 1% and full load slip of 4%. Find the following: (i) Syn. speed (ii) no-load speed (iii) full-load speed. (iv) frequency of rotor current at full-load (v) full-load torque **07**
- OR
- Q.3** (a) Discuss how will you perform open-circuit and short-circuit tests on a single phase transformer in the laboratory. From the test results how will you find the efficiency and regulation of a transformer? **07**
- (b) Explain the speed-current, torque-current and speed-torque characteristics of DC shunt motor **07**
- Q.4** (a) State the various losses which takes place in a transformer. On what factors do they depend? Explain the steps taken to minimize these losses. **07**
- (b) A 40 kVA, single phase transformer has 400 turns on primary and 100 turns on secondary. The primary is connected to 2000 V.50 Hz supply. Determine: (i) The secondary Voltage on open circuit. (ii) The current following through the two windings on full load.(iii) The maximum value of flux. **07**
- OR
- Q.4** (a) Derive EMF equation of alternator and explain coil span factor and distribution factor. **07**

Q.4 (b) A 240 V series motor takes 40A when giving its rated output at 1500 rpm . Its resistance is 0.3 ohms. Find what resistance must be added to obtain rated torque (i) at starting and (ii) at 1000 rpm. **07**

Q.5 (a) Bring out clearly with the help of neat sketches the differences between the 3-phase slip ring induction motor and a three phase squirrel cage induction motor **07**

(b) A 230 V, 2.5 kVA single- phase transformer has an iron loss of 100 W at 40-Hz and 70 W at 30 Hz. Find the hysteresis and eddy current losses at 50 Hz. **07**

OR

Q.5 (a) Derive the expressions for developed torque in a 3-phase induction motor and find the condition for maximum torque **07**

(b) What are the conditions to be fulfilled for parallel operation of two alternators? Give any one method of synchronization. **07**
