Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–III • EXAMINATION – WINTER • 2014

Subject Code: 130904   **Date: 30-12-2014**

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)**	Explain construction and working principle of dc generator.	**07**
	(b)	Explain torque-current, speed-current and speed-torque characteristic of dc shunt and series motor.	**07**
Q.2	**(a)**	What is the critical field resistance of a dc shunt generator? Explain voltage build up process of dc shunt generator.	**07**
	(b)	Explain the necessity of starter in a dc motor? Explain three-point starter with neat sketch.	**07**

OR

	(b)	A 500 V dc shunt motor takes 4 A on no load. The armature resistance including that of brushes is 0.2 Ω and the field current is 1 A. Estimate output and efficiency when the input current is (a) 20 A (b) 100 A	**07**
Q.3	**(a)**	Explain synchronous impedance method of determining voltage regulation of an alternator.	**07**
	(b)	Explain the difference between cylindrical and salient pole rotor used in large alternator. Also explain pitch factor and distribution factor.	**07**

OR

Q.3	**(a)**	Explain necessary conditions required for parallel operation of two synchronous generator.	**07**
	(b)	The following test results are obtained on a 6,600 V alternator:	**07**

Open-circuit voltage: 3,100   4,900   6,600   7,500   8,300
Field current (amps):   16   25   37.5   50   70
A field current of 20 A is found necessary to circulate full-load current on short-circuit of the armature. Calculate the full-load voltage regulation at 0.8 p.f(lag) by M.M.F. method. Neglect resistance and leakage reactance.

Q.4	**(a)**	Explain torque-slip characteristic of three phase induction motor.	**07**
	(b)	Explain working principle of three phase induction motor. also derive expression for the frequency of rotor current in an induction motor.	**07**

OR

Q.4	**(a)**	Define slip. Explain different method used for measurement of slip of an induction motor.	**07**
	(b)	A 12-pole ,3-phase ,600 V , 50 Hz , star-connected , induction motor has rotor-resistance and stand-still reactance of 0.03 and 0.5 ohm per phase respectively. Calculate (a) Speed of maximum torque (b) the ratio of full-load torque to maximum torque, if the full-load speed is 495 rpm.	**07**
Q.5	**(a)**	Explain open circuit and short circuit test of single phase transformer	**07**
	(b)	Two single phase transformers with equal turns have impedances of (0.5+j3) ohm and (0.6+j10) ohm with respect to the secondary. If they operate in parallel, determine how they will share a total load of 100 KW at p.f. 0.8 lagging.	**07**

OR

Q.5 **(a)** What is an autotransformer and derive an expression for saving in conductor **07** material in an autotransformer over a two-winding transformer

(b) Consider a 20 KVA, 2200/220 V,50 Hz transformer. The O.C./S.C. test results **07** are as follows

O.C. test: 220 V 4.2 A 148W (l.v.side)

S.C.test: 86 V 10.5 A 360 W (h.v.side)

Determine the voltage regulation at full load 0.8 p.f.lagging

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