Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III • EXAMINATION – SUMMER 2013

Subject Code: 130904 **Date: 29-05-2013**

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)**	Explain the process of building up of voltage in a d.c. shunt generator and give the conditions to be satisfied for voltage buildup.	**07**
	(b)	What are the losses that occur in a d.c. machines? Derive the condition for maximum efficiency of a d.c. generator.	**07**
Q.2	**(a)**	What is armature reaction? Describe the effects of armature reaction on the operation of d.c. machines. How the armature reaction is minimized?	**07**
	(b)	Mention the reasons for compounding d.c. generator. Neatly sketch and explain the internal and external characteristics of a d.c. compound generator.	**07**
		OR	
	(b)	Why the starting current is very high in a d.c. motor? What are the drawbacks of three-point starter? Describe a four-point starter with a neat sketch.	**07**
Q.3	**(a)**	Define voltage regulation of an alternator Explain the synchronous impedance method of determining regulation of an alternator.	**07**
	(b)	Explain the essential difference between smooth cylindrical and salient-pole rotors used in alternators. What type of rotor would you expect to find in (i) A 2-pole machine (ii) A 12-pole machine At what speed would each of the machines be driven in order to produce a frequency of 50 Hz?	**07**
		OR	
Q.3	**(a)**	Explain necessary conditions required for parallel operation of two synchronous generators.	**07**
	(b)	Explain the MMF method of determining regulation of an alternator.	**07**
Q.4	**(a)**	Derive the equivalent circuit of a single phase transformer and show how it is useful in the analysis of the performance of a transformer.	**07**
	(b)	A 600 kVA, 1-phase transformer has an efficiency of 92% both at full-load and half-load at unity power factor. Determine its efficiency at 60% of full load at 0.8 power factor lag.	**07**
		OR	
Q.4	**(a)**	Define %regulation of a transformer. Derive an expression for the %regulation in terms of resistance and reactance of the transformer.	**07**
	(b)	Explain with circuit diagrams, the open circuit and short circuit tests to be carried out in the laboratory, for the determination of the parameters of a single phase transformer.	**07**
Q.5	**(a)**	Prove that when three phase supply is applied across the stator of a three phase induction motor, a rotating magnetic field of constant magnitude is produced.	**07**

Q.5	**(b)**	Compare cage and wound three phase induction motor with reference to construction, performance and applications.	**07**

OR

Q.5	**(a)**	Show that in an induction motor the rotor input: power developed: rotor copper losses = 1: (1 - S): S, where S = fractional slip.	**07**
	(b)	The power input to the rotor of a 440V, 50 Hz, 6-pole, 3-phase induction motor is 100kW. The rotor electromotive force is observed to make 120 cycles per minute, calculate (i) the slip (ii) the rotor speed (iii) mechanical power developed (iv) the rotor copper loss per phase and (v) speed of stator field w.r.t. rotor.	**07**

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