Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III • EXAMINATION – SUMMER 2013

Subject Code: 131701 **Date: 29-05-2013**

Subject Name: Electrical Machines

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)**	Differentiate between self-excited and separately excited d.c. machines. Draw the load characteristics of shunt, series and compound generators.	**07**
	(b)	Explain three point starter for D.C.Shunt motor.	**07**
Q.2	**(a)**	Derive the E.M.F. equation of single phase transformer and explain effect of turns ratio on output voltage	**07**
	(b)	Explain scott connection for transformer with diagram.	**07**
		OR	
	(b)	An ideal 25 KVA transformer has 500 turns on the primary winding and 40 turns on the secondary winding. The primary is connected to 3000 V,50 Hz supply. Calculate (1) primary and secondary currents on full load (2) secondary e.m.f. (3) maximum core flux	**07**
Q.3	**(a)**	Differentiate between single excited and multiple excited systems. Derive the expression for magnetic field energy stored in a singly excited system.	**07**
	(b)	Define energy and co-energy. Derive the expression for force developed for current excited and voltage controlled systems	**07**
		OR	
Q.3	**(a)**	Discuss power angle characteristic of an alternator. Also discuss its operation at constant load with variable excitation.	**07**
	(b)	Discuss the conditions to be satisfied before a 3-phase alternator is synchronized with infinite bus. Two 3-phase alternators operate in parallel. The rating of one machine is 50 MW and that of the other is 100 MW. Both alternators are fitted with governors having a droop of 4 %. How will the machines share a common load of 100 MW?	**07**
Q.4	**(a)**	State the type of three phase induction motor. Explain how rotor rotates when three phase induction motor is connected across three phase supply & Define Slip.	**07**
	(b)	A 3-phase ,50 Hz,500V Induction motor with 6 poles gives an output of 20 Kw at 950 rpm with a power factor of 0.8 The mechanical losses are equal to 1 Kw. Calculate for this load(i)slip (ii)rotor copper loss (iii)input if the stator losses are 1500 W(iv)line current	**07**
		OR	
Q.4	**(a)**	With reference to induction motor, attempt the following (1) Explain ñcoggingò and ñcrawlingò in a 3-phase induction motor with their remedies. (2) Why single-phase induction motor is not self-starting? Explain any one method to make it self-starting.	**07**
	(b)	A 4-pole, lap wound D.C shunt generator has a useful flux per pole of 0.07 wb. The armature winding consists of 220 turns each of 0.004 ohm resistance.Calculate the terminal voltage when running at 900 r.p.m if the armature current is 50 amp.	**07**

Q.5	**(a)**	Explain the difference between cylindrical and salient pole rotors used in large alternator . Define (1) pitch factor (2) Distribution factor (3) form factor.	**07**
	(b)	Define Voltage regulation of alternator. State various methods to find voltage regulation and Explain any one method in detail.	**07**

OR

Q.5	**(a)**	Discuss power angle characteristic of an alternator. Also discuss its operation at constant load with variable excitation.	**07**
	(b)	Explain synchronization of alternators. Which conditions must be satisfied for proper synchronization of 3-phase alternators?	**07**

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