Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE SEMESTER– VII EXAMINATION – WINTER 2014

Subject Code:170902 **Date: 02/12/2014**

Subject Name: Electrical Machine Design- I

Time: 10:30 AM TO 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)**	Define Field Form Factor. Explain Carter's Fringe Curve.	**07**
	(b)	Explain how temperature rise affects the life of electrical machine ? Also explain Intermittent with starting duty cycle.	**07**
Q.2	**(a)**	Calculate approximate overall dimensions for a 500 KVA, 6600 / 440 V, 50Hz, 3-phase core type transformer. The following data may be assumed ; emf / turn= 10 V, max. flux density = 1.3 wb/m^2 , current density = 2.5 A/mm^2, window space factor = 0.3 , overall height = overall width, stacking factor=0.9, Use 3 stepped core. For core, width of largest stamping = 0.9 d and net iron area= 0.6 d, where d= dia. of circumscribing circle.	**07**
	(b)	Explain effect of change in frequency on losses, voltage & leakage impedance of transformer.	**07**
		OR	
	(b)	List out diff. types of winding used in 3- phase transformer with its voltage rating. Also explain continuous disc type winding for 3- phase transformer.	**07**
Q.3	**(a)**	Explain various factors affecting selection of air gap length in dc machine.	**07**
	(b)	Calculate main dimensions of 50 KW, 4-pole, 600 rpm, dc shunt generator with full load terminal voltage 220 V. The max. gap flux density is 0.83 wb/m2 and the specific electric loading is 30,000. Assume that the full load armature voltage drop is 3 % of rated terminal voltage and field current is 1 % of rated full load current. Ratio of pole arc to pole pitch is 0.67& pole face is square.	**07**
		OR	
Q.3	**(a)**	Explain diff. methods used to improve armature reaction effect in dc machine.	**07**
	(b)	Explain guiding factors for choice of no of armature slots. Also show the slot view with insulations.	**07**
Q.4	**(a)**	Define Design Optimisation of Transformer. Derive necessary conditions for maximum efficiency of transformer.	**07**
	(b)	The armature of 12 pole ,500KW, 550 V, generator has a simplex lap winding consisting of 2484 conductors. There are 621 commutator segments & ratio of pole arc to pole pitch is 0.7. (a) Calculate the demagnetizing & cross magnetizing mmf / pole at rated full load current if brushes are shifted through 3 segments from G.N.A. (b) Calculate no. of conductors that must be provided in each pole face if a compensating winding is used.	**07**
		OR	
Q.4	**(a)**	Explain Commutation in dc machine. Explain how interpole improves it ?	**07**
	(b)	The following particulars refer to the shunt field coil for 440 V, 6 pole, dc generator.	**07**

MMF / pole = 7000 A, depth of winding =50 mm, length of inner turn = 1.1 m, length of outer turn = 1.4 m, loss radiated from outer surface excluding ends =1400 W/m^2, space factor =0.62, resistivity = 0.02 ohm/ m &mm^2
calculate (1) dia of wire, (b) length of coil (3) no of turns (4) exciting current
Assume a voltage drop of 20 % of terminal voltage across the field regulator.

Q.5	**(a)**	Explain design aspects of C.T.	**07**
	(b)	Explain 1. Bracing in tr. Winding 2. Choice of current density in transformer	**07**

OR

Q.5	**(a)**	Define Window Space Factor. Explain role of it to improve transformer regulation .	**07**
	(b)	Explain diff. cooling methods used for oil immersed transformer	**07**

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