Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII (OLD) - EXAMINATION – SUMMER 2017

Subject Code: 170902 **Date: 02/05/2017**

Subject Name: Electrical Machine Design-I

Time: 02:30 PM to 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)**	Discuss factors to be considered while deciding the length of air gap in the design of a D.C. machine	**07**
	(b)	What is design optimization? Derive necessary condition for designing a transformer with minimum cost.	**07**
Q.2	**(a)**	Explain guidelines used for the selection of number of armature slots in D.C. machine design	**07**
	(b)	Describe steps to calculate AT required for each part and total magnetic circuit of a D.C. machine	**07**
		OR	
	(b)	Derive equation Et =K $\sqrt{Q}$, where Q = kVA rating of a transformer. Explain how service condition of transformer affect the value of K.	**07**
Q.3	**(a)**	What is window space factor? Explain how it varies with (1) KVA rating (2) KV rating	**07**
	(b)	Determine the main core dimensions of a 5 KVA, 11000/400V, 50 Hz, 1-phase core type distribution transformer from the following data: The net conductor area in window is 06 times the net c/s of iron in the core , Current density = 1.4 A/mm² , square c/s of core, window space factor= 0.2 Max. flux density = 1.0 Wb/m² , Height of window / width of window = 3	**07**
		OR	
Q.3	**(a)**	Explain technical reasons for : (1) Low flux density is selected for yoke of a three phase transformer. (2) Circular coils are preferred in transformer winding. (3) Tappings are usually provided on h.v. side of transformer	**07**
	(b)	Calculate the main dimensions of the armature of a 400 KW, 500V, 180 rpm, 16 poles dc generator. Use square pole-face. Efficiency = 90 % Pole-arc to pole pitch ratio = 0.7 Average gap density = 0.6 Wb/m² Ampere-conductors per metre = 35000.	**07**
Q.4	**(a)**	List out the factors affecting choice of choice of number of poles & explain how in a d.c. machine affects : 1. Losses in the machine. 2. Weight of machine.	**07**
	(b)	Explain : a. Significance of mitered joints in transformer. b. Design difference between power & distribution transformer.	**07**
		OR	

Q.4	**(a)**	Define Magnetic & Electric loading in D.C. machine. Also explain in brief factors affecting the selection for it.	**07**
	(b)	Briefly explain cooling methods of transformer.	**07**
Q.5	**(a)**	Briefly explain the principles of core design of a current transformer	**07**
	(b)	Explain steps to design shunt field winding of a d.c. machine.	**07**

OR

Q.5	**(a)**	Write a Short Note on : Duty Cycle of electrical machines.	**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. Calculate (1) The demagnetizing & cross magnetizing mmf/ pole at rated full load current if brushes are shifted through 3 segments from GNA. (2) No. of conductors that must be provided in each pole face if a compensating winding is used.	**07**

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