Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE – SEMESTER – VI (NEW).EXAMINATION – WINTER 2016

Subject Code: 2160912 Date: 22/10/2016

Subject Name: Design of DC Machines and Transformer

Time: 10:30 AM to 01:30 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)** Derive equation $Et = k\sqrt{Q}$ where Q = kVA rating of a transformer. Explain how service conditionof transformer affect the value of K. **07**

(b) Explain: (a) Significance of mitered joints in transformer. **07**
(b) Difference between power transformer and distribution transformer

Q.2 **(a)** What is design optimization ? Derive necessary condition for designing a transformer with minimum cost. **07**

(b) Prepare a technical note on classification of insulating materials. **07**

OR

(b) Determine the main dimensions of the core for a 5 kVA , 11000/400 V, 50 Hz, single phase core type distribution transformer. The net conductor area in the window is 0.6 times the net cross section of iron in the core. Assume a square cross-section for the core, a flux density 1 Wb/m^2 , a current density 1.4 A/mm^2, and a window space factor 0.2. The height of window is 3 times its width. **07**

Q.3 **(a)** The current densities in the primary and secondary windings of a transformer are 2.2 and 2.1 A/ mm^2 respectively. The ratio of transformation is 10 : 1 and the length of the mean turn of the primary is 10 percent greater than that of the secondary . Calculate the resistance of the secondary winding given that the primary winding resistance is 8 Ω. **07**

(b) Explain guidelines used for selection of No. of armature slots in D.C. machine. **07**

OR

Q.3 **(a)** Explain different methods used to improve armature reaction effect in D.C. machine. **07**

(b) Explain various factors affecting selection of airgap length in D.C. machine. **07**

Q.4 **(a)** A design is required for a 50 kW, 4 pole, 600 r.p.m. d.c. shunt generator, the full load terminal voltage being 220 V. If the maximum gap density is 0.83 Wb /m^2 and the armature ampere conductors per metre are 30000, Calculate suitable dimensions of the armature core to give a square pole face. **07**
Assume that the full load armature voltage drop is 3 percent of the rated terminal voltage, and that the field current is 1 percent of rated full load current. Ratio of pole arc to pole pitch is 0.67.

(b) Discuss the factors affecting No. of poles in D.C. machine. **07**

OR

Q.4 **(a)** Explain Commutation in dc machine. Explain how interpole improves it. **07**

(b) Explain steps to design shunt field winding of a D.C. machine. **07**

Q.5 **(a)** Derive the equation of leakage reactance of 3 phase core type distribution transformer. **07**

(b) State the function of enclosers for the rotating machines and state the differnt types of enclosers and specific use of them. **07**

OR

Q.5	**(a)**	Derive the output equation of D.C. machine.	**07**
	(b)	Explain different cooling methods used in oil immersed transformer.	**07**

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