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

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (NEW) - EXAMINATION – SUMMER 2016

Subject Code:2160912 **Date:06/05/2016**

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

(b) Explain types of mechanical forces are developed in transformer winding? **07**

Q.2 **(a)** How will the output and losses in transformer vary with linear dimensions? **07**

(b) How area of core is affected by weight of copper and iron. **07**

OR

(b) Explain technical reasons for: **07**

1. Circular coils are preferred in transformer winding.
2. Tapping's are usually provided on H.V. Side of Transformer

Q.3 **(a)** A 200 kVA, 6.6kV/440volts, 50Hz, three phase core type transformer has the following design data: **07**

Max. flux density : 1.25 wb/m^2
EMF/Turn : 10 volts
Stacking factor : 0.9
Window space factor : 0.32
Current density: 2.4 A/mm^2
Overall with and overall height are same. If three stepped core is used determine overall dimensions.

(b) From the design data discuss how no load current can be estimated in 3-phase core type transformer. **07**

OR

Q.3 **(a)** Discuss design procedure for designing a commutator and brushes of a DC machine. **07**

(b) The length of the air-gap is not uniform under the entire pole face. Why it is so? **07**

Q.4 **(a)** A 400 kW, 500V, 500 rpm, 6 pole DC generator is built with an armature diameter of 90 cm and core length of 36 cm. the lap wound armature has 700 conductor. Determine specific magnetic and specific electric loading of the machine. Efficiency 80%. **07**

(b) Explain criteria for selection of specific loading. **07**

OR

Q.4 **(a)** Write a short note on heating of electric machine. **07**

(b) A 100 kw,500 V,300 rpm generator has the main dimensions. D = 1.5 m, L=0.4 m, flux density in the airgap = 1 Wb/m^2 voltage drop at full load is 7 volts and from factor k_f =0.7.calculate emf/conductor, number of conductors in series, total flux. **07**

Q.5	**(a)**	Calculate the diameter and length of armature for a 7.5kW, 4 pole, 1000 r.p.m 220 V shunt motor. Given: full load efficiency= 0.83; maximum gap flux density=0.9 Wb/m^2: specific electric loading=30,000 ampere conductors per meter; field form factor = 0.7. Assume that the maximum efficiency occurs at full load and field current is 2.5% of rated current. The pole face is square.	**07**
	(b)	How to reduce the demagnetizing effects and cross-magnetizing effect?	**07**

OR

Q.5	**(a)**	Explain steps to design shunt field winding of a D.C. machine.	**07**
	(b)	Explain various factor affecting selection of number of poles for D.C. machine	**07**

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