

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-VI (NEW) EXAMINATION – WINTER 2018

Subject Code:2160912

Date:16/11/2018

Subject Name:Design of DC Machines and Transformer

Time: 02:30 PM TO 05:30 PM

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

		MARKS
Q.1	(a) State factors to be consider for selection of specific loading.	03
	(b) Derive output equation of a D.C. machine.	04
	(c) Write a short note on Duty Cycle.	07
Q.2	(a) Give the comparison between power transformer and distribution transformer.	03
	(b) Explain heating of electrical machines.	04
	(c) Derive equation $E_t = k\sqrt{Q}$ where $Q = \text{kVA rating of a transformer.}$ Explain how service conditions of transformer affect the value of K .	07
OR		
	(c) What is design optimization? Derive necessary condition for designing a transformer with minimum cost.	07
Q.3	(a) State factors affecting the choice of specific magnetic loading.	03
	(b) Classify different insulating materials according to temperature withstanding capacity.	04
	(c) Explain various factors affecting selection of airgap length in D.C. machine.	07
OR		
Q.3	(a) Discuss in brief. What is window space factor?	03
	(b) Explain any two types of winding used in transformer.	04
	(c) Explain steps to design shunt field winding of a D.C. machine.	07
Q.4	(a) Differentiate between Radial Forces and Axial Forces in transformer windings.	03
	(b) What are the salient features of a Distribution transformer?	04
	(c) Explain the guidelines used for the selection of number slots in D.C. Machine design.	07
OR		
Q.4	(a) Explain the disadvantages of having higher specific electric loading in DC Machine Design.	03
	(b) Give the comparison between core type transformer and shell type transformer.	04

	(c)	Explain various factors affecting the choice of specific electric loading in the design of DC machine.	07
Q.5	(a)	Why Circular Coils are preferred in Transformer?	03
	(b)	A 400 kW, 500 V, 500 rpm, 80 % efficiency, 6 pole d.c. generator is built with an armature of 90 cm and core length of 36 cm. the lap wound armature has 700 conductors. Determine specific electric loading of the machine.	04
	(c)	Determine the dimensions of the core and yoke for a 100 kVA, 50Hz, 1 ϕ , core type transformer. A square core is used with distance between adjacent limbs equal to 1.6 times the width of laminations. Assume voltage per turn to be 14 volts, maximum flux density 1.1 Wb/m ² , window space factor 0.32 and current density 3A/mm ² . Take stacking factor=0.9, flux density in yoke to be 80 % of flux density in core.	07

OR

Q.5	(a)	Explain Compensating winding.	03
	(b)	Discuss the factors in brief how the number of poles affects the weight of iron and weight of copper in D.C. Machine.	04
	(c)	Determine main dimensions (D and L) of 5 kW, 250 V, 4-pole, 1500 rpm, D.C. Shunt generator if the required data is: Full load efficiency = 87% Pole arc/pole pitch = 0.66 Average flux density = 0.42 Wb/m ² Ampere-conductors per meter = 15000 Machine is designed to have square pole face	07
