Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI(NEW) – EXAMINATION – SUMMER 2019

Subject Code:2160912 Date:10/05/2019

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.**

			MARKS
Q.1	**(a)**	Describe importance of mitered joints in transformer.	**03**
	(b)	Discuss the factors affecting the selection of specific magnetic loading in transformer.	**04**
	(c)	For a transformer show that e.m.f. per turn $Et = k\sqrt{Q}$ where Q = kVA rating. Explain how service condition of transformer affect the value of K.	**07**
Q.2	**(a)**	What is window space factor? On wat factors does it depend?	**03**
	(b)	Show the complete magnetic path in a sketch of 4 pole d.c. machine.	**04**
	(c)	How will the output and losses in a transformer vary with the linear dimensions?	**07**
		OR	
	(c)	Design a 250KVA, 2000/400 Volt, 50 HZ, 1 phase, core type oil immersed self cooled power transformer with following data: Induced emf per turn = 15 Volt Max flux density Bm= 1.2 wb/m^2 Current density= 2.75 A/mm^2 Window space factor = 0.3 Height of the window Hw/ width of window Ww = 3 Assume 3 stepped core and Ai=0.6d^2, a= 0.9d Determine the main dimensions of the core and yoke	**07**
Q.3	**(a)**	Why circular coils are always preferred over rectangular coils for winding a transformer?	**03**
	(b)	Define specific magnetic loading and specific electrical loading in d.c. machine.	**04**
	(c)	Give the important guidelines in selecting no. of poles in d.c. machine design.	**07**
		OR	
Q.3	**(a)**	State the relation between Wight of copper and iron for minimum volume of transformer.	**03**
	(b)	Explain the differences between Power and Distribution transformer.	**04**
	(c)	Give reasons for following: 1)Why are tapping provided on HV winding ? 2) Why cores of transformers are stepped?	**07**

Q.4	**(a)**	Describe any one method to improve commutation in d.c. machine.	**03**
	(b)	Explain different methods of cooling of transformer	**04**
	(c)	What are the types of windings commonly used in transformer and on what basis they are selected?	**07**

OR

Q.4	**(a)**	Explain design of brushes in d.c. machine	**03**
	(b)	Explain No load current calculations for 3 phase transformers.	**04**
	(c)	A 600 kVA , 6600 / 400 V , 50 hz delta-star 3 ph. Core type transformer has the following data: width of h.v. and l.v. winding are 3 cm for both .; Height of H.V.winding and L.V. winding = 40 cm. ; Length of mean turn =1.5 m ; h.v. winding turns =220 ; width of duct between hv and lv winding = 2 cm. Calculate the leakage reactance of the transformer referred h.v. side.	**07**
Q.5	**(a)**	The length of air gap is not uniform under the entire pole face, why it is done in d.c. machine?	**03**
	(b)	Explain the factors affecting for the choice of armature diameter and armature core length in d.c. machine.	**04**
	(c)	Find the suitable no of poles and the diameter of the core of a 400 KW 550 volt , 180 RPM, d.c. generator having 92% efficiency. Assume an average flux density in the air gap of about 0.6 wb/m^2 and ampere conductor per meter to be 35000 and ratio of pole arc/pole pitch =0.7.	**07**

OR

Q.5	**(a)**	Discuss how the size of the core of a d.c. machine depends upon its(i) rating (ii) speed	**03**
	(b)	Write note on selection of number of armature slots in D.C.machine.	**04**
	(c)	Find main dimensions of a 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 ; avg. flux density = 0.42 Wb/m^2.; Ampere conductors / m =15000. Machine is designed with pole arc to pole pitch ratio equal to 0.66.	**07**

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