

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 $E_t = k\sqrt{Q}$ where $Q = \text{kVA}$ rating. Explain how service condition of transformer affect the value of K .	07
OR	
Q.2 (a) What is window space factor? On what 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 $B_m = 1.2 \text{ wb/m}^2$ Current density = 2.75 A/mm^2 Window space factor = 0.3 Height of the window H_w / width of window $W_w = 3$ Assume 3 stepped core and $A_i = 0.6d^2$, $a = 0.9d$ 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 Weight 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/m² 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/m².; Ampere conductors / m =15000. Machine is designed with pole arc to pole pitch ratio equal to 0.66. **07**
