

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VI (NEW) EXAMINATION – WINTER 2023****Subject Code:2160912****Date:02-12-2023****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.
4. Simple and non-programmable scientific calculators are allowed.

		Marks
Q.1	(a) Describe importance of mitered joints in transformer	03
	(b) Define:(1) Specific Electric Loading in DC machines. Also explain factors affecting for selecting it.	04
	(c) Derive the output equation of a 3-phase core type transformer.	07
Q.2	(a) Why stepped core are preferred in transformer design?	03
	(b) Describe any two methods to improve commutation in d.c. machine.	04
	(c) Explain different methods of cooling of transformer	07
	OR	
	(c) Determine the dimensions of core and yoke for a 200 kVA, 50 Hz single phase core type transformer. A cruciform core is used with distance between adjacent limbs equal to 1.6 times the width of core laminations. Assume voltage per turn 14 V, maximum flux density 1.1 Wb/m^2 , Window space factor 0.32, current density 3 A/mm^2 and stacking factor = 0.9. The net iron area is $0.56 d^2$ in a cruciform core where d is the diameter of circumscribing circle. Also the width of largest stamping is $0.85d$.	07
Q.3	(a) Explain: Bracing in transformer winding.	03
	(b) State the relation between Weight of copper and iron for minimum volume of transformer.	04
	(c) Explain in the differences between Power and Distribution transformer.	07
	OR	
Q.3	(a) How to reduce the demagnetizing effect of armature reaction in a D.C. machine?	03
	(b) Explain:(1) Window space factor (2) Stacking factor. Of Transformer.	04
	(c) Give the important guidelines in selecting no. of poles in d.c. machine design	07
Q.4	(a) Derive output equation of a D.C. machine.	03
	(b) Discuss the factors to be considered when selecting a suitable value of core length of a D.C. machine.	04
	(c) A design is required for a 50 kW, 4 pole, 600 r.p.m. D.C. shunt generator, the full load terminal voltage being 220V. If the maximum gap density is 0.83 Wb/m^2 and the armature ampere conductors per meter are 30,000, calculate suitable dimensions of armature core to give a square pole face. 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.	07

OR

- Q.4** (a) Why circular coils are always preferred over rectangular coils for winding a transformer? **03**
(b) Discuss how the size of the core of a d.c. machine depends upon its (i) rating (ii) speed **04**
(c) Give reasons for following: **07**
1) Why are tapping provided on HV winding?
2) Why laminated stampings are used in transformer core?
- Q.5** (a) Define Armature reaction in DC machine. **03**
What effects are on performance of machine?
(b) Show the complete magnetic path in a sketch of 4 pole d.c. machine **04**
(c) Define: (1) Specific Magnetic Loading in DC machines. Also explain factors affecting for selecting it. **07**

OR

- Q.5** (a) Give technical reason for low flux density for yoke of a three-phase transformer. **03**
(b) Explain effect of change in frequency on losses of transformer. **04**
(c) Explain steps to design shunt field winding of a D.C. machine. **07**
