

GUJARAT TECHNOLOGICAL UNIVERSITY**BE – SEMESTER- VII EXAMINATION-SUMMER 2023****Subject Code: 3170909****Date: 30/06/2023****Subject Name: AC Machine Design****Time: 10:30 AM TO 01:00 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) Explain the differences between Power and Distribution transformer.	03
	(b) Prepare a list of class of insulating materials along with their temperature withstand capability and applications	04
	(c) What do you mean by specific electric loading and specific magnetic loading applied to electric machines? State the factors on which the choice of these loadings depends.	07
Q.2	(a) Why tapping is provided on HV winding?	03
	(b) Explain the difference between turbo and hydro alternator from a design point of view.	04
	(c) Derive an output equation for 3- ϕ induction motor with usual notation.	07
	OR	
	(c) Explain various methods of Transformer Cooling.	07
Q.3	(a) What is window space factor? How it varies with KVA and KV rating?	03
	(b) Enlist different types of windings used in transformer design. Explain anyone.	04
	(c) Explain the relation between emf per turn and transformer rating.	07
	OR	
Q.3	(a) Why stepped core is used in transformers?	03
	(b) Give reason: the area of yoke in a transformer is kept 15-20 % more than that of core.	04
	(c) Calculate approximate overall dimensions for a 200 kVA, 6600/440V, 50 Hz, 3 phase core type transformer. The following data may be assumed: emf per turn=10 V maximum flux density=1.3 Wb/m ² , current density=2.5 A/mm ² , window space factor=0.3, overall height=overall width, window area = 5/4 times core area(net area of iron core), stacking factor=0.9. Use a 3 stepped core having Width of largest stamping=0.9d and Net iron area= 0.6d ² , where d=diameter of circumscribing circle.	07
Q.4	(a) Define SCR and its importance in designing of synchronous machine	03
	(b) Explain significance of FEM in design problem	04
	(c) Write the steps and necessary equations for rotor design of a synchronous machine	07

OR

- Q.4** (a) Explain the terms “critical speed” and “runaway speed” with reference to synchronous machine **03**
- (b) Explain application of FEM technique for design problems. **04**
- (c) Explain steps for design of field winding of synchronous machine. **07**
- Q.5** (a) Discuss briefly the harmonic induction torque in 3- ϕ induction motor **03**
- (b) Draw and explain the current distribution waveform spread over one pole pitch in bars and end rings in a squirrel cage induction motor **04**
- (c) Discuss the factors affecting determining air gap length in induction motor design. **07**
- OR**
- Q.5** (a) State the rules for the selection of rotor slots in 3-phase squirrel cage induction motor. **03**
- (b) Give the design difference between squirrel cage and slip ring induction motor. **04**
- (c) Find the main dimensions, number of stator turns per phase & number of stator conductors for a 25KW, 415V, 50Hz, 2880rpm, 3- ϕ delta connected induction motor. Assume that: specific magnetic loading=0.48wb/m², specific electric loading=21000ac/m, Efficiency=88%, power factor=0.87 Machine should be designed for good overall design **07**
