

Seat No.: \_\_\_\_\_

Enrolment No. \_\_\_\_\_

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE- SEMESTER-VII (NEW) EXAMINATION – WINTER 2020****Subject Code:2170909****Date:30/01/2021****Subject Name:Design of AC Machines****Time:10:30 AM TO 12:30 PM****Total Marks: 47****Instructions:**

1. Attempt any **THREE** questions from Q.1 to Q.6.
2. Q7 is compulsory.
3. Make suitable assumptions wherever necessary.
4. Figures to the right indicate full marks.

- Q.1** (a) Explain factors to be considered for selecting specific magnetic loading for 3- phase I. M. **03**
- (b) Sketch the different types of rotor slot in 3 phase I. M.. **04**
- (c) What is dispersion coefficient? How does it affect maximum power? **07**
- Q.2** (a) What is the role of damper winding in synchronous generator and motor? **03**
- (b) Explain step for designing the field winding of Synchronous machine. **04**
- (c) A 1250 kVA, 3 phase, 50 Hz, 3300 V, 300 rpm, synchronous generator with a concentric winding has the following design data: specific magnetic loading,  $B_{av} = 0.58 \text{ Wb/m}^2$ , specific electrical loading,  $a_c = 33000 \text{ A/m}$ , gap length = 5.5 mm, field turn per pole = 60, winding factor = 0.955, short circuit ratio = 1.2, The effective gap area is 0.6 times the actual area. Peripheral speed is 30 m/s. Find stator core length, stator bore, turns per phase, mmf for air gap, armature mmf per pole and field current for no load and rated voltage. **07**
- Q.3** (a) Which factors affecting the size of 3-phase induction motor? Explain in short. **03**
- (b) Briefly discuss factors affecting determining air gap length in induction motor design. **04**
- (c) Which types of slots are used for stator? How the number of slots is estimated? Which point are to be considered for selecting number of stator slots? **07**
- Q.4** (a) State and explain the factor to be considered for selecting specific electrical loading for 3 phase I. M.. **03**
- (b) State the rules for the selection of rotor slots in 3-phase squirrel cage induction motor. **04**
- (c) List out the method for reducing harmonics in induction motor? Explain in brief. **07**
- Q.5** (a) Explain direct axis and quadrature axis synchronous reactance in synchronous machine. **03**
- (b) Explain how mmf is calculated for magnetic circuit in synchronous machine. **04**
- (c) Explain design of damper winding with equation. **07**

- Q.6** (a) Explain the terms “peripheral speed” & “run-away speed” with reference to synchronous machine **03**
- (b) State the important design different between turbo alternators and hydro generators. **04**
- (c) What is SCR? Discuss its effect in synchronous machine performance. **07**
- Q.7** (a) Explain application of FEM technique for design problems. **05**
- OR**
- Q.7** (a) State the procedure of designing an auxiliary winding in case of resistance split phase motor. **05**

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