

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code: 2150904

Date: 17/06/2019

Subject Name: Elements of Electrical Design

Time: 02:30 PM TO 05:00 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) Define: (1) Field form factor (2) Gap contraction factor for slots.	03
	(b) How Magnetizing current is calculated for 3 phase induction motor?	04
	(c) Explain different types of wiring used in Electrical installation?	07
Q.2	(a) Define Real and apparent flux density and write the equation for relation between them.	03
	(b) What is carter's fringing curves? Why it is used?	04
	(c) A 15 kW 230 volt, 4 pole d.c. machine has the following data: armature diameter= 0.25m; armature core length=0.125m, length of air gap at pole centre= 2.5mm, flux per pole = 11.7 mWb, ratio Pole arc/pole pitch = 0.66. Calculate the mmf required for the air gap (i) if the armature surface is treated as smooth ii) if the armature is slotted and gap contraction factor is 1.18.	07
	OR	
	(c) Calculate the mmf required for the air gap of a machine having core length=0.32m, including 4 ducts of 10mm each , pole arc =0.19m, slot pitch = 65.4 mm , slot opening = 5mm, air gap length = 5 mm, flux per pole = 52 mWb. Given Carter's coefficient is 0.18 for slot opening/gap length = 1 , and is 0.28 for duct width/ gap length = 2.	07
Q.3	(a) Classify the various types of a.c. armature windings.	03
	(b) What is the function of field regulator in case of d.c. shunt motor? Explain briefly.	04
	(c) Design a suitable 5 section starter for a 7.5 kW, 250 V, 1000 rpm DC shunt motor from the following data: Maximum starting torque = 1.5 times the full load torque Armature circuit resistance = 0.5 Ω Full load efficiency = 85%	07
	OR	
Q.3	(a) Explain in brief the progressive and retrogressive lap windings.	03
	(b) What is the function of field regulator in case of d.c. shunt generator? Explain briefly.	04
	(c) Find the resistance of each section of a rotor resistance starter of a slip-ring induction motor having a rotor resistance of 0.02 Ω per phase and a full load slip of 3%. Use 9 studs. Assume maximum starting current = Full load current. Also determine the slip at various studs.	07

- Q.4** (a) What is armature winding? Define following term with respect to it (1) Turn (2) Coil (3) Coil side **03**
(b) Define : (1) Coil pitch (2) Commutator pitch (3) Back pitch (4) Front pitch **04**
(c) Find and give comments whether the following wave windings are symmetrical or not: **07**
(i) 4-pole, 25-slots, 2 coil sides per slot
(ii) 4-pole, 14-slots, 2 coil sides per slot

OR

- Q.4** (a) Differentiate between integral and fractional slot windings also state advantages of fractional slot windings. **03**
(b) What do you mean by “dummy coil”? What is its application? Also explain the use of equalizer connections in d.c. armature winding. **04**
(c) Workout an arrangement for equalizer connection for 16 slots, 4 pole, 16 coils simplex lap wound d.c. machine. Use 4 equalizer rings. **07**
- Q.5** (a) State the condition for designing a single layer mush winding. **03**
(b) Explain the importance of current carrying capacity and voltage drop while determine the size of conductor. **04**
(c) Discuss the design procedure of single phase variable choke coil. **07**

OR

- Q.5** (a) What is the purpose of estimating and costing? **03**
(b) What are the factors that should be considered while selecting the type of wiring system? **04**
(c) Define wiring diagram, schematic diagram and single line diagram. Explain using suitable example. **07**
