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: (i) 4-pole, 25-slots, 2 coil sides per slot (ii) 4-pole, 14-slots, 2 coil sides per slot	**07**

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**

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