Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V EXAMINATION – WINTER 2015

Subject Code: 150904 **Date:05/12/2015**

Subject Name: Elements of Electrical Design

Time: 10:30am to 1:00pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	Define real and apparent flux densities in the tooth of a d.c machine armature. Explain difference between them and also derive relation between them.	**07**
	(b)	Find the front pitch, back pitch, winding pitch and commutator pitch for a simplex wave wound 13-slots, 4-pole d.c armature with 13 commutator segments. Draw the winding diagram in developed form. Assume number of coil sides per slot=2.	**07**
Q.2	**(a)**	What is carter's coefficient? How does it help in estimation of mmf in case of slotted armature? What are the expressions to be used for estimation ?.	**07**
	(b)	Determine the air gap length of a D.C machine from the following data: Gross core length= 0.10m, Number of ducts =01, width of duct=10mm, Slot pitch=24mm, slot width =12mm, carter's co-efficient for slots and ducts =0.3, gap flux density at pole centre=0.65T, field MMF per pole=3800A, MMF required for iron parts of magnetic circuit=600A.	**07**
		OR	
	(b)	Derive the steps to calculate the starter resistance for D.C shunt motor.	**07**
Q.3	**(a)**	Define space factor applied to magnetic coil design and how it can be calculated in bedded and unbedded conductors.	**07**
	(b)	The power input to the rotor of 415V, 3-phase slip-ring induction motor is 39kw. the total full load rotor copper losses are 1200W. the rotor resistance per phase is 0.18 ohm. Assume maximum starting current is not to exceed 1.2 times full load current. Workout the steps of a 4 section rotor resistance starter.	**07**
		OR	
Q.3	**(a)**	Name various types of lifting electromagnets commonly used in practice and give comparison between them.	**07**
	(b)	Design a flat-faced armature type of circular electro-magnet having following data: force F=150 Kg, Stroke =0.7 mm , Supply voltage =6 volts, temperature rise 70^0 C above an ambient temperature of 20^oC , Excitation=Continuous.	**07**
Q.4	**(a)**	Explain the following: (1) Load factor (2) Diversity factor (3) Luminous flux (4) Illumination	**07**
	(b)	Design a 10 KVA, 230/50V, 50Hz single phase arc welding transformer.	**07**
		OR	
Q.4	**(a)**	Differentiate between integral and fractional slot windings. also state advantages of fractional slot windings.	**07**

	(b)	What are the requirements for designing welding transformer? Explain V-I characteristic of a welding transformer.	**07**
Q.5	**(a)**	What is electric load ? Give examples and classify different types of load.	**07**
	(b)	A drawing hall 18 m x 9 m with a ceiling height of 4 meters is to be provided with a general illumination of 125 lux. Assuming a co-efficient of utilization 0.4 and depreciation factor of 1.3. determine the number of fluorescent tubes required, their spacing, mounting height and total wattage. Take efficiency of fluorescent tube as 50 lumens/watt for 40 W tube.	**07**

OR

Q.5	**(a)**	Explain the design procedure of a 3-phase variable choke coil.	**07**
	(b)	Design and develop a mush winding for a 4-pole, 36 slots,3-phase stator of AC machine.	**07**

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