		Seat No.: Enrolment No  GUJARAT TECHNOLOGICAL UNIVERSITY  BE - SEMESTER-V • EXAMINATION – WINTER • 2014  Subject Code:150904 Date: 01-12-2014  Subject Name: Elements of Electrical Design  Time: 10.30 am - 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.	
Q.1	(a)	What are the types of iron losses? Explain how they are estimated per unit weight of	07
	(b)	the machine.  Determine the mmf required for the air gap of a machine having following data: core length= 0.3 m including three ducts of 1 cm width each, pole arc = 0.2 m, slot pitch = 6.6 cm, slot opening = 5 mm, flux per pole = 0.05 Wb, length of air gap = 5 mm,  Assume Carter's co efficient of 0.18 and 0.28 for opening/gap of 1 and 2 respectively.	07
Q.2	(a)		07
	(b)	pole double layer lap winding with chorded(Short pitch) coils. For a d.c. series motor starter, with usual notations prove that: $r_m = R_1 \left[ 1 - \left( \frac{1 - \delta^n}{1 - \delta} \right) (\beta - \delta) \right], \text{ where,}$ $r_m = \text{motor resistance,}$	07
		$R_1 = \text{Motor resistance plus total resistance of all starter sections},$ $\alpha = I_2/I_1$ $\beta = \phi_1/\phi_2$ $\delta = \alpha\beta.$ $OR$	
	(b)	The starter of a 460 V d.c. series motor has 5 resistance sections and the current limits during starting are 120 A and 156 A. The resistance of the machine is 0.19 $\Omega$ , and between these current limits the flux changes by 10%. Determine the resistance of each section of starter.	07
Q.3	(a)	Discuss advantages of fractional slot winding. Explain how the slot distribution is	07
	(b)	done for fractional slot winding.  What is Index number of electromagnets? Explain four basic equations used in flat faced armature type circular magnet design.  OR	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)	An electromagnetic coil has an outer diameter of 0.5 m and internal diameter of 0.25 m. Its height is 0.3 m. The outer cylindrical surface of the coil can dissipate 1200 W/m <sup>2</sup> . Determine total mmf of the coil if voltage applied across the coil is 80 V.Assume space factor = 0.6 and resistivity of 0.02 $\Omega/m/mm^2$ .	07
0.4	(a)	Explain clearly how design procedure of a welding transformer differs from the that	07

		of normal single phase transformer.	
	(b)	Discuss the role of equalizer connection in d.c. armature winding.	0
Q.4	(a)	OR Explain the design procedure of a three phase variable choke coil	0
	(b)	Clearly explain the concept of real and apparent flux densities.	0.
Q.5	(a)	What is electric power supply system? With the help of a single line diagram explain typical ac power supply system.	07
	(b)	An illumination of 160 lumens/sqr meter is required in a seminar hall of 30 meter x	07
		35 meter size. Determine no. of lamps of 200 watts are required and their positions. Given:	
		Depreciation factor = $0.75$	
		Co efficient of utilization = $0.5$	
		Waste light factor = 1.25	
		Efficiency of lamp = 16 lumens/watt	
		OR	
Q.5	(a)	Discuss the factors to be considered while selecting the type of wiring system.	07
	(b)	Discuss the significance of	07
		(1) Space height ratio,	
		(2) Utilisation factor,	
		(3) Depreciation factor and	
		(4) Waste light factor	
		In the design of a lighting scheme.	