

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 the machine. 07
- (b) Determine the mmf required for the air gap of a machine having following data: 07
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.

- Q.2 (a) Prepare winding layout for a three phase a.c. machine having 24 armature slots, 4 pole double layer lap winding with chorded(Short pitch) coils. 07
- (b) For a d.c.series motor starter, with usual notations prove that: 07

$$r_m = R_1 \left[1 - \left(\frac{1-\delta^n}{1-\delta} \right) (\beta - \delta) \right], \text{ where,}$$

r_m = motor resistance,

R_1 = 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 0.19Ω , 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 done for fractional slot winding. 07
- (b) What is Index number of electromagnets? Explain four basic equations used in flat faced armature type circular magnet design. 07

OR

- 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^2 . Determine total mmf of the coil if voltage applied across the coil is 80 V. Assume space factor = 0.6 and resistivity of $0.02 \Omega/\text{m/mm}^2$. 07

- Q.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. 07

OR

- Q.4 (a) Explain the design procedure of a three phase variable choke coil.. 07
- (b) Clearly explain the concept of real and apparent flux densities. 07

- 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 35 meter size. Determine no. of lamps of 200 watts are required and their positions. 07
- 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.
