

Seat No: _____

Enrolment No: _____

GUJARAT TECHNOLOGICAL UNIVERSITY
B.E. SEMESTER: V – Examination-Nov/Dec-2011

Subject Code: 150904

Subject Name: Elements of Electrical Design

Date: 29/11/2011

Time: 2.30pm-5.30 pm

Instructions:

Total marks: 70

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

- Q-1 Calculate the front pitch, back pitch and winding pitch for a simplex lap wound 18 slots, 6 pole d.c. armature. Make the winding table and draw the winding diagram in developed form. Also draw the sequence diagram to show the position of brushes. Assume 2 coil sides/slot. 07
- (A)
- (B) Explain the use of dummy coils and equalizer connections in d.c. armature windings. Also explain why equalizer connections are not necessary in case of wave windings? 07

- Q-2 What is Carter's coefficient? How does it help in estimation of mmf in case of a slotted armature? What are the expressions to be used for estimation? 07
- (A)
- (B) Determine the m.m.f. required for the airgap of a machine with open slots from the following particulars: 07
- Slot pitch = 4.3 cm
Slot opening = 2.1 cm
Gross length of core = 48 cm
Pole arc = 18 cm
Airgap length = 0.6 cm
Flux per pole = 0.056 wb
No. of ventilating ducts = 8
Width of each ventilating duct = 1.2 cm

Ratio: slot opening/ gap length	1	2	3	3.4	4
Carter's coefficient	0.15	0.28	0.37	0.41	0.43

OR

- (B) Define real and apparent flux densities in the tooth of d.c. machine armature and give the difference between them. Also derive the relation between them. 07

OR

- Q-3 Discuss the design procedure for the coil of electromagnet. 07
- (A)
- (B) Give complete procedural steps for designing Horse shoe type of electromagnet for a given supply voltage, required force and stroke. 07

OR

- Q-3 Discuss design procedure of single phase small transformer. 07
- (A)
- (B) Design a suitable 8 section starter for a 14.92 kw, 250 volt, 1000 rpm d.c. shunt motor from the following data: 07
- Maximum starting torque = full load torque
Armature circuit resistance = 0.4 ohm
Full load efficiency = 0.85

- Q-4 Design a 10 KVA, 230/50 volt, 50 Hz single phase arc welding transformer. Also 07
 (A) design series reactor for the above transformer.
 (B) Give complete procedural steps for designing single phase variable choke coil for 07
 given supply voltage, airgap variation and current variation.
- OR
- Q-4 Design a mush winding for 24 slots, 3-phase, 4 pole stator of induction motor. 07
 (A) Draw layout of it.
 (B) Differentiate between integral and fractional slot windings also state advantages of 07
 fractional slot windings.
- Q-5 Describe and compare the different systems of wiring used for domestic 07
 (A) installations.
 (B) A middle class gentleman has following in his newly built single story house. 07
 Drawing room, Bed room, Kitchen, Warandah, Reading Room, Kitchen, Bath
 room, Toilet and some open space at the back. Carry out the approximate load
 assessment and determine the number of power and control circuit.
- OR
- Q-5 What is electric load? Giving examples classify different types of load. 07
 (A)
 (B) The domestic load in residential building is used in the following manner: 07
 Fluorescent lamps 55 watt each, 4 Nos. 6 Hrs/day
 Fans 70 watt each , 4 Nos. 8 Hrs/day
 Refrigerator of 300 watt, 12 Hrs/day
 Heater of 1000 watt, 2 Hrs/day
 Television of 150 watt, 8 Hrs/day
 Calculate : (a) connected load and (b) daily load factor