

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-V • EXAMINATION – WINTER 2013

Subject Code: 150904**Date: 02-12-2013****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) Explain the design procedure to design a field regulator to change the Emf generated in a self excited dc generator. **07**
- (b) Design and develop a mush winding for a stator of 3-phase A.C machine having 4 pole and 36 slots. **07**

- Q.2** (a) A laminated iron cylinder is rotated in a uniform magnetic field. The iron loss is 240 watt at 600 rpm and 300 watt at 700 rpm. Separate hysteresis and eddy current loss at both the speeds. Also calculate the hysteresis loss at 700 rpm and 25% more stronger field. **07**
- (b) Explain with neat sketch power and control circuit of Direct On Line Starter. **07**

OR

- (b) 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**
- Q.3** (a) An electromagnet coil has an outer diameter of 0.6 m and an internal diameter of 0.3 m. Its length is 0.25m. The outer cylindrical surface of the coil can dissipate 1200 Watt/m². Calculate the total mmf of coil if voltage applied across the coil is 100 V. Assume space factor 0.6, Resistivity 0.02ohm/m/m². **07**
- (b) Discuss step by step complete procedure to design a horse shoe type electro-magnet for a given supply voltage, required force and stroke. **07**

OR

- Q.3** (a) Name various types of lifting electromagnets commonly used in practice and give comparison 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 winding diagram in developed form. Assume no. of coil side/slot = 2. **07**
- Q.4** (a) Calculate the steps in a 4 section rotor resistance starter for a 3-phase slip-ring induction motor having full load slip 2.5%, maximum starting current =full load current and rotor resistance/phase 0.02 Ω. **07**
- (b) Which are the types of wiring system? Explain any three of them in brief. **07**

OR

- Q.4** (a) Explain the design procedure for electrification of a small industry having a load of about 50 KW and a shade area of about 1100 m². **07**
- (b) Design a 10 KVA, 230/50 volt, 50 Hz single phase arc welding transformer. Also design series reactor for the above transformer. **07**
- Q.5** (a) Give the design steps for single phase variable chock coil. **07**

- (b) Determine the critical value of the flux density and the mmf requirement in a variable airgap choke coil to operate at 240 volts, 50hz. A.C supply and to carry a rated current of 10 amps. The length of the airgap varying from 0 to 50mm. **07**

OR

- Q.5** (a) Describe at least two important components of a simple control panel for a three Phase induction motor. **07**
- (b) A drawing hall 18m x 9m with a ceiling height of 4 m is to be provided with a general illumination of 125 lux. Assuming a co-efficient of utilization of 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 40watt tube. **07**
