

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-V • EXAMINATION – SUMMER 2013****Subject Code: 150904****Date: 20-05-2013****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) 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) Calculate the front, back, winding and commutator pitches for the following wave windings having **07**
- (1) 15 slots, 4-pole, 2 conductors/slot
 - (2) 32 slots, 6-pole, 2 conductors/slot

- Q.2** (a) Differentiate clearly between a mush winding and a double layer winding for three phase a.c.machine. **07**
- (b) An electromagnet coil has an outer diameter of 0.6 m and an internal diameter of 0.3 m. its height is 0.25 m. the outer cylindrical surface of the coil can dissipate 1200 watt/ m². Calculate the total mmf of the coil if voltage applied across the coil is 100 Volt. Assume space factor = 0.6, Resistivity = 0.02 ohm/m/mm². **07**

OR

- (b) 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**
- Q.3** (a) Grade the resistance of a 5 section starter for a 3.7 KW, 250 V, 1000 rpm D.C. shunt motor from the following data. **07**
- Maximum torque at starting = 1.5 times full load torque, full load efficiency = 0.82 , Armature circuit resistance = 1 Ω , field current = 1.2 Amp.
- (b) Discuss design procedure of single phase small transformer. **07**

OR

- Q.3** (a) Explain the design procedure to design a field regulator to change the Emf generated in a self excited DC generator. **07**
- (b) Discuss the design procedure of 3-phase variable choke coil. **07**

- Q.4** (a) Give complete procedural steps for designing Horse shoe type of electromagnet for a given supply voltage, required force and stroke. **07**
- (b) Explain the design procedure for electrification of a small industry having a load of about 50 kw and a shade area of about 1000 metre². **07**

OR

- Q.4** (a) Determine the airgap length of a D.C.machine from the following data. **07**
- Gross core length = 0.10 m , number of ducts = 01, width of duct = 10 mm, slot pitch = 24mm, slot width = 12mm, carter's coefficient for slots and ducts = 0.3, gap flux density at pole centre = 0.65 T, field MMF per pole = 3800 A, MMF required for iron parts of magnetic circuit = 600 A.

- (b) Name various types of lifting electromagnets commonly used in practice and give comparison between them 07
- Q.5** (a) Describe and compare the different system of wiring used for domestic installations. 07
- (b) The domestic load in residential building comprises of the following : 07
6 lamps of 55 watt each, 4 fans of 80 watt each, 1 refrigerator of 300 watt, 1 heater of 1000 watt, Television of 120 watt. Calculate
(1) The total current taken from the supply at a voltage of 230 volts
(2) The energy consumed in a day, if on average only a quarter of the above load persists all the time.
- OR**
- Q.5** (a) A drawing hall 18 m X 9 m with a ceiling height of 4 metres 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 40 watt tube. 07
- (b) What is electric load ? Giving examples classify different types of load. 07
