

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**BE – SEMESTER – V (NEW) EXAMINATION – WINTER 2015**

**Subject Code: 2150904**

**Date: 14/12/ 2015**

**Subject Name: Elements Of Electrical Design**

**Time: 10:30am to 1:00pm**

**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) Calculate the front pitch, back pitch and winding pitch for a simplex lap wound 16 slots, 4 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**
- (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** (a) A salient pole dc machine has a core length of 0.32m including four ducts of 10 mm each, Pole arc 0.19 m, slot pitch 65.4 mm, slot opening 5 mm, air gap length 5 mm, and a flux per pole 52 mWb. Assume Carter's coefficient of 0.18 for opening/gap = 1 and 0.28 for opening/gap = 2, calculate the mmf required for the airgap. **07**
- (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**
- (b) Explain various methods for calculating the mmf required for tapered teeth. **07**
- Q.3** (a) Calculate the steps in a 4 section rotor resistance starter for a 3-phase slipring induction motor having full load slip 2.5%, maximum starting current = full load current and rotor resistance/phase 0.02 ohm. **07**
- (b) Derive the steps for calculate the starter resistance for D.C shunt motor. **07**
- OR**
- Q.3** (a) Write all steps to estimate the total cost of electric wiring installation for Building. **07**
- (b) A small room of size 4 m X 3 m is required to be provided with lamp, fan, tube light and one 5A 3-pin socket outlet. Each of the points is controlled with their respective switches installed in one switch board. Assumes in PVC wiring system. No main switch is to be provided as the entry of the sub-circuit is from nearby room. **07**
- Do the following:
- (1) Mark the location of electrical points and draw the installation plan.
- (2) Draw the wiring and schematic diagram.
- (3) Calculate the length of PVC conduit.
- Q.4** (a) Give the design steps for three phase variable chock coil. **07**
- (b) Explain with neat sketch power and control circuit of Direct On Line Starter. **07**
- OR**
- Q.4** (a) Give design steps for small 1-  $\Phi$  transformer. **07**
- (b) Give the design steps for single phase variable chock coil. **07**

- Q.5 (a)** Explain with neat sketches, the different systems of wiring used for domestic installations. **07**
- (b)** A residential building has following load connected in it. **07**
- Incandescent lamps 100W each, 02 Nos. 6hrs/day  
Fluorescent lamps 40W each, 04 Nos. 6hrs/day  
Fans 60W each, 06 Nos. 5hrs/day  
Electric cooker 1.5 KW each, 01 Nos. 4hrs/day  
Electric geyser 1 KW each, 01 Nos. 3hrs/day  
Calculate the total cost of electrical energy for 30 days, at the rate of Rs. 3 per unit.

**OR**

- Q.5 (a)** Explain the load assessment and permissible voltage drop for electrical installation. **07**
- (b)** Discuss briefly the different types of loads. Give examples. **07**

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