Seat No.: _____ Enrolment No._____

# GUJARAT TECHNOLOGICAL UNIVERSITY

**PDDC - SEMESTER–V • EXAMINATION – SUMMER • 2014**

**Subject Code: X 50902** **Date: 29-05-2014**

**Subject Name: Elements of Electrical Design**

**Time: 02:30 pm - 05:00 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)** With neat sketch explain power and control circuit diagram of a DOL starter. **07**

**(b)** Discuss advantages of fractional slot windings. **07**

**Q.2** **(a)** Prepare winding layout for a d.c. machine having 24 armature slots, 4 pole simplex lap winding. **07**

**(b)** Design a suitable 6 section starter for a 25 kW , 220 volt, 1000 rpm d.c.shunt motor. **07**

Given:
Max torque = Full load torque.
Armature resistance 0.55 ohm.
Efficiency = 88%.
Also determine the speeds at which notching takes place.

**OR**

**(b)** With suitable diagram explain the terms with respect to d.c. armature winding. **07**

(1) Back pitch
(2) Front pitch
(3) Winding pitch
(4) Commutator pitch

**Q.3** **(a)** What is Carter's fringing curves? Discuss its application. **07**

**(b)** Explain following terms: **07**

(1) Carter's co efficient
(2) Stacking factor
(3) Gap contraction factor
(4) Field form factor

**OR**

**Q.3** **(a)** Derive an expression of reluctance of an air gap in d.c. machine. Explain clearly the effects of (1)Slotting and (2) Ventilating ducts. **07**

**(b)** Determine the maximum MMF that can be produced by exciting coil of an electromagnet requiring to dissipate 7 kW . **07**

Given:
Length of mean turn = 2.2 m
Winding area =( 0.3 x 0.25)sqr meter
Space factor = 0.55
Resistivity = 0.023 ohm/m/sqr mm.

**Q.4** **(a)** Explain design procedure of a small single phase transformer. **07**

**(b)** Explain concept of real and apparent flux densities. **07**

**OR**

**Q.4** **(a)** Explain the design procedure of a single phase variable choke coil. **07**

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|---|---|---|---|
| | **(b)** | Discuss various types of lifting electromagnets used in practice and give comparison between them. | **07** |
| **Q.5** | **(a)** | Compare different types of domestic wiring systems. | **07** |
| | **(b)** | Explain the design procedure of electrification of a small industrial shade having a load of about 80 kW and shade area of 1000 square meters. | **07** |

**OR**

| | | | |
|---|---|---|---|
| **Q.5** | **(a)** | What is electric load? Classify them by giving suitable example. | **07** |
| | **(b)** | A building is being supplied with power at a 230 V. The load consists of 150 fluorescent tubes of 40 W each , 50 lamps of 60 watts each and 60 fans of 70 W each. Determine the total load and the current taken by the load assuming an average power factor of 0.7(lag) | **07** |

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