# GUJARAT TECHNOLOGICAL UNIVERSITY
### BE - SEMESTER–V (Old) EXAMINATION – WINTER 2019

**Subject Code: 150904**                                              **Date: 02/12/2019**
**Subject Name: Elements Of Electrical Design**
**Time: 10:30 AM TO 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)** What are the functions and necessity of a starter for DC and AC motors. State different types of starters used in AC and DC motors.  **07**

**(b)** What is armature winding? Define following terms for it: Turn, Coil,Coil side, Single Layer Winding, Double Layer winding  **07**

**Q.2** **(a)** Draw main circuit and control circuit of star delta starter for 3 phase squirrel cage induction motor.  **07**

**(b)** Prove that the section resistances of DC shunt motor starters are in geometrical progression.  **07**

**OR**

**(b)** Design a suitable 8 sections starter for a 20 hp, 250 V, 1000 rpm DC shunt motor from the following data:  **07**
Max. Torque= full load torque, Armature resistance= 0.4Ω,  Efficiency=.85%,.

**Q.3** **(a)** Explain the terms: Field Form Factor, Carter's Coefficient, Staking Factor, Gap Contraction Factor.  **07**

**(b)** Explain various methods for calculating the mmf required for tapered teeth.  **07**

**OR**

**Q.3** **(a)** Discuss step by step procedure to design horse shoe type electromagnet for a given supply voltage, required force and stroke.  **07**

**(b)** Name various types of lifting electromagnets commonly used in practice and give comparison between them.  **07**

**Q.4** **(a)** Draw the winding diagram of a DC machine with 4 poles, 14 slots, progressive double layer lap winding. Show the position of brushes.  **07**

**(b)** Explain how the induced emf in stator winding of an AC machine is affected by Pitch Factor and Distribution Factor.  **07**

**OR**

**Q.4** **(a)** Explain design procedure of small transformer in steps.  **07**

**(b)** Prove that for a given variable choke coil, flux linkages remain constant with constant supply voltage and frequency. Also explain how variable inductance is obtained by varying air gap. State assumptions made if any.  **07**

**Q.5** **(a)** It is required to provide illumination of 120 lumens/m$^2$ in a factory hall 30m*10m . Assume that the depreciation factor is 0.8, coefficient of utilization= 0.5, waste light factor=1.2 and efficacy of lamp is 15 lumens. Calculate number of lamps and their disposition.  **07**

**(b)** What do you mean by service connection. Give its types. Explain any two types.  **07**

**OR**

**Q.5** **(a)** Which are types of wiring system? Explain any three of them.  **07**

**(b)** Explain with neat sketch power and control circuit of Direct On line Starter.  **07**

************