

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-V (NEW) EXAMINATION – WINTER 2017

Subject Code: 2150904

Date: 28/11/2017

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 is the necessity of starter in DC motors and Induction motors? **03**
 - (b) Derive an expression for gap contraction factor in electrical machines. **04**
 - (c) Determine the mmf required for the air gap of a DC machine having following data: **07**
Core length=0.32 m including 4 ducts of 10 mm each, pole arc=0.19 m, slot pitch=65.4 mm, slot opening=5 mm, flux per pole=52 mWb. Given Carter's coefficient is 0.18 for opening/gap=1 and 0.28 for opening /gap=2.
- Q.2**
- (a) Give the classification of insulating materials on the basis of maximum permissible temperature rise. **03**
 - (b) Describe how we can calculate the magnetizing current in a transformer having concentrated windings. **04**
 - (c) State and explain various methods for calculating mmf required for the tapered teeth. **07**
- OR**
- (c) Explain the grading of starting resistance for DC Shunt motor starters. **07**
- Q.3**
- (a) Define the following terms used in armature winding design: **03**
(1) back pitch (2) front pitch (3) winding pitch
 - (b) Explain the working of three point starter with neat sketch for DC Shunt motor. **04**
 - (c) The power input to the rotor of 415 V, 3-phase slip-ring induction motor is 39 KW. The total full load rotor copper losses are 1200 W. The rotor resistance per phase is 0.18Ω . Assume maximum starting current is not to exceed 1.2 times full load current. Work out the resistance steps of a 4 section rotor resistance starter. **07**
- OR**
- Q.3**
- (a) What do you mean by short-pitched winding? Explain its advantages. **03**
 - (b) Give the comparison of simplex lap and simplex wave windings. **04**
 - (c) Design a mush winding for 3-phase, 4-pole and 24 slots stator. Also show winding diagram for phase R only. **07**
- Q.4**
- (a) Explain with neat sketch the power and control circuit of direct on line starter. **03**
 - (b) Explain the following terms related to AC winding: **04**
(1) Pitch factor (2) distribution factor
 - (c) Give the design steps for small single phase transformer. **07**
- OR**
- Q.4**
- (a) Give the classification of electrical loads with examples. **03**

	(b)	The domestic load in residential building is used in the following manner: Fluorescent lamps:40 W each,5Nos.,5 Hrs/day Fans 70W each,5 Nos,10 Hrs/day Refrigerator of 225 W,12 Hrs/day Heater of 1000 W,1Hr/day Television of 150 W,6 Hrs/day Calculate: (a) connected load (2) daily load factor.	04
	(c)	Give the design steps for three phase variable choke coil.	07
Q.5	(a)	Discuss briefly how we can determine the number of sub circuits, rating of main switch and distribution boards?	03
	(b)	State the rules for electrical wiring as per IS.	04
	(c)	Which are the types of wiring system? Explain any three of them.	07
		OR	
Q.5	(a)	Give the definition of the following terms with respect to load assessment: (1) demand factor (2) load factor (3) diversity factor	03
	(b)	Explain the function of field regulators in DC Shunt motors and DC Shunt generators.	04
	(c)	A small room of size 4m X 3m 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. Assume PVC wiring system. No main switch is to be provided as the entry of the sub-circuit is from the nearby room. Do the following: (1) Mark the suitable location of the electrical points in the room and draw the installation plan. (2) Draw the wiring and schematic diagram. (3) Calculate the length of PVC conduit pipe required.	07
