

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- SEMESTER- VI EXAMINATION – SUMMER 2026****Subject Code:3160918****Date:29-05-2026****Subject Name: Element 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.
4. Simple and non-programmable scientific calculators are allowed.

		MARKS
Q.1	(a) Define the real and apparent flux densities in the tooth of d.c machine armature.	03
	(b) List various methods for calculating the mmf required for tapered teeth & Explain any one.	04
	(c) Determine the air gap length of DC Machine from the following data: Gross core length=0.1 meter, Number of ducts=1, Width of duct=10 mm, Slot pitch= 24 mm, Slot Width= 12mm, Carter's coefficient for slots and ducts=0.3, Gap flux density at pole center=0.65 T, Field MMF per pole=3800 A, MMF required for iron parts of magnetic circuit= 600 A.	07
Q.2	(a) Define the following terms used in armature winding design: (1) back pitch (2) Commutator pitch (3) Front pitch	03
	(b) Give the comparison between Lap winding and Wave winding.	04
	(c) Find the front pitch, back pitch, winding pitch and commutator pitch for a simplex wave wound 13 slots, 4-pole d.c. armature with 13 commutator segments. Draw the winding diagram in developed form. Also draw the sequence diagram to indicate the position of brushes. Assume number of coil sides per slot=2.	07
	OR	
	(c) Design a mush winding for 3-phase, 4-pole and 36 slots stator. Also show winding diagram for R phase.	07
Q.3	(a) What is soft starter? What are the advantages of soft starter?	03
	(b) Explain working of No Volt Coil and Overload Release coil in terms of three point starters for DC motor.	04
	(c) Explain design procedure of a small single phase transformer.	07
	OR	
Q.3	(a) Discuss function & necessity of field regulator in case of DC shunt Generators.	03
	(b) Explain the working of 4- point starter with neat sketch for DC motor.	04
	(c) Calculate the steps in a 4 section rotor resistance starter for a 3 phase slip-ring induction motor from the following data: Full load slip = 2.5%, maximum starting current = Full load current, Rotor resistance per phase = 0.02 ohm.	07

- Q.4 (a)** Write steps to estimate the cost of electrical wiring installation for building. **03**
- (b)** Define wiring diagram and schematic diagram. Draw a wiring diagram and schematic for light and fan circuit. **04**
- (c)** 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. Assume 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:
- (i) Mark the location of electrical points and draw the installation plan.
 - (ii) Draw the wiring and schematic diagram.
 - (iii) Calculate the length of phase and neutral wire required for the wiring installation.
 - (iv) Calculate the length of earth wire required.

OR

- Q.4 (a)** How can you determine the number of sub circuits, rating of main switch and distribution board? **03**
- (b)** State the rules for electrical wiring as per IS. **04**
- (c)** Explain the installation plan, wiring diagram and single line diagram for electric wiring based on a given load. Also give the rules for deciding the number of sub circuits and power circuit. **07**
- Q.5 (a)** Explain the importance of (a) current carrying capacity and (b) voltage drop while determining the size of conductor. **03**
- (b)** What is control panel? State and explain the various components/devices used in the control panel. **04**
- (c)** The domestic load in a residential building is used in the following manner: **07**
- (i) LED tubes 18W each, 04 Nos., switched on for 6 hours/day
 - (ii) LED lamps 07W each, 04 Nos., switched on for 2 hours/day
 - (iii) Ceiling fans 60W each, 04 Nos., switched on for 08 hours/day
 - (iv) Air conditioner (1.5T) 1500W, switched on for 04 hours/day
 - (v) Refrigerator of 300W, switched on for 12 hours/day
 - (vi) Television 100 W, switched on for 12 hours/day
- Calculate (a) connected load (b) Total cost of electrical energy for 30 days at the rate of Rs. 5/Unit.

OR

- Q.5 (a)** Which materials are required for installation of service connection? **03**
- (b)** Why AC system is preferred over DC system for transmission and distribution of electrical energy? **04**
- (c)** What is electric power supply system? With help of a single line diagram explain typical ac power supply system. **07**
