Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– VI (NEW) EXAMINATION – WINTER 2021

Subject Code:3160918 Date:02/12/2021

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)**	Classify insulating materials on the basis of maximum permissible temperature rise.	**03**
	(b)	Derive the equation of gap contraction factor for slots.	**04**
	(c)	Describe design steps for small single phase transformer.	**07**
Q.2	**(a)**	Define the following terms used in armature winding design: (1) Coil span, (2) Pole pitch (3) front pitch	**03**
	(b)	Describe the field control method and its application for DC shunt generator and DC shunt motor.	**04**
	(c)	Design a mush winding for 3-phase, 4-pole and 24 slots stator. Also show winding diagram for R phase.	**07**
		OR	
	(c)	Calculate the Front pitch, back pitch, winding pitch and Commutator pitch for a simplex lap wound 16 slots, 4-pole DC armature. Make the winding table and 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**
Q.3	**(a)**	Write steps to estimate the total cost of electrical wiring installation for building.	**03**
	(b)	Justify the use of dummy coils and equalizer connections in DC armature windings.	**04**
	(c)	Determine the MMF required for the airgap of a machine with open slots from the following particulars: Slot pitch= 4.3 cm, Slot opening= 2.1 cm, Gross length of core= 48 cm, Pole arc= 18 cm, Airgap length= 0.6 cm, Flux per pole= 0.056 wb, No. of ventilating ducts= 8, Width of each ventilating ducts= 1.2 cm	**07**

Slot opening/Gap length	1	2	3	3.4	4
Carter's coefficient	0.15	0.28	0.37	0.41	0.43

OR

Q.3	**(a)**	Discuss the necessity of starter in DC motors and Induction motors.	**03**
	(b)	Find whether the following wave windings are symmetrical or not: (i) 4-pole, 25 slots, 2 coil sides/slot (ii) 4-pole, 14 slots, 2 coil sides/slot	**04**
	(c)	Define real and apparent flux densities in the tooth of DC machine armature and give the difference between them. Also derive the relation between them.	**07**
Q.4	**(a)**	Describe how to calculate the magnetizing current in a machine with distributed winding.	**03**
	(b)	Compare Simplex lap winding & Simplex wave winding.	**04**

	(c)	Explain the grading of starting resistance for DC Series motor starters.	**07**

OR

Q.4	**(a)**	Explain working of No Volt Coil and Overload Release coil in terms of three point starters for DC motor.	**03**
	(b)	Discuss the factors considered for selection of type of electrical wiring.	**04**
	(c)	Design a suitable 8 section starter for a 14.92 kw, 250 V, 1000 rpm D.C. shunt motor from the following data: Maximum starting torque = Full load torque, Armature circuit resistance = 0.4 ohm, Full load efficiency = 0.85	**07**
Q.5	**(a)**	State and explain methods for calculating MMF required for tooth in DC machine.	**03**
	(b)	Explain the working of auto transformer starter with neat sketch for squirrel cage induction motor.	**04**
	(c)	Give the design steps for three phase variable chock coil.	**07**

OR

Q.5	**(a)**	Discuss the significance of (i) Space to height ratio (ii) Utilization factor and (iii) Depreciation factor in the design of lighting system.	**03**
	(b)	Discuss briefly the different types of loads with examples.	**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. 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 winding installation. (iv) Calculate the length of earth wire required.	**07**

****

Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (NEW) EXAMINATION – SUMMER 2022

Subject Code:3160918 Date:08/06/2022

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)**	Give the comparison between Lap winding and Wave winding.	**03**
	(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?	**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**
Q.2	**(a)**	Define the real and apparent flux densities in the tooth of d.c machine armature.	**03**
	(b)	Give the classification of insulating materials used in electrical machines based on their thermal stability as per IS along with examples.	**04**
	(c)	Explain various methods for calculating the mmf required for tapered teeth.	**07**
		OR	
	(c)	Determine the air gap length of a D.C. machine for following data. gross core length=0.10m, no of ducts=01, width of duct=10mm, slot pitch=24mm, slot width=12mm, caters coefficient for slot and ducts=0.3, gap flux density at pole centre=0.65wb/m^2, field MMF per pole=3800A, mmf required for iron part of magnetic circuit=600A.	**07**
Q.3	**(a)**	Write a short note on field regulator.	**03**
	(b)	Explain the working of star delta starter with neat sketch for squirrel cage induction motor.	**04**
	(c)	Prove that the section resistances of d.c. shunt motor starters are in geometrical progression.	**07**
		OR	
Q.3	**(a)**	Draw different types of stampings used for making the core of 1-Ø transformer.	**03**
	(b)	What is choke coil? State the function of chokes used in Tube-lights.	**04**
	(c)	Give the design steps for designing the single phase transformer.	**07**
Q.4	**(a)**	Explain the factors to be considered while selecting the type of wiring.	**03**

	(b)	Explain the load assessment and permissible voltage drop for electrical installation.	**04**
	(c)	A 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. 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.	**07**
		OR	
Q.4	**(a)**	Discuss in brief points to be considered while determination of the size of conductor.	**03**
	(b)	Discuss the rules for electrical wiring as per IS standard.	**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)**	Why AC system is preferred over DC system for transmission and distribution of electrical energy?	**03**
	(b)	What is control panel? State and explain the various components/devices used in the control panel.	**04**
	(c)	Find the diversity factor of a power station which supplies the following loads: Load A : Motor load of 150 KW between 10 a.m. to 7 p.m. Load B : Lighting load of 50 KW between 7 p.m. to 11 p.m. Load C : Pumping load of 60 KW between 3 p.m. to 10 a.m.	**07**
		OR	
Q.5	**(a)**	Define load factor, demand factor and diversity factor	**03**
	(b)	What is electric load? Giving examples classify different types of load.	**04**
	(c)	Explain with neat sketches, the different systems of wiring used for domestic installations.	**07**

****