Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III (NEW) EXAMINATION – SUMMER 2021

Subject Code:2130904 Date:16/09/2021

Subject Name:DC Machines and Transformer

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: (i) pole pitch, (ii) distribution factor and (iii) Pitch factor.	**03**
	(b)	Write short note on auto transformer.	**04**
	(c)	Explain working principle of dc generator.	**07**
Q.2	**(a)**	What is the necessity of starter in a dc motor?	**03**
	(b)	Explain four-point starter for dc motor in brief.	**04**
	(c)	Explain different parts of dc machine.	**07**
		OR	
	(c)	List different methods of speed control of dc shunt motor. Explain any one method in detail.	**07**
Q.3	**(a)**	Explain critical field resistance of dc shunt generator with its significance.	**03**
	(b)	Explain process of commutation.	**04**
	(c)	A four-pole, long-shunt lap-wound generator supplies 25 kW at a terminal voltage of 500 V. The armature resistance is 0.03 Ω, series field resistance is 0.04 Ω and shunt field resistance is 200 Ω. The total brush drop is 2.0 V. Determine the e.m.f. generated. Calculate the number of conductors if the speed is 1200 rpm and flux per pole is 0.02 weber. Neglect armature reaction.	**07**
		OR	
Q.3	**(a)**	Write applications of dc shunt and series Motor.	**03**
	(b)	Explain Hopkinson's test of dc motor.	**04**
	(c)	A 200 V dc shunt motor running at 1000 rpm takes an armature current of 17.5 A. It is required to reduce the speed to 600 rpm. What must be the value of resistance to be inserted in the armature circuit if the original resistance is 0.4 Ω? Take armature current to be constant during this process. Ignore brush voltage drop.	**07**
Q.4	**(a)**	State various losses which take place in a transformer. On which factors do they depend?	**03**
	(b)	Explain Sumpner's test of transformer.	**04**
	(c)	In no-load test of a single-phase transformer, the following test data were obtained: Primary voltage = 220 V: Secondary Voltage = 110 V; Primary current = 0.5 A; Power input = 30 W. Find: (i) the turns ratio, (ii) the magnetizing component of no-load current, (iii) the working component of no-load current and (iv) the iron loss. Resistance of the primary winding is 0.6 Ω.	**07**
		OR	

Q.4	**(a)**	Derive the condition for maximum efficiency of a transformer.	**03**
	(b)	Explain polarity test of transformer.	**04**
	(c)	A 10 kVA, 500/250 V, single-phase transformer has its maximum efficiency of 94% when delivering 90% of its rated output at unity power factor. Estimate its efficiency when delivering its full-load output at power factor of 0.8 lagging.	**07**
Q.5	**(a)**	Compare current transformer and potential transformer.	**03**
	(b)	Explain the no-load operation of transformer with vector diagram.	**04**
	(c)	Derive the expression for voltage regulation of a transformer on lagging and leading power factor loads.	**07**

OR

Q.5	**(a)**	Derive e.m.f. equation of single-phase transformer.	**03**
	(b)	State any four conditions of parallel operation of transformer.	**04**
	(c)	Explain Scott connection of transformer.	**07**

****