Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–IV (NEW) EXAMINATION – SUMMER 2022

Subject Code:3140913   **Date:29-06-2022**
Subject Name:Electrical Machine- I
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)**	Distinguish between linear & non-linear magnetic circuit.	**03**
	(b)	Derive an expression for the EMF of DC generator.	**04**
	(c)	Describe the performance of a transformer with the help of open circuit & short circuit test.	**07**
Q.2	**(a)**	What is the significance of back EMF in a DC motor?	**03**
	(b)	Give a comparison of an auto transformer with a two winding transformer.	**04**
	(c)	Explain the flow of energy in electromechanical devices for motoring action & generating action with necessary block diagram.	**07**
		OR	
	(c)	A 4-pole DC shunt generator with a shunt & armature resistances of 100 Ω & 1 Ω respectively .It has 378 wave connected conductors in its armature. The flux/pole is 20mwb.If a load resistance of 10 Ω is connected across armature terminals the generator is driven at 1050rpm. Estimate the power absorbs by the load.	**07**
Q.3	**(a)**	Explain the magnetization curve of ferromagnetic material.	**03**
	(b)	What is armature reaction in DC generators? Explain in brief.	**04**
	(c)	Explain the Hopkinson's test with circuit diagram. Also write its merits & demerits.	**07**
		OR	
Q.3	**(a)**	Derive an expression for energy stored in the magnetic field.	**03**
	(b)	Explain singly excited magnetic system.	**04**
	(c)	Explain the step by step voltage build-up process of self excited DC shunt generator with necessary characteristics. Also list the conditions for voltage build-up.	**07**
Q.4	**(a)**	State the application of various types of motors.	**03**
	(b)	What is the necessity of starter in a DC motor, explain in brief.	**04**
	(c)	A shunt generator deliver 195A at 250V, the armature and shunt field resistances are 0.02 Ω and 50 Ω respectively. The iron and friction losses are 950W.Compute (1) generated emf (2) Total copper loss, (3) Mechanical efficiency, electrical efficiency and total efficiency.	**07**
		OR	
Q.4	**(a)**	Explain the conditions for parallel operation of DC Generators.	**03**
	(b)	Differentiate armature control method, voltage control method and field flux control method.	**04**
	(c)	A DC shunts motor drive a centrifugal pump whose torque varies as the square of the speed. Motor is feed from 200V DC supply and takes 50A,	**07**

when running at 1000rpm .What resistance must be inserted in the armature circuit to reduce the speed to 800rpm. Take armature and field resistances are 0.1Ω and 100 Ω respectively.

Q.5	**(a)**	Derive an expression for maximum efficiency of a transformer.	**03**
	(b)	Explain different types of losses in Transformer.	**04**
	(c)	Explain the transformer ''ON Load''. Draw the vector diagram to represent a load at UPF, lagging and leading power factor.	**07**

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OR

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Q.5	**(a)**	Briefly discuss the polarity test of a single phase transformer.	**03**
	(b)	A 40 KVA, single phase transformer has 400 turns on primary & 100 turns on secondary. The primary is connected to 2000 V, 50 Hz supply. Determine :(i) The secondary Voltage on open circuit. (ii)The maximum value of flux.	**04**
	(c)	Draw and explain the winding connections and vector diagram for Scott (T-T) connection. Also derive the utilization factor.	**07**

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