GUJARAT TECHNOLOGICAL UNIVERSITY
BE- SEMESTER–IV (NEW) EXAMINATION – WINTER 2020

Subject Code: 3140913   **Date: 15/02/2021**
Subject Name: Electrical Machine- I
Time: 02:30 PM TO 04:30 PM   **Total Marks: 56**

Instructions:
1. **Attempt any FOUR questions out of EIGHT questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

			Marks
Q.1	**(a)**	What is tap changing? Why is it required?	**03**
	(b)	Distinguish between singly excited and doubly excited magnetic systems.	**04**
	(c)	Sketch diagram of 3 point starter and explain working.	**07**
Q.2	**(a)**	Why Secondary of current transformer should not be open?	**03**
	(b)	What is the necessity of starter in a DC motor?	**04**
	(c)	Define Pitch Factor and Distribution factor. Enlist advantages and disadvantages of short pitch or fractional pitch coil.	**07**
Q.3	**(a)**	Derive the EMF equation of a DC generator from first principle.	**03**
	(b)	Mention the conditions for satisfactory parallel operation of three phase transformers.	**04**
	(c)	Explain the procedure and calculations for Field test on identical DC series machines.	**07**
Q.4	**(a)**	Derive the equation of pitch factor for short pitch coil.	**03**
	(b)	Draw the vector diagram of a transformer on load. Consider the winding resistances, leakage reactance and no load losses.	**04**
	(c)	Draw and explain internal and external characteristics of dc series generator.	**07**
Q.5	**(a)**	Describe function of compensating winding.	**03**
	(b)	Draw the schematic diagrams and explain the winding connections for the short shunt and long shunt compound generators.	**04**
	(c)	Enlist different speed control methods of DC shunt motor. Explain any one method.	**07**
Q.6	**(a)**	State advantages and disadvantages of Swinburne's test.	**03**
	(b)	Define armature reaction. Explain cross magnetizing and demagnetizing effects of armature reaction in brief.	**04**
	(c)	Explain the direct load test for determination of voltage regulation and efficiency of transformer with necessary diagram.	**07**
Q.7	**(a)**	Justify following statements: i. Transformer core is laminated. ii. Transformer rating is in KVA.	**03**
	(b)	Differentiate between core type and shell type transformer.	**04**
	(c)	Explain V-V connection of 3 phase transformer.	**07**

Q.8 **(a)** Explain polarity test of single phase transformer. **03**

(b) Draw connection diagrams and winding diagrams for Dd0, Yd1, and Dy11. **04**

(c) Derive an expression for saving of copper when auto transformer is used compared to Two winding transformer. **07**

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–IV (NEW) EXAMINATION – WINTER 2021

Subject Code:3140913   **Date:03/01/2022**
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)	Define Biot Savart Law.	03
	(b)	Explain Energy Stored in a Magnetic Field.	04
	(c)	A 4-pole, lap wound D.C. shunt generator has a useful flux per pole of 0.07 Wb. The armature winding consists of 220 turns each of 0.004 ohm resistance. Calculate the terminal voltage when running at 900r.p.m. if the armature current is 50 amp.	07
Q.2	(a)	Explain following parts of D.C. Machine 1) Yoke 2) Poles 3) Commutator	03
	(b)	Give the comparison between Lap Winding and Wave Winding	04
	(c)	Draw and explain internal and external characteristics of dc series generator.	07

OR

	(c)	A 200 V, 14.92 kW, dc shunt motor when tested by the Swinburne method gave the following result: Running light: armature current was 6.5 A and field current 2.2 A. With the armature locked, the current was 70 A when a potential difference of 3V was applied to the brushes. Estimate the efficiency of the motor when working under the full load conditions.	07

Q.3	(a)	Describe function of compensating winding.	03
	(b)	Explain the difference between supply voltage and Back E.M.F. in case of D.C. Motor	04
	(c)	Derive the Torque equation of a D.C. Motor	07

OR

	(a)	Give the conditions to be satisfied for voltage buildup in a d.c. shunt generator.	03
	(b)	What are the advantages and disadvantages of Hopkinson's Test?	04
	(c)	Enlist the methods of speed control of DC motors. Explain any one of them in detail.	07

Q-4	**(a)**	Derive condition for maximum efficiency for single phase transformer	**03**
	(b)	Define All day efficiency and Voltage regulation for a single phase transformer.	**04**
	(c)	A 40 kVA, single phase transformer has 400 turns on primary and 100 turns on secondary. The primary is connected to 2000V, 50 Hz supply. Determine: (i) The secondary voltage on open circuit (ii) The current flowing through the two windings on full load (iii) The maximum value of flux.	**07**

OR

Q-4	**(a)**	Draw the vector diagram of a single phase transformer in case of inductive load.	**03**
	(b)	Write comparison of autotransformer with two winding transformer.	**04**
	(c)	Explain O.C. and S.C. test on single phase transformer	**07**

Q-5	**(a)**	Describe the parallel operation of transformer.	**03**
	(b)	Explain Scott-connection of transformer in detail.	**04**
	(c)	What is Tap Changer? Explain on load tap changer and off load tap changer of transformer.	**07**

OR

Q-5	**(a)**	Differentiate between core and shell-type transformers.	**03**
	(b)	Draw connection diagram and vector diagram for following connections of three phase transformer. (i) Dd6 (ii) Dy1	**04**
	(c)	Explain with diagram different cooling methods used for transformer.	**07**

Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–IV (NEW) EXAMINATION – SUMMER 2021
Subject Code:3140913   **Date:06/09/2021**
Subject Name:Electrical Machine- I
Time:02:30 PM TO 05:00 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 classification of DC generators with neat connection diagram.	**03**
	(b)	Compare electric and magnetic circuits.	**04**
	(c)	Derive an emf equation for transformer with usual notation.	**07**
Q.2	**(a)**	State advantages and disadvantages of Swinburne's test.	**03**
	(b)	Derive the condition for maximum efficiency of single-phase transformer.	**04**
	(c)	Explain O.C. and S.C. test on single phase transformer.	**07**
		OR	
	(c)	What is the necessity of starter in a DC motor? Explain three-point starter for DC motor in brief.	**07**
Q.3	**(a)**	Mention the parts of a DC machine. Explain the use of any one of them.	**03**
	(b)	A long-shunt compound generator delivers a load current of 50 A at 500 V and has armature, series field and shunt field resistances of 0.05 Ω, 0.03 Ω and 250 Ω respectively. Calculate the generated voltage and the armature current. Allow 1 V per brush for contact drop.	**04**
	(c)	Explain voltage build up process of D.C. Generator. Also derive E.M.F. equation of D.C. Generator.	**07**
		OR	
Q.3	**(a)**	Discuss the conditions to be satisfied before connecting two single-phase transformers in parallel.	**03**
	(b)	Explain Scott-connection of transformer in detail.	**04**
	(c)	Draw the vector and winding diagram for the following three-phase transformer connections: Dd6 and Yd11.	**07**
Q.4	**(a)**	Define "All day efficiency" and % regulation of transformer.	**03**
	(b)	Differentiate between core type and shell type transformer.	**04**
	(c)	Enlist different speed control methods of DC shunt motor. Explain any one method.	**07**
		OR	
Q.4	**(a)**	Give a comparison of an auto transformer with a two-winding transformer.	**03**
	(b)	Explain the internal and external characteristics of D.C. Shunt Generator.	**04**
	(c)	Derive the expression of armature torque developed in a dc motor using fundamental equation and power equation. Also, draw the speed-torque characteristics of shunt, series and compound motors.	**07**

Q.5 **(a)** Why transformer rating is in KVA? **03**

(b) Briefly describe the principle of operation of a transformer. **04**

(c) A 30 KVA, 2400/120 V, 50 Hz transformer has a high voltage winding resistance of 0.1 Ω and a leakage reactance of 0.22 Ω. The low voltage winding resistance is 0.035 Ω and the leakage reactance is 0.012 Ω. Find the equivalent winding resistance, reactance and impedance referred to (i) high-voltage side and (ii) low-voltage side. **07**

<div align="center">OR</div>

Q.5 **(a)** Give the relation between energy and co-energy for linear system. **03**

(b) What is the eddy current and hysteresis loss? How they can be minimized? **04**

(c) What is armature reaction? Explain cross magnetizing and demagnetizing effects of armature reaction in brief. **07**

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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

OR

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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