Enrollment No./Seat No.:

GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering - SEMESTER - IV EXAMINATION - WINTER 2025

Subject Code: 3140913 **Date: 18-11-2025**

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)**	State advantages and disadvantages of Swinburne's test.	**03**
	(b)	Explain principle of energy conservation.	**04**
	(c)	Derive an emf equation for transformer with usual notation.	**07**
Q.2	**(a)**	Give classification of DC Motors with neat connection diagram.	**03**
	(b)	Compare electric and magnetic circuits.	**04**
	(c)	Analyze the O.C. and S.C. test on single phase transformer.	**07**
		OR	
	(c)	Analyze the step by step voltage build up process of self-excited D.C. Generator.	**07**
Q.3	**(a)**	Discuss the conditions to be satisfied before connecting two single-phase transformers in parallel.	**03**
	(b)	Differentiate between core type and shell type transformer.	**04**
	(c)	Derive the expression of armature torque developed in a dc motor using fundamental equation and power equation.	**07**
		OR	
	(a)	State and explain the working principle of DC motor.	**03**
	(b)	Explain Scott-connection of transformer in detail.	**04**
	(c)	Explain the methods of speed control on d.c. shunt motor.	**07**
Q.4	**(a)**	List the applications of d.c. motors.	**03**
	(b)	Explain singly excited magnetic field system in detail.	**04**
	(c)	A 4-pole long-shunt lap wound generator supplies 25 KW at a terminal voltage of 500 V. The armature, shunt field & series field resistances are 0.03Ω, 200Ω & 0.01Ω resp. Calculate the numbers of armature conductors if the speed of armature is 1200 RPM & flux/pole is 0.02 Wb.	**07**
		OR	
	(a)	Explain Equalizer connection for DC machine.	**03**

	(b)	Enlist different methods to improve commutation and explain any one method.	**04**
	(c)	A 500 KVA Transformer has an iron loss and full load copper loss are 2.2 KW & 7.5 KW resp. Calculate the efficiency at (a) full load 0.8 p.f.(b) KVA load at which maximum efficiency occurs.	**07**
Q.5	**(a)**	Explain On Load Tap Changer for transformer.	**03**
	(b)	Explain 3-point starter for d.c. motor.	**04**
	(c)	Draw the vector and winding diagram for the following 3- phase transformer connections Dd0, Dy11, Yd1 .	**07**

OR

	(a)	What is auto transformer ?, explain in brief.	**03**
	(b)	Discuss series field test on D.C machine.	**04**
	(c)	Draw the vector and winding diagram for the following 3- phase transformer connections Dd6, Dy1, Yd11.	**07**

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Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–IV (NEW) EXAMINATION – WINTER 2024

Subject Code:3140913 Date:22-11-2024

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)**	State and explain working principle of transformer.	**03**
	(b)	Compare between electrical and magnetic circuit.	**04**
	(c)	With diagram explain construction of DC Machine.	**07**
Q.2	**(a)**	Define Biot Savart Law.	**03**
	(b)	Explain the terms: (1) MMF (2) Reluctance (3) Inductance (4) Flux	**04**
	(c)	What is the necessity of starter in a DC motor? Explain the working of 3-point starter.	**07**
		OR	
	(c)	Explain the methods of speed control on DC shunt motor.	**07**
Q.3	**(a)**	State and explain Ampere's law.	**03**
	(b)	State the condition for parallel operation of three phase transformer.	**04**
	(c)	With diagram explain construction of single phase transformer.	**07**
		OR	
Q.3	**(a)**	Explain different types of losses in transformer.	**03**
	(b)	Explain Scott-connection of transformer in detail	**04**
	(c)	Explain OC and SC test of single phase transformer.	**07**
Q.4	**(a)**	State and explain the working principle of DC Generator.	**03**
	(b)	Derive the EMF equation of a DC generator.	**04**
	(c)	Derive condition for maximum efficiency for single phase transformer.	**07**
		OR	
Q.4	**(a)**	Explain Energy Stored in a magnetic field.	**03**
	(b)	Draw connection diagrams and winding diagrams for Dd0, Yd1, and Dy11.	**04**
	(c)	What is Tap Changer? Explain on load tap changer and off load tap changer of transformer.	**07**
Q.5	**(a)**	List the applications of DC motors.	**03**
	(b)	Give a comparison of an auto transformer with a two winding transformer.	**04**
	(c)	Explain with diagram different cooling methods used for transformer.	**07**
		OR	

Q.5	**(a)**	Define All day efficiency and Voltage regulation for a single phase transformer.	**03**
	(b)	Derive EMF equation of transformer.	**04**
	(c)	Give classification of DC generators with neat connection diagram.	**07**

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Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV (NEW) EXAMINATION – WINTER 2023

Subject Code:3140913 Date:19-01-2024

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)**	Briefly describe the operating principle of a transformer. Draw schematic diagram of a single phase transformer.	**03**
	(b)	Explain the term 'voltage regulation of a transformer'. Write down the equation of voltage regulation of a single phase transformer.	**04**
	(c)	Explain the terms (1) Pole pitch (2) Full pitch coil (3) Front pitch (4) Back pitch in relation to armature winding of a DC machine	**07**
Q.2	**(a)**	Derive the EMF equation of a transformer from first principles.	**03**
	(b)	Draw necessary diagrams and explain the (1) Pole with field windings (2) Armature core, for a DC machine.	**04**
	(c)	An 8-pole DC generator has 500 armature conductors and has a useful flux per pole of 0.025 Wb. What will be the emf generated if it is lap connected and runs at a speed of 1000 rpm? What must be the speed at which it must be driven to produce the same emf if it is wave wound?	**07**
		OR	
	(c)	A 440/110 Volt transformer has a HV resistance of 0.04 Ohm and LV resistance of 0.02 Ohm. Its iron loss at rated output is 150 Watt. Determine the secondary current at which maximum efficiency will occur. Also find out the value of maximum efficiency with unity power factor load.	**07**
Q.3	**(a)**	Draw the field lines for the magnetic fields produced by a bar magnet and a current carrying coil respectively.	**03**
	(b)	Take a suitable example and explain the terms (1) MMF (2) Reluctance (3) Inductance (4) Flux	**04**
	(c)	Derive the equation of force as a partial derivative of stored energy with respect to position of a moving element.	**07**
		OR	
Q.3	**(a)**	Draw the magnetic field lines created due to field winding currents in case of a DC machine.	**03**
	(b)	Explain B-H curve and its significance for a magnetic material.	**04**
	(c)	Derive the equation of torque as a partial derivative of stored energy with respect to angular position of a rotating element.	**07**
Q.4	**(a)**	Derive the EMF equation for a DC generator.	**03**
	(b)	Briefly explain the Swinburn's test for a DC shunt machine	**04**
	(c)	Draw the vector diagrams and winding connections for the following transformer connections. (1) Yd1 (2) Dz0	**07**
		OR	
Q.4	**(a)**	Describe various losses in a DC machine and derive the equation of efficiency of DC machine as a motor and as a generator.	**03**

	(b)	Draw the vector diagram and winding connections for Open Delta connection.	**04**
	(c)	Draw the vector diagrams and winding connections for the following transformer connections. (1) Dy11 (2) Yz1	**07**
Q.5	**(a)**	Derive the torque equation of a DC motor from first principles.	**03**
	(b)	What is the necessity of starter in a DC motor? Explain the working of 3-point starter.	**04**
	(c)	Mention the techniques used for cooling of transformers. Explain any two methods in detail.	**07**

OR

Q.5	**(a)**	Briefly explain the short circuit test for a single-phase transformer.	**03**
	(b)	What is armature reaction? Discuss any one method to counterbalance armature reaction.	**04**
	(c)	Draw the circuit diagram and explain the Field test for DC series machines in detail.	**07**

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Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV(NEW) EXAMINATION – WINTER 2022

Subject Code:3140913 Date:15-12-2022

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)**	Explain principle of energy conservation.	**03**
	(b)	List out parts of D.C machine and briefly discuss any two.	**04**
	(c)	A shunt generator deliver 195A at 250V, armature and shunt field resistances are 0.02 Ω and 50 Ω respectively. The iron and friction losses are 950W.Calculate (1) Emf generated ,(2)Total copper loss,(3)Output of prime-mover,(4)Mechanical efficiency , electrical efficiency and total efficiency.	**07**
Q.2	**(a)**	Define following terms: (1) Mechanical and Electrical angle (2) Pole pitch (3) pitch factor	**03**
	(b)	Explain polarity test of transformer.	**04**
	(c)	A 600 KVA single phase transformer has an efficiency of 92 % both at full load and half load at unity power factor.Determine its Efficiency at 60 % of full load at 0.8 power Factor lag.	**07**
		OR	
	(c)	Discuss series field test on D.C machine.	**07**
Q.3	**(a)**	Distinguish between singly excited and doubly excited magnetic systems.	**03**
	(b)	Define the following: (a) magnetic flux (b) mmf (c)magnetic permeability(e)leakage flux.	**04**
	(c)	Explain Equivalent circuit of transformer with circuit diagram.	**07**
		OR	
Q.3	**(a)**	Explain comparison between simplex lap and wave winding.	**03**
	(b)	Explain Equalizer connection.	**04**
	(c)	Define voltage regulation of a transformer. Describe the method to find out voltage regulation of a transformer using open circuit and short circuit tests.	**07**
Q.4	**(a)**	Explain O.C . test on 1-Φ transformer	**03**
	(b)	Explain 3-point starter for d.c. motor.	**04**
	(c)	Explain process of commutation. Enlist different methods to improve commutation and explain any one method.	**07**
		OR	
Q.4	**(a)**	List the applications of d.c. motors.	**03**
	(b)	Derive condition for maximum efficiency for I - Ø transformer.	**04**
	(c)	Draw the vector diagrams and winding connections for the Following transformer connections. (a) Dz6 (b) Yz11 (c) Yd11	**07**

Q.5	**(a)**	Explain the load characteristics of d.c. shunt generator.	**03**
	(b)	Explain Sumpner's test for testing of a transformer.	**04**
	(c)	Explain the methods of speed control on d.c. shunt motor.	**07**

OR

Q.5	**(a)**	Explain the conditions for parallel operation of three phase transformer.	**03**
	(b)	What are the advantages and disadvantages of Swinburne test?	**04**
	(c)	Derive an expression for saving of copper when auto transformer is used compared to Two winding transformer.	**07**

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