Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV EXAMINATION – SUMMER 2025

Subject Code:3140913 Date:15-05-2025

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)**	List out parts of D.C machine and briefly discuss any two.	**03**
	(b)	Explain principle of energy conservation.	**04**
	(c)	Describe the method to find out voltage regulation of a transformer using open circuit and short circuit tests.	**07**
Q.2	**(a)**	Define: (1) leakage flux. (2) Pole pitch (3) magnetic permeability.	**03**
	(b)	Explain polarity test of transformer.	**04**
	(c)	A 4- pole, d.c. shunt generator with a wave wound armature having 390 conductors has to supply the load of 500 lamps, each of 100W at 250 V. Allow 10V as voltage drop in the connecting leads of the wire between generator and a brush contact drop of 1 volt/brush. Calculate the speed of armature at which the generator should be in driven. The flux/pole is 30mwb.The armature and shunt field resistances are 0.05Ω and 65 Ω respectively.	**07**
		OR	
	(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**
Q.3	**(a)**	List the applications of d.c. motors.	**03**
	(b)	Derive the EMF equation of a transformer	**04**
	(c)	Explain 3-point starter for d.c. motor.	**07**
		OR	
Q.3	**(a)**	Explain B-H curve and its significance for a magnetic material.	**03**
	(b)	Explain Equalizer connection.	**04**
	(c)	Discuss series field test on D.C machine.	**07**
Q.4	**(a)**	Describe the process of commutation.	**03**
	(b)	Compare singly excited and doubly excited magnetic systems.	**04**
	(c)	Explain Sumpner's test for testing of a transformer.	**07**
		OR	
Q.4	**(a)**	List the advantages and disadvantages of Swinburne test.	**03**
	(b)	Derive condition for maximum efficiency for I - Ø transformer.	**04**
	(c)	Explain the methods of speed control on d.c. shunt motor.	**07**
Q.5	**(a)**	Explain the load characteristics of d.c. series generator.	**03**
	(b)	What is armature reaction? Discuss any one method to counter balance armature reaction.	**04**
	(c)	Derive an expression for saving of copper when auto transformer is used compared to Two winding transformer.	**07**

OR

Q.5	**(a)**	List the conditions for parallel operation of three phase transformer.	**03**
	(b)	Derive the torque equation of a DC motor from first principles.	**04**
	(c)	Draw the vector diagrams and winding connections for the following transformer connections. (1) Dy11 (2) Yd0	**07**

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	(b)	Explain principle of energy conservation.	**04**
	(c)	Describe the method to find out voltage regulation of a transformer using open circuit and short circuit tests.	**07**
Q.2	**(a)**	Define: (1) leakage flux. (2) Pole pitch (3) magnetic permeability.	**03**
	(b)	Explain polarity test of transformer.	**04**
	(c)	A 4- pole, d.c. shunt generator with a wave wound armature having 390 conductors has to supply the load of 500 lamps, each of 100W at 250 V. Allow 10V as voltage drop in the connecting leads of the wire between generator and a brush contact drop of 1 volt/brush. Calculate the speed of armature at which the generator should be in driven. The flux/pole is 30mwb.The armature and shunt field resistances are 0.05Ω and 65 Ω respectively.	**07**
		OR	
	(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**
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	(b)	Derive the EMF equation of a transformer	**04**
	(c)	Explain 3-point starter for d.c. motor.	**07**
		OR	
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	(b)	Compare singly excited and doubly excited magnetic systems.	**04**
	(c)	Explain Sumpner's test for testing of a transformer.	**07**
		OR	
Q.4	**(a)**	List the advantages and disadvantages of Swinburne test.	**03**
	(b)	Derive condition for maximum efficiency for I - Ø transformer.	**04**
	(c)	Explain the methods of speed control on d.c. shunt motor.	**07**
Q.5	**(a)**	Explain the load characteristics of d.c. series generator.	**03**
	(b)	What is armature reaction? Discuss any one method to counter balance armature reaction.	**04**
	(c)	Derive an expression for saving of copper when auto transformer is used compared to Two winding transformer.	**07**

OR

Q.5	**(a)**	List the conditions for parallel operation of three phase transformer.	**03**
	(b)	Derive the torque equation of a DC motor from first principles.	**04**
	(c)	Draw the vector diagrams and winding connections for the following transformer connections. (1) Dy11 (2) Yd0	**07**

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Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code:3140913 Date:20-07-2024

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)**	Define the terms: (a) magnetic flux (b) mmf (c) reluctance	**03**
	(b)	Compare electrical and magnetic circuit.	**04**
	(c)	Derive EMF equation of transformer.	**07**
Q.2	**(a)**	State the condition for parallel operation of three phase transformer.	**03**
	(b)	Explain working principle of transformer.	**04**
	(c)	With diagram explain construction of DC machine.	**07**
		OR	
	(c)	With diagram explain construction of single phase transformer.	**07**
Q.3	**(a)**	Define Biot Savart Law.	**03**
	(b)	Draw connection diagrams and winding diagrams for Dd0, Yd1, and Dy11.	**04**
	(c)	Explain OC and SC test of single phase transformer.	**07**
		OR	
Q.3	**(a)**	Explain Energy Stored in a Magnetic Field.	**03**
	(b)	Explain the methods of speed control on DC shunt motor.	**04**
	(c)	Explain with diagram different cooling methods used for transformer.	**07**
Q.4	**(a)**	List the applications of DC motor.	**03**
	(b)	What is armature reaction of DC generator? Explain in brief.	**04**
	(c)	Explain 3-point starter for DC motor.	**07**
		OR	
Q.4	**(a)**	What is the necessity of starter in DC motor?	**03**
	(b)	Explain Scott-connection of transformer in detail.	**04**
	(c)	Give classification of DC generators with neat connection diagram.	**07**
Q.5	**(a)**	Explain different types of losses in transformer.	**03**
	(b)	Derive condition for maximum efficiency for single phase transformer.	**04**
	(c)	Give a comparison of an auto transformer with a two-winding transformer.	**07**
		OR	
Q.5	**(a)**	Define “All day efficiency” and “ Voltage regulation” of transformer.	**03**
	(b)	Derive the EMF equation of a DC generator.	**04**
	(c)	What is Tap Changer? Explain on load tap changer and off load tap changer of transformer.	**07**

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Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code:3140913 Date:13-07-2023

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)**	State and explain Ampere's circuital law.	**03**
	(b)	Derive the emf equation of a DC generator.	**04**
	(c)	Draw the vector and winding diagram for the following 3-phase transformer connections Dd0, Dd6, Dy1, Yd11.	**07**
Q.2	**(a)**	Give the classification of DC generator.	**03**
	(b)	Draw and explain load characteristics of dc compound generator.	**04**
	(c)	A 250V dc shunt generator delivers a full load current of 130 amp. The resistances of armature and shunt field are 0.1 ohms and 125 ohms resp. Iron losses are 450 watts and mechanical losses are 550 W. Find the full load efficiency, load current for maximum efficiency and the value of maximum efficiency.	**07**
		OR	
	(c)	A 230 V dc shunt motor runs at 1000 RPM and takes 5 amp under no load condition..The armature resistance of the motor is 0.025 ohms and shunt field resistance is 230 ohms. Calculate the drop in speed when the motor is loaded and takes a line current of 41 amp.	**07**
Q.3	**(a)**	State and explain the working principle of DC motor.	**03**
	(b)	Draw and explain performance characteristics of dc series motor.	**04**
	(c)	Explain the procedure and calculations for Field test on identical DC series machines.	**07**
		OR	
Q.3	**(a)**	Derive the torque equation of a DC motor from first principles.	**03**
	(b)	Enlist the methods of speed control of DC shunt motors. Explain field control method in detail.	**04**
	(c)	Explain with neat sketch Swinburne's test to find the efficiency of dc motor. Write its merits and demerits.	**07**
Q.4	**(a)**	Compare core type and shell type transformer.	**03**
	(b)	Explain direct load test on single transformer with circuit diagram.	**04**

	(c)	The iron loss and full load copper loss of 100 KVA single phase transformer are 3 KW & 4 KW resp. Calculate the efficiency at (a) full load 0.8 p.f.(b) half load, at 0.707 pf (c) ¼ load unity p,f	**07**
		OR	
Q.4	**(a)**	Compare auto transformer with two winding transformer.	**03**
	(b)	Explain T-T connection of 3 phase transformer.	**04**
	(c)	The following are the test results of a 100 KVA, 1100/440 V, single phase transformer. O.C. test: with normal primary voltage, 500W S.C. test: 40 V, 850 W when secondary winding is shorted and full load current flowing. Find the full load efficiency and regulation when the power factor is 0.8 lagging.	**07**
Q.5	**(a)**	Mention the conditions for satisfactory parallel operation of three phase transformers.	**03**
	(b)	Define self and mutual inductance with proper formula.	**04**
	(c)	Explain singly excited magnetic field system in detail	**07**
		OR	
Q.5	**(a)**	Explain On Load Tap Changer for transformer.	**03**
	(b)	Write short note on electromechanical energy conversion.	**04**
	(c)	Explain in detail doubly excited magnetic field system.	**07**

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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**

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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