Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–V (NEW) EXAMINATION – WINTER 2020

Subject Code:3150910 Date:27/01/2021

Subject Name:Electrical Machine- II

Time:10:30 AM TO 12:30 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 slip? Explain torque-slip characteristics of an induction motor.	**03**
	(b)	Define pitch factor and distribution factor with respect to an alternator.	**04**
	(c)	Explain the procedure to construct the circle diagram of three-phase induction motor. Also, discuss how the losses, efficiency and slip of three-phase induction motor are calculated at full load condition using circle diagram.	**07**
Q.2	**(a)**	Explain cogging and crawling in case of three-phase induction motor.	**03**
	(b)	Discuss the procedure to perform no load and blocked rotor tests on a three-phase induction motor.	**04**
	(c)	List out the methods of speed control of three-phase Induction Motor. Explain any one in detail.	**07**
Q.3	**(a)**	Why synchronous motor is not self-starting? Describe in brief.	**03**
	(b)	Derive the maximum running torque condition in case of three-phase induction motor.	**04**
	(c)	Define voltage regulation of an alternator. List out the methods to find out the voltage regulation of the alternator. Explain any one in detail.	**07**
Q.4	**(a)**	Discuss working of Repulsion motor.	**03**
	(b)	Write a note on double cage induction motor.	**04**
	(c)	Mention different starters for three phase Induction motor and explain star-delta starter in detail.	**07**
Q.5	**(a)**	Explain the construction of a salient pole synchronous machine.	**03**
	(b)	What is synchronization in case of alternator? Explain two bright one dark lamp method of synchronization.	**04**
	(c)	Write a short note on auto synchronous motor.	**07**
Q.6	**(a)**	Briefly describe the construction and working of linear induction motor.	**03**
	(b)	Briefly explain V-curves of synchronous motor.	**04**
	(c)	Explain construction, working and applications of Permanent magnet brushless DC motor.	**07**
Q.7	**(a)**	How direct axis and quadrature axis reactance can be measured for salient pole machine?	**03**
	(b)	Explain the construction and working of universal motor.	**04**
	(c)	Mention the types of single-phase AC motors. Explain the construction and working of shaded pole single phase motor.	**07**
Q.8	**(a)**	Derive the emf equation of an alternator.	**03**
	(b)	Draw and explain the equivalent circuit of three-phase induction motor.	**04**
	(c)	Define and describe the effect of armature reaction in an alternator.	**07**

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Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V (NEW) EXAMINATION – WINTER 2021

Subject Code:3150910 Date:01/01/2022

Subject Name:Electrical Machine- II

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 technical reason of skewed rotor bar conductor of induction motor.	**03**
	(b)	Explain working of 3-phase induction motor	**04**
	(c)	Discuss the effect of harmonics, cogging, crawling and unbalanced voltages on performance of induction motor.	**07**
Q.2	**(a)**	Why single phase induction motor not self started?	**03**
	(b)	Explain working of capacitor start capacitor run single phase motor.	**04**
	(c)	Explain working of Double cage induction motor	**07**
		OR	
	(c)	What is regulation of alternator? Explain ZPF method for finding regulation in alternator.	**07**
Q.3	**(a)**	Write advantages and application universal motor	**03**
	(b)	Explain armature reaction phenomena in case of synchronous machine.	**04**
	(c)	Draw the construction and explain working of cylindrical rotor synchronous machine	**07**
		OR	
Q.3	**(a)**	Give comparison of squirrel cage and wound rotor motors.	**03**
	(b)	State the methods of starting of synchronous motor and explain any one of them.	**04**
	(c)	What is slip in induction motor? Explain torque/slip characteristics of induction motor.	**07**
Q.4	**(a)**	Discuss the conditions to be satisfied before a 3- phase alternator is synchronized with infinite bus.	**03**
	(b)	Justify that to get high starting torque slip ring motor is best suitable.	**04**
	(c)	State the condition of parallel operation of alternator. Explain working of capacitor-start capacitor-run 1-phase induction motor	**07**
		OR	
Q.4	**(a)**	What do you mean by synchronous speed of induction motor? Why can not 3-phase induction motor run at synchronous speed?	**03**
	(b)	Draw and explain power stages of an induction motor	**04**
	(c)	Draw and explain V-Curve of synchronous motor.	**07**
Q.5	**(a)**	What is magnetic levitation?	**03**
	(b)	What is Auto Synchronous Motor? Where it is used?	**04**
	(c)	A 3-φ induction motor is wound for 6 poles and is supplied from 50-Hz system and has a slip of 1% at no-load and 3% at full load. Find (i) the synchronous speed (ii) no-load speed (iii) full load speed and (iv) frequency of rotor current at standstill. (v) Frequency of rotor current at full-load.	**07**
		OR	
Q.5	**(a)**	State advantages and applications of linear induction motor	**03**
	(b)	Explain how stepper motor works?	**04**
	(c)	Discuss working and applications of Permanent magnet brushless DC motor	**07**

Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code:3150910 Date:09/09/2021

Subject Name:Electrical Machine- II

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 the working principle of Induction generator.	**03**
	(b)	Draw Slip Torque characteristic of 3 phase Induction motor and explain in brief.	**04**
	(c)	Explain V curves and inverted V curves for Synchronous motor.	**07**
Q.2	**(a)**	Explain double field revolving theory for single phase Induction Motor.	**03**
	(b)	Explain the phenomena of crawling and cogging in induction motor.	**04**
	(c)	A 6 pole, 50 Hz 3 phase Induction motor running on full load with 4 % slip develops a torque of 149.3 N-m at its pulley rim. The friction and windage losses are 200 Watts and the stator copper and iron losses equal to 1620 Watts. Calculate (a) output power (b) the rotor copper loss and (c) efficiency at full load.	**07**
		OR	
	(c)	Mention different starters for three phase induction motor and explain Auto-transformer starter in details.	**07**
Q.3	**(a)**	Explain with reason why synchronous motor is not self-starting. List out different methods of starting the synchronous motor.	**03**
	(b)	Explain synchronous condenser and synchronous phase modifiers.	**04**
	(c)	Discuss the procedure to perform no load and blocked rotor tests on a three phase induction motor.	**07**
		OR	
Q.3	**(a)**	Briefly describe the construction and working of linear induction motor.	**03**
	(b)	Draw and explain the vector diagrams of loaded alternator for lagging, leading and unity power factor conditions.	**04**
	(c)	The rotor resistance and reactance per phase of a 4 pole, 50 Hz, 3 phase Induction motor are 0.025 Ω and 0.12 Ω resp. Find the speed at maximum torque and find the value of additional rotor resistance per phase required to give three-fourth of maximum torque at starting.	**07**
Q.4	**(a)**	Define the pitch factor and distribution factor for synchronous generator.	**03**
	(b)	Differentiate between salient pole and cylindrical rotor synchronous machine.	**04**
	(c)	Calculate the RMS value of the induced emf per phase of a 10 pole, 3 phase, 50 Hz, alternator with 2 slots per pole per phase and 4 conductors per slot in two layers. The coil span is 150 degrees. The flux per pole has a fundamental component of 0.12 Wb and a 20% third harmonic component.	**07**
		OR	
Q.4	**(a)**	Describe the effects of armature reaction in Alternators.	**03**
	(b)	List the methods of determination of voltage regulation of an alternator.	**04**

Describe any one of them in detail.

(c) A given 3 MVA, 50 Hz, 11 KV, 3 phase, star connected alternator when supplying 100 amp. at zero power factor leading has a line to line voltage of 12,370 Volts; when the load is removed, the terminal voltage falls down to 11,000 Volts. Calculate the regulation of an alternator when supplying full load at 0.8 P.F. lag. Assume an effective resistance of 0.4 Ω per phase. **07**

Q.5 **(a)** What do you mean by Auto Synchronous motor? **03**

(b) State the conditions to be satisfied for putting a 3 phase alternator in parallel with infinite bus. **04**

(c) What is synchronization? Explain two bright and one dark lamp method of synchronization of 3 phase alternators. **07**

OR

Q.5 **(a)** How direct axis and quadrature axis reactance can be measured for salient pole machine? **03**

(b) Explain construction and working of shaded pole single phase motor. **04**

(c) Explain construction, working and applications of Permanent magnet brushless DC motor. **07**

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Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V(NEW) EXAMINATION – SUMMER 2022

Subject Code:3150910 Date:04/06/2022

Subject Name:Electrical Machine- II

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)**	What is Synchronous speed ?	**03**
	(b)	State the principle of operation of a three-phase Induction motor.	**04**
	(c)	Explain the production of rotating field in 3-Phase Induction motor by Analytical Method.	**07**
Q.2	**(a)**	Draw the phasor diagram of 3-phase alternator with unity power factor load and lagging power factor load.	**03**
	(b)	Draw the per phase complete equivalent circuit of 3 -phase induction motor referred to the stator with approximate equivalent circuit.	**04**
	(c)	The power input to the rotor of 440V, 50Hz, 6 pole, 3-Phase induction motor is 80 kW. The rotor emf is observed to make 100 complete alternations per min. Calculate (a) the slip; (b) the rotor speed;(c) the mechanical power developed;(d) the rotor copper loss per phase;(e) the rotor resistance per phase if the rotor current is 65 A.	**07**
		OR	
	(c)	Derive the E.M.F. equation of an Alternator.	**07**
Q.3	**(a)**	Define different types of losses in 3-phase Alternator.	**03**
	(b)	Draw the equivalent circuit of a single-phase, single winding Induction motor based on two-revolving field theory.	**04**
	(c)	State the different methods of starting squirrel cage motors.	**07**
		OR	
Q.3	**(a)**	What is voltage regulation?	**03**
	(b)	Explain the V-curves of synchronous motor.	**04**
	(c)	Describe the construction and operating principle of synchronous motor.	**07**
Q.4	**(a)**	Explain the double field revolving theory of single-phase Induction Motor.	**03**
	(b)	Explain power stages in an Induction Motor with flow diagram.	**04**
	(c)	Explain the construction, working principle of Permanent magnet brushless DC motor.	**07**
		OR	
Q.4	**(a)**	Explain the effect of slip on rotor circuit in 3-phase Induction Motor.	**03**

	(b)	What is synchronization and load division in Parallel operation of alternators ?	**04**
	(c)	Auto Synchronous Motor: Construction, principle of operation	**07**
Q.5	**(a)**	What is Synchronous condenser?	**03**
	(b)	What is the process to make synchronous motor self-starting?	**04**
	(c)	A 3-phase, star connected alternator is rated at 1600 kVA 13500 V. The armature effective resistance and synchronous reactance are 1.5Ω and 30Ω respectively per phase. Calculate the percentage voltage regulation for a load of 1280 kW at power factors of (a)0.8 lagging;(b) unity;(c)0.8 leading	**07**

OR

Q.5	**(a)**	What is the principle of Magnetic levitation?	**03**
	(b)	Explain the principle of operation Auto Synchronous Motor.	**04**
	(c)	Explain different methods to make single-phase Induction motor self -starting.	**07**

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