Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII (NEW) EXAMINATION – WINTER 2018

Subject Code: 2170909 Date: 29/11/2018

Subject Name: Design of AC Machines

Time: 10:30 AM TO 01:30 PM Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

			MARKS
Q.1	**(a)**	Explain direct axis and quadrature axis synchronous reactance in synchronous machine.	**03**
	(b)	State important design difference between turbo alternators and hydro generators.	**04**
	(c)	What do you mean by specific electric loading and specific magnetic loading applied to electric machines? State the factors on which the choice of these loadings depends.	**07**
Q.2	**(a)**	Explain harmonic induction and harmonic synchronous torques produced in induction motor.	**03**
	(b)	Explain the terms "critical speed" and "run away speed" with reference to synchronous machine.	**04**
	(c)	Explain the term SCR and its effects on synchronous machine performance	**07**
		OR	
	(c)	Explain steps for design of field winding of synchronous machine.	**07**
Q.3	**(a)**	What are the design criteria that should be taken care while design of submersible motors?	**03**
	(b)	Explain which combinations of number of stator and rotor slots should be avoided in the induction motor design ? why?	**04**
	(c)	Write a note on computer aided design of Induction motor. Explain algorithm steps to find main dimensions.	**07**
		OR	
Q.3	**(a)**	What is done to reduce tooth pulsation losses in an induction motor?	**03**
	(b)	Discuss the Finite Element Method for design of electrical machine	**04**
	(c)	State the rules for the selection of rotor slots. Describe the methods for reducing the effect of harmonics torque.	**07**
Q.4	**(a)**	Explain estimation of full load field mmf in synchronous machine.	**03**
	(b)	Draw and explain briefly the current distribution wave form speeded over one pole pitch in bars and end rings squirrel cage induction motor	**04**
	(c)	Estimate the main dimensions, air gap length, no of stator slots, stator turns per phase and cross sectional area of stator conductors for a 3 phase, 20 h.p., 400V, 6 poles, 50 Hz, 970 rpm, induction motor, suitable for a star delta starting. Assume magnetic and electric specific loadings as 0.45 wb/m^2, and 23000 ac/m respectively, current density = 4 A/mm^2, ratio of core length to pole pitch is 0.85, full load efficiency 0.88 and power factor 0.89.	**07**

OR

Q.4	**(a)**	Why closed types slots are often used for small induction motors?	**03**
	(b)	In single phase induction explain design of auxiliary winding for capacitor start motor.	**04**
	(c)	What is Dispersion coefficient? Explain the effect of Dispersion coefficient on maximum output power factor.	**07**
Q.5	**(a)**	Explain how length of air gap is estimated in synchronous machine.	**03**
	(b)	Explain how mmf is calculated for magnetic circuit in synchronous machine.	**04**
	(c)	Determine the main dimensions of a 12 MVA, 13.8KV, 50Hz, 1500 rpm, 3 star connected synchronous generator. The additional data is given as: Bav= 0.6wb/m^2, ac=42000 ac/m and peripheral speed= 80m/sec. Find also the maximum flux, the number of stator slots if one conductor per slot is used, and the number of turns per phase.	**07**

OR

Q.5	**(a)**	Discuss the effect of "skewing" on the performance of three phase induction motor.	**03**
	(b)	Explain design considerations to eliminate harmonics in synchronous machines..	**04**
	(c)	Briefly discuss factors affecting determining air gap length in induction motor design.	**07**

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