GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–VII (NEW) EXAMINATION – SUMMER 2022

Subject Code:2170909   **Date:14/06/2022**

Subject Name:Design of AC Machines

Time:02:30 PM TO 05:30 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 the rules for the selection of rotor slots in 3-phase induction motor.	03
	(b)	State the effect of air gap length on the performance of a 3-phase induction motor. Explain any one in brief.	04
	(c)	Derive an output equation for 3-ϕ induction motor with usual notation.	07
Q.2	**(a)**	Explain dispersion co-efficient applied to induction motors.	03
	(b)	How design of 1-phase and 3-phase induction motor differ from each other	04
	(c)	Prove that torque produce by 5TH harmonics is in backward direction & 7TH harmonics is in forward direction.	07
		OR	
	(c)	Explain the deciding factor for stator slots of a 3-phase induction motor	07
Q.3	**(a)**	Why auxiliary winding needed in 1-phase induction motor.	03
	(b)	Write output equation in 1-phase induction motor. Give identification of each notation in it.	04
	(c)	Explain the design procedure of rotor for 1-ϕ induction motor with usual notation.	07
		OR	
Q.3	**(a)**	Important of circle dia. in design of motor.	03
	(b)	Define and explain the term "short circuit ratio" of a synchronous generator.	04
	(c)	Explain the design procedure of an auxiliary winding in case of resistance split phase 1-ϕ induction motor with usual notation.	07
Q.4	**(a)**	State different materials used in alternator construction.	03
	(b)	Explain purpose damper winding in alternator	04
	(c)	Find the main dimensions, number of turns per phase & number of stator slots of 3-ϕ, 13750V,50Hz, 1500 RPM, star connected alternator from given data : . Bav= 0.62 Wb/m2, ac=40000 Amp-cond/m, Kw=0.95, peripheral velocity= 79m/s., Rating=12MVA.	07
		OR	
Q.4	**(a)**	Explain different types of rotor used in 3-phase induction motor construction.	03
	(b)	Explain different excitation system in alternator	04
	(c)	Calculate the diameter, core length, no of conductors of the stator , size of conductor, no of stator slots of 75 MVA, 96 pole,50 HZ,low speed star connected hydro generator having voltage per phase is 8000V. Assume Bav= 0.64 Wb/m2, ac=40625 Amp-cond/m, Kw=0.955, peripheral velocity= 39.5m/s	07

Q.5 **(a)** Explain different types of rotor used in alternator construction. **03**

(b) Explain why a turbo alternator has smaller diameter and large length but hydro alternator has larger diameter and small length? **04**

(c) Find the main dimensions, number of stator turns per phase & number of stator slots for a 25KW, 415V, 50Hz, 2880rpm,3-ϕ delta connected induction motor. Assume that: specific magnetic loading=0.48wb/m2, specific electric loading=21000ac/m, Efficiency=88%, power factor=0.87, stator winding factor=0.9451. Take ratio (L/τ)=0.7 **07**

OR

Q.5 **(a)** Explain the advantages of finite element method **03**

(b) Discuss the design differences of a salient pole and non salient pole synchronous machines **04**

(c) Explain significance of FEM in design problem **07**

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