Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VIII EXAMINATION – WINTER 2015

Subject Code:180904 Date:16/12/2015

Subject Name: Electrical Machine Design-II

Time: 2:30pm to 5:00pm Total Marks: 70

Instructions:

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

Q.1 **(a)** Give reasons: **06**

(i) Semi-enclosed sots are usually preferred for induction motors.

(ii) Use of revolving field system is almost universal in synchronous machines.

(b) Derive the relation for total leakage reactance in a single phase induction motor. **08**

Q.2 **(a)** Explain how following factors shall be affected while selecting the length of air-gap in a 3-phase induction motor. **06**

1) Power factor

2) Overload capacity

3) Unbalance Magnetic pull

(b) Write a short note on Harmonic induction torque and Harmonic synchronous torque of squirrel cage induction motor Also give its effect on the selection rotor slots. **08**

OR

(b) A 15-kW, 440-V, 4-pole, 50-Hz, 3-phase induction motor is built with a stator bore 0.25m and a core length of 0.16. The specific electric loading is 23000 ampere conductors/meter. Using the data of this machine, determine the core dimensions, number of stator slots and number of stator conductors for 11-kW, 460-V, 6 pole, 50-Hz motor. Assume a full-load efficiency of 84% and power factor of 0.82 for each machine. The winding factor is 0.955. **08**

Q.3 **(a)** Explain the points to be considered for the selection of number of stator slots of an 3-phase induction motor. **07**

(b) Explain the construction of Hydro-generators with respect to stator core ,stator winding and bracing of stator overhang. **07**

OR

Q.3 **(a)** Explain the factors that effects the choice of specific magnetic loading in case of a synchronous machine. **07**

(b) A 1250 kVA , 3-phase, 50 Hz, 3300V, 300 r.p.m synchronous generator with a concentric winding has B_{av} =0.58 Wb /m^2 , ac= 33000A/m, gap length 5.5mm, field turns per pole =60, short circuit ratio =1.2, The effective gap area is 0.6 times the actual area. Peripheral speed is 30 m/s. Find the stator core length, stator bore , turns per phase , mmf for air gap, armature mmf per pole, and field current for no load and rated voltage. **07**

Q.4 **(a)** Write the steps and necessary equations for rotor design of an synchronous machine **07**

(b) Define SCR and its importance in designing of synchronous machine. **07**

OR

Q.4	**(a)**	Compare three phase induction motor and single phase induction motor	**07**
	(b)	Define is dispersion coefficient? Explain effect of Dispersion coefficient on maximum power factor and overload capacity of an Induction motor	**07**
Q.5	**(a)**	State the rules for selecting rotor slots of an 3-phase induction motor. Also explain the methods for the reduction of harmonic torque.	**07**
	(b)	A 15 kW, 400V , 3-phase , 50Hz, 6-pole induction motor has a diameter of 0.3m and the length of the core 0.12m. The number of stator slots is 72 with 20 conductors per slot. The stator is delta connected. Calculate the value of magnetizing current per phase if the length of air gap is 0.55m. The gap contraction factor is 1.2. Assume the mmf required for the iron parts to be 35 per cent of the air gap mmf. Coil span =11 slots.	**07**

OR

Q.5	**(a)**	Explain the current distribution in the bars and the end rings of a squirrel cage induction motor. Also derive the relation for the current in the end ring.	**07**
	(b)	Derive the equation of capacitance to give maximum starting torque of capacitor start single phase induction motor.	**07**

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