Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC SEMESTER VIII– EXAMINATION – SUMMER 2017

Subject Code: X80902 **Date: 01/05/2017**

Subject Name: Electrical Machine Design I and II

Time: 10.30AM to 01.00PM **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)** Which are the losses occurring in transformer? Derive condition for maximum efficiency. **07**

(b) Explain how following factors affect the main dimensions of a d.c. machine. **07**

(1) L/τ ratio,

(2) Peripharal speed,

(3) Moment of inertia,

Q.2 **(a)** Derive relation $E_t = k\sqrt{Q}$, Q= kVA rating of a transformer. Discuss significance of the value of k. **07**

(b) Discuss design procedure to design a commutator and brushes of a d.c. machine. **07**

OR

(b) Determine main dimensions of 50 kW, 4 pole , 600 rpm, dc shunt generator with full load terminal voltage 220 V. The maximum gap flux density is 0.83 wb/m^2. And specific electric loading is 30000. **07**

Assume that full load armature voltage drop is 3% of rated terminal voltage and field current is 1% of rated full load current. Ratio of pole arc to pole pitch is 0.67 and pole face is square.

Q.3 **(a)** Discuss process of calculating no load current for a three phase transformer from design data. **07**

(b) What is Dispersion coefficient? Explain the effect of Dispersion coefficient on maximum output power factor. **07**

OR

Q.3 **(a)** Discuss factors to be considered while selecting number of poles in the design of d.c. machine. **07**

(b) Discuss the effect of "skewing" on the performance of three phase induction motor. **07**

Q.4 Calculate (1) main dimension of stator ,(2) no. of stator slots and (3) winding turns per phase for a 22.5 kw , 3 ph. , 440 V , 960 rpm , 50 hz, delta connected induction motor for overall good electrical design. Assume ac/m = 25000 ; Bav = 0.46T, ; p.f. = 0.87 and peripheral velocity should not exceed 30 m/sec **14**

OR

Q.4 **(a)** Discuss factors affecting the length of air gap on performance of a three phase induction motor. **07**

(b) Explain which combinations of number of stator and rotor slots should be avoided in the induction motor design ? why? **07**

Q.5	**(a)**	Discuss the effect of SCR in the design of synchronous machine..	**07**
	(b)	Explain the terms “critical speed” and “run away speed” with reference to synchronous machine.	**07**

OR

Q.5	**(a)**	Write technical note on classification of insulating materials.	**07**
	(b)	Write steps and necessary equations for rotor design of a synchronous machine.	**07**

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