Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI- EXAMINATION – SUMMER 2016

Subject Code:160804 **Date:17/05/2016**

Subject Name:Electrical Machine Design

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.**

Q.1	**(a)**	Deduce an expression for the m.m.f required for the air gap of an armature with slots and ducts.	**07**
	(b)	Explain the methods for the estimation of mmf for the tapered teeth.	**07**
Q.2	**(a)**	Define heating time constant and explain how it can be evaluated from heating curve.	**07**
	(b)	Explain the Real and Apparent flux densities.	**07**
		OR	
	(b)	A 15 kw, 230-V, 4 pole d.c. machine has the following data: armature diameter=0.25m; armature core length= 0.125 m; length of air gap at pole centre = 2.5 mm; flux per pole = 11.7 x 10(-3) Wb, ratio pole arc/ pole pitch = 0.66. Calculate the mmf required for air gap (I) if the armature surface is treated as smooth. (ii) if the armature is slotted and the gap contraction factor is 1.18.	**07**
Q.3	**(a)**	Deduce an expression for the design of core for Square and cruciform sections also state the reason why circular coils are always preferred in comparison to rectangular coils.	**07**
	(b)	A 200 KVA,6600/440 V,50 Hz,3-phase core type transformer has the following parameter. Maximum flux density=1.3 wb/m^2,emf per turn=10 V ,stacking factor=0.9,Window space factor=0.3,current density=2.5A/mm^2,overall width=overall height,3-stepped core is to be used. Calculate over all dimension.	**07**
		OR	
Q.3	**(a)**	Deduce the expression for the EMF equation of a single phase and three phase transformer.	**07**
	(b)	Show that for minimum total material cost of a 3-phase transformer the ratio (Weight of iron/Weight of copper) should be equal to the ratio (specific cost of Copper (Rs./kg) / specific cost of iron ((Rs. /kg)).	**07**
Q.4	**(a)**	What is meant by specific electric and magnetic loadings of a rotating machine?	**07**
	(b)	The diameter and length of a 500 KW,500 V,455 r.p.m., 6 pole dc generator are 84 cm and 35 cm respectively. If it is lap wound with 660 conductors, estimate the specific electric and magnetic loadings.	**07**

OR

Q.4	**(a)**	Discuss the factors that determine the choice of air-gap in induction motor.	**07**
Q.4	**(b)**	Discuss the factor which govern the choice of specific loadings for a 3-ph induction motor.	**07**
Q.5	**(a)**	What are the important points to be considered while selecting the length of the air gap of a dc machine?	**07**
	(b)	Find the suitable number of poles and the dia. Of the core of a 400 KW,550 V,180 rpm dc generator having 92% efficiency. Assume an average flux density in the air gap of about 0.6 wb/m^2 and ampere conductor per meter to be 35000.	**07**

OR

Q.5	**(a)**	Discuss the factors which govern the choice of number of poles in dc machine.	
	(b)	Why the length of air gap in induction motor is kept minimum possible where as in dc machine it is larger?	

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