

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER- VI • EXAMINATION-SUMMER 2015****Subject Code:160804****Date:14/05/2015****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 the expression of m.m.f for the air gap of the armature for the slotting and ducting. **07**
- (b) Explain the factors affecting the choice of electrical loading. **07**
- Q.2** (a) Explain the Real and Apparent flux densities. **07**
- (b) Derive the expression for the leakage permeance of parallel sided slot **07**
- OR**
- (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.3** (a) Define specific magnetic loading (B_{av}) and specific electric loading (a_c) and obtain an expression for the “output co-efficient for a d.c. machine. **07**
- (b) Discuss the factors that determine the choice of air-gap in induction motor. **07**
- OR**
- 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) Define heating time constant and explain how it can be evaluated from heating curve. **07**
- Q.4** (a) Derive the expression for the KVA rating of a three phase transformer and show that the e.m.f per turn $E_t = K\sqrt{KVA}$. **07**
- (b) Derive the condition for the optimum design of transformer for the minimum cost and minimum losses. **07**
- OR**
- Q.4** (a) Explain the methods of estimation of motor rating for variable load drives. **07**
- (b) The temperature rise of a transformer is 25° after one hour and 37.5° after two hours of starting from cold conditions. Calculate its final steady temperature rise and the heating time constant. If its temperature falls from the final steady value to 40° C in 1.5 hour when disconnected, calculate its cooling time constant. The ambient temperature is 30° C. **07**
- Q.5** (a) What are the important considerations in choosing number of poles in d.c. machine? **07**
- (b) List and explain briefly the limitations being imposed in the design of electrical machines also discuss the modern trends in the design. **07**
- OR**
- Q.5** (a) What are the types of windings commonly used in transformer and on what basis are they selected? **07**
- (b) Explain the methods for the estimation of Mmf for the tapered teeth. **07**
