Roll No. | | | | | | | | | | | | |

Total No. of Pages : 02

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B.Tech. (Electronics Engg) (E-1 2012 Onwards) (Sem.–6)

ELECTRICAL MACHINE DESIGN

Subject Code : BTEEE-603A

M.Code : 72842

Time : 3 Hrs. Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1. Answer briefly:

a. What are the *"main dimensions"* in machine design?

b. What are the factors that affect volume of a three phase induction motor?

c. Define short time and intermittent rating of induction motor.

d. Why machines with large dimensions are more efficient?

e. Write the differences between core and shell type transformer.

f. What is the function of fins on the tank of transformer?

g. Write the function of frame of a three phase induction motor.

h. Which design factors influence the power factors of induction motor?

i. What is peripheral speed of rotating machine?

j. What are the design parameters responsible for increase in starting torque?

SECTION-B

2. What are the cooling methods applied for reduction of temperature rise of a transformer?

3. Derive the output equation for design of a three phase transformer.

4. Derive the condition for design of minimum cost in a transformer.

5. Discuss the steps of calculations for designing number of stator slots and area of stator slots of a three phase induction motor.

6. A 3-phase, 4 pole induction motor has 24 slots. Calculate the order of slot harmonics produced. It is desired to completely eliminate the higher order slot harmonic, find the angle through which the bars must be skewed. Find the effect of skewing on the lower order harmonic.

SECTION-C

7. Determine the core dimensions, number of stator slots, number of stator conductors for a 10 kW, 415V, 3-Ph, 4 pole, 50 Hz. Motor. Assume winding factor 0.955, full load efficiency 0.85, power factor 0.8. For the machine B_{av} = 0.35 Wb/ m^2 ac = 20000 A/m. Output coefficient C_0 = 87.2, L/τ = 0.83.

8. Calculate the approximate overall dimensions for a 100 KVA, 6000/440V, 50 Hz. 3-Ph core type transformer. Volts/ turn, E_t = 10V, Flux density B_m = 1.1 Wb/ m^2 , current density δ = 2.5 A/ m^2 , Winding factor K_w = 0.3, Overall height = overall width, stacking factor 0.9. Use a 3-stepped core.

9. Derive the equation of temperature rise with time in electric machines. What is heating time constant? Briefly discuss about induced, forced, radial and axial ventilation. Write the advantages of hydrogen cooling in turbo alternators.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.