Exam.Code:0936
Sub. Code: 33772

2055

B.E. (Electrical and Electronics Engineering)

Sixth Semester

PC-EE-605: Electric Machine Design

Time allowed: 3 Hours Max. Marks: 50

NOTE: *Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Unit.*

x-x-x

I. Attempt the following:-

a) Explain why real and apparent flux densities differ and how this impacts machine performance.

b) Why is forced ventilation preferred in large machine over natural cooling?

c) How does the choice of conductor size affect the efficiency and thermal performance of a transformer?

d) Why is the number of stator and rotor slots carefully chosen to avoid harmonic torques?

e) Explain the reason behind calculating output coefficient during alternator design.

(5x2)

UNIT - I

II. a) Discuss the steps involved in separating the main dimensions of rotating machines. What design considerations are taken into account?

b) A 350 kW, 500v, 450 rpm, 6-pole dc generator is built with an armature diameter of 0.87m and core length of 0.32m. The lap wound armature has 660 conductors. Calculate specific electric and magnetic loadings. (2x5)

III. a) Explain various methods of cooling used in electrical machines. How does choice of cooling method impact machine rating and performance.

b) Discuss various duties and ratings of rotating machines and give their temperature time curves. (2x5)

IV. Determine the main dimensions of the core, the number of turns, the cross-section of conductors for a 50 kVA, 11000/400 volts, 50Hz, 1-ϕ core type distribution transformer. The net copper area in the window is 0.6 times the net cross-section area in the core. Assume a square cross-section for the core, a flux density of 1.0 wb/m^2, a current density 1.4 ampere per mm^2, and window space factor 0.2. The height of window is 3 times its width. (10)

P.T.O.

UNIT - II

V. a) Derive the output equation of a three-phase induction motor and explain significance of each tern.

b) Estimate the main dimensions, air gap length, stator slots, and cross section area of station conductors for a 3-ϕ, 15HP, 400V, 6 pole, 50Hz, 975 rpm induction motor. The motor is suitable for star-delta starting. B_{av} = 0.45wb/m^2, ac = 20000 amp cond/m, L/Z = 0.85, η=0.9, p.f. = 0.85. (2x5)

VI. What do you mean by SCR? How the value of SCR affects the design of alternator. Describe the procedure to design the main dimensions of an alternator. What parameters affect the diameter and core length. (10)

VII. a) What is computer aided design of electrical machines? Explain different method of designing CAD based machine design.

b) Enumerate the advantages and disadvantages of providing large air-gap in synchronous machines. (2x5)

x-x-x