Exam.Code:0936
Sub. Code: 33772

2015

B.E. (Electrical and Electronics Engineering)

Sixth Semester

PE-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) How do you separate D and L from the volume D^2L of a three-phase induction motor?

b) Explain the hybrid techniques available for computer aided design.

c) Explain the factors considered for selection of air-gap length in induction motor.

d) Define Window space factor in the design of transformers.

e) Explain why stepped core are generally used for transformers. (5x2)

UNIT - I

II. a) Explain the different types of ventilations in electrical machines.

b) Derive volt per turn equation of a single-phase transformer. (2x5)

III. Determine the dimensions of core and yoke of a 200 kVA, 50 Hz, single phase core type transformer. A cruciform core is used with distance between adjacent limbs equal to 1.6 times width of core laminations. Assume voltage per turn 14V, maximum flux density $1.1 wb/m^2$, window space factor 0.32, current density $3A/mm^2$ and stacking factor of 0.9. The net iron area is $0.56\ d^2$ in a cruciform core where d is diameter of circumscribing circle and width of largest stamping is 0.85d. (10)

IV. a) Explain continuous rating, short time rating and intermittent rating with reference to electrical machines.

b) Derive the output equation in terms of design constants for a three-phase core type transformer. Also explain forces which affect the core of the transformer. (2x5)

P.T.O.

UNIT - II

V. a) Design the main dimensions of a 25kW, 3-phase, 415V, 50Hz, 1475 rpm squirrel cage induction motor having an efficiency of 85% and full load power factor of 0.86. Assume B_{av} = 0.5T, ac = 28000 A/m. The rotor peripheral velocity is 25 m/s at synchronous speed.

b) Explain the concept of cogging and crawling in the design of 3-phase induction machine. (7,3)

VI. a) Derive the output equation of a synchronous generator.

b) Define short circuit ratio in connection with 3-phase synchronous generator. Discuss its effects on the machine performance. (2x5)

VII. What do you mean by computer aided design? How does it help in designing electrical machine? Explain the various methods and steps involved in the computer aided design of electrical machines. (10)

x-x-x