SATHYABAMA UNIVERSITY

(Established under section 3 of UGC Act, 1956)

Course & Branch: B.E – EEE
Title of the paper: Electrical Machine Design

Semester: V	Max.Marks: 80
Sub.Code: 414505-614502	Time: 3 Hours
Date: 29-04-2009	Session: AN

PART – A   (10 x 2 = 20)
Answer All the Questions

1.   List the Indian standard specification for Transformer.

2.   Why the total loadings are not used to determine the output of a rotating machine?

3.   Mention the important factor which affects the proportions of the armature core in a dc machine.

4.   Write the equation for maximum value of the main dimensions of a dc machine.

5.   Distinguish between core and shell type transformers.

6.   Define copper space factor in transformer.

7.   Name the materials used to insulate the laminations of the core in an induction motor.

8.   How the induction motor can be designed for best power factor?

9.   What is crawling and cogging?

10. State the factors for separations of D and L for cylindrical rotor machine.

<div align="center">PART – B   (5 x 12 = 60)</div>
<div align="center">Answer All the Questions</div>

11. Estimate the main dimensions of a 6-pole, 200kW, 1500 rpm dc generator by assuming 25000 ampere-conductors and 0.6wb/m^2 for specific electric and magnetic loadings. Assume that the length of armature is equal to the pole pitch.

<div align="center">(or)</div>

12. Calculate the mmf required for airgap of a dc machine from the following data. Length = 170mm, width of duct = 10mm, number of ducts = 4, pole arc / pole pictch = 0.67, slot pitch = 28mm, length of airgap = 5mm, average airgap density = 0.71wb/m^2 and slot opening = 13mm.

13. Explain the choice of number of poles used in dc machines. Mention the advantages and disadvantages of large number of poles.

<div align="center">(or)</div>

14. A 500kW, 400V, 4-pole dc machine is rotating at 600rpm and the commutator diameter is 0.9m, current density at brush contact is 6.8 x 10^{-3} A/mm^2, brush pressure is 13.8kN/m^2, coefficient of friction is 0.28 and brush contact drop is 1.9V. Determine the total losses in the commutator.

15. Derive the output equation of a three phase transformer.

<div align="center">(or)</div>

16. The tank of a 500kVA, 1-ph, 50Hz, 6600/400V transformer is 110cm X 155cm. If the load losses is 6.2kW, find the suitable arrangements for the cooling tubes to limit the temperature rise to 35. Take the diameter of the cooling tubes as 5cm and average length of tube as 110cm.

17. Explain the rules for selecting rotor slots and derive the expression for the rms value of end ring current.

(or)

18. Determine the approximate diameter and length of stator core, the number of stator slots and the number of conductors for a 11kW, 400V, 3-ph, 4-pole, 1425rpm, delta connected induction motor. The specific electric and magnetic loadings are 23000 ampere-conductors/m and $0.45wb/m^2$, full load efficiency is 0.85, power factor is 0.88 and L/τ is 1. The stator employs a double layer winding.

19. Explain the open circuit and short circuit characteristics of an alternator and give the importance of short circuit ratio.

(or)

20. With a neat sketch indicate the location of damper windings in a synchronous machine. Also sketch the shape of salient pole rotor for synchronous machine.