SATHYABAMA UNIVERSITY
(Established under section 3 of UGC Act, 1956)

Course & Branch: B.E - EEE
Title of the paper: Electrical Machines Design
Semester: V   Max. Marks: 80
Sub.Code: 314505   Time: 3 Hours
Date: 06-11-2008   Session: FN

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

1. List the Indian standard specifications for transformer?

2. What is Leakage flux in magnetic circuits?

3. What is back pitch?

4. State the various factors that depends upon the length of the commutator in a D.C machine?

5. Why is the Yoke cross section made larger than the core cross section in transformer?

6. What is the purpose of providing a conservator on a transformer tank?

7. How will you find the synchronous speed of the 3 phase induction motor?

8. What are the advantages of slip ring induction motor over cage induction motor?

9. Mention the uses of damper windings in a synchronous machine.

10. A 3 phase 400 V, 50Hz, 4 pole Synchronous motor has load angle of 20 degree electrical. Find the equivalent mechanical degree.

PART – B (5 x 12 = 60)

Answer All the Questions

11. A 350 kW, 500V, 450 rpm, 6 pole d.c. generator is built with an armature diameter of 0.87 m and a core length of 0.32m. The lap wound armature has 660 conductors. Calculate the specific electric and magnetic loadings.

(or)

12. What are the important properties of insulating materials? Give the classifications of insulating materials.

13. A shunt field coil has to develop an mmf of 9000A. The voltage drop in the coil is 40 V, and the resistivity of round wire used is 0.021 ohm/m and mm^2. The depth of winding is 35 mm approximately And the length of mean turn is 1.4m. Design a coil so that the power dissipated is 700 W/m^2 of the total coil surface (i.e. outer. Inner, top and bottom). Take the diameter of the insulated wire 0.2mm greater than that of bare wire.

(or)

14. A 350 kW, 500 V generator has a 8 poles, an armature diameter of 1.3m and a core length of 0.35 m.A duplex winding is accommodated in 114 slots with 6 coil sides per slot. The axial length of commutating pole is 0.2m and the gap length under the commutating pole is 10mm. Find the necessary mmf for each inter pole if the specific permeance is $6x10^{-6}$. find also the number of turns.

15. Explain the design of small single phase transformer in detail.

(or)

16. The cruciform cores in a 200 KVA, 6600/400 V, 50 Hz, 1 phase core type transformer are enclosed in a circumscribing circle of 37 cm diameter. Find the number of turns for a flux density of 1.2 wb/m2 and suitable conductor sections for a current density of $2A/mm^2$.

17. Determine the main dimensions and the number of turns per phase of a 307 Kw, 400 volt, 3 phase, 4 pole, 5Hz squirrel cage induction motor to be started by a star delta starter.

    Assume:

    Average flux density in the gap = $0.45\ wb/m^2$,
    Ampere conductors / metre = 23000
    Efficiency = 0.85, power factor = 0.84
    Winding factor = 0.955. Stacking factor = 0.9

    Machines rated at 3.7 Kw, 4 pole are sold at a competitive price and therefore choose the main dimensions to give a cheap design.

(or)

18. A, 4 pole, 3 phase induction motor has its maximum power factor of 0.9 at its normal full load of 10 Kw. The efficiency at full load is 89% . Find the effect oif increasing the air gap length by 50% on maximum power factor, full load output and efficiency.

19. Derive the output equation of an alternator interms of the main dimensions.

(or)

20. A 1250 kVA, 3 phase, 6600 V, salient pole alternator has the following data:

    Air gap diameter = 1.6m; length of the core = 0.45m;
    Number of pole = 20
    Armature ampere conductors/metre = 28000 pole pitch = 0.68 stator slot pitch = 28mm; current density in damper bars = $3A/mm^2$. Design a suitable damper winding for the machine.