Register Number……

B.E. DEGREE EXAMINATIONS: APRIL/MAY 2012

Sixth Semester

ELECTRICAL AND ELECTRONICS ENGINEERING

EEE116: Design of electrical Apparatus

Time: Three Hours **Maximum Marks: 100**

Answer All Questions:-

PART A (10 x 1 = 10 Marks)

1. The harmonic or differential leakage flux is called _____ .

a) Fringing b) Belt leakage flux c) Specific permeance d) Leakage coefficient

2. The mmf creates flux in a closed path against the _____ of the path.

a) reactance b) voltage c) reactance d) Resistance

3. The armature core is made of laminations of thickness _____

a) 0.05mm b) 0.5 mm c) 0.4 mm d) 0.6 mm

4. _____ are used for mechanical balancing of armature.

a) Slots b) field coils c) dummy coils d) armature coil

5. The power transformer will have maximum efficiency at _____.

a) minimum copper loss b) minimum iron loss

c) copper loss = iron loss d) maximum copper loss

6. The convection of heat by oil is _____ times more than that of air.

a) 4 b) 6 c) 9 d) 10

7. _____ is providing to reduce hunting in alternators.

a) dummy coils b) damper winding c) armature coil d) Interpoles

8. If an induction motor runs at a stable speed less than the rated speed then it is called _____.

a) cogging b) crawling c) Dampering d)skew

9. The _____ is employed in ac machines to reduce harmonics.

a) damper winding b)dummy coils c)short chorded winding d) None of these

10. The effect of cross magnetization in an alternator field is to make the output

a) true sinusoidal b) non sinusoidal

c) harmonic free d) square.

PART B (10 x 2=20 Marks)

11. How to minimize the magnetic leakage?
12. State the relationship between apparent flux density and real flux density.
13. What is equalizer connection?
14. What are the factor that influence the choice of commutator diameter?
15. Why stepped cores are used in transformer?
16. What are the factors to be considered to choose the type of winding for a core type of transformer?
17. What is run away speed?
18. Why the airgap of an induction motor is made as small as possible?
19. Determine the total number of slots in the stator of an alternator having 4 poles, 3 phase, 6 slots per pole for each phase?
20. What is the limiting factor for the diameter of synchronous machine?

PART C (5 x 14 = 70 Marks)

21. a) (i) Determine the airgap length of a dc machine from the following particulars: gross length of core = 0.12 m, number of ducts = 1 and is 10 mm wide, slot pitch = 25mm, slot width = 10mm, carter's coefficient for slots and ducts = 0.32, gap density at pole center = 0.7 Wb/m^2, field mmf/pole = 3900 AT, mmf required for iron paths of magnetic circuit = 800 AT. (10)

(ii) Explain the cooling of turbo alternators. (6)

(OR)

b) (i) Calculate the apparent flux density at a section of the teeth of an armature of a dc machine from the following data at that section: slot pitch=24 mm , slot width = tooth width =12 mm, length of srmature core including 5 ducts of 10mm each =0.38 m, iron stacking factor =0.92 . true flux density in teeth at that section is 2.2 Wb/m^2 for which the mmf is 70,000 AT/m. (10)

(ii) Write short notes about Thermal rating. (6)

22. a) Calculate the size of the conductor and number of turns for the field coil of a 6 poles 460V, dc shunt motor. The coil is to supply 4000AT at the working temperature , where ρ = 0.02 micro ohm m. The length of the inside turn is 0.74 m, the space factor of the winding is 0.52 and the permissible dissipation per sq.m of external surface (excluding the two ends) is 1200 watts. Solution should not be attempted by assuming a numerical value for the winding depth.

(OR)

b) Design a suitable commutator for a 350kW, 600 rpm, 440v, 6 pole dc generator having an armature diameter of 0.75 m. The number of coils are 288. Assume suitable values wherever necessary.

23. a) Derive the optimal designing aspects in achieving minimum cost and minimum losses of the transformer.

(OR)

b) A 250 kVA, 6600/400V, 3 phase core type transformer has a total loss of 4800 watts on full load. The transformer tank is 1.25 m in height and 1m X 0.5 m in plan. Design a suitable scheme for cooling tubes if the average temperature rise is to be limited to 35 C. The diameter of the tube is 50 mm and are spaced 75mm from each other. The average height of the tube is 1.05m.

24. a) Calculate the equivalent resistance of rotor per phase referred to stator, from the following data of a 400 v, 3 phase, 4 pole , 50 Hz cage motor. Stator slots = 48 with 30 conductors per slot, rotor slots =53 with one bar in each slot. The length of each rotor bar is 0.12 m and area 60 mm^2. The end rings have a mean diameter of 0.18 m and an area of cross section 150mm^2. Full pitch winding with 60 degree phase spread is used for the stator. The material used for bars and end rings has a resistivity of 0.021 ohm/m and mm^2.

(OR)

b) (i) Design a cage rotor for a 40 HP, 3 phase , 400 V, 50 Hz, 6 pole, delta connected induction motor having a full load efficiency of 87% and a full load pf of 0.85. take D = 33 cm and L=17 cm. Stator slots =54, conductors per slot =14. assume suitably the missing data if any. (10)

(ii) How the dimensions of induction generator differs from that of an induction motor. (6)

25. a) (i) For a 250 kVA, 1100 V, 12 pole, 500 rpm, 3 phase alternator . Determine airgap diameter, core length, number of stator conductors, number of stator slots and cross section of stator conductors. Assuming the average gap density as 0.6 wb/m2 and specific electric loading 0f 30,000 amp.cond.m. $L./\tau = 1.5$. (10)

(ii) Explain short circuit ratio for synchronous machine. (6)

(OR)

b) Write short notes on

(i) Computer aided design of electrical machine. (8)

(ii) Design of field coils of synchronous machine. (8)

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