ELECTRICAL AND ELECTRONICS ENGINEERING BRANCH

SIXTH SEMESTER

EE 9355 - DESIGN OF ELECTRICAL APPARATUS

(REGULATIONS 2008)

Duration: 3 Hrs   Max. Marks: 100

PART – A (10 x 2 = 20 Marks)

1. Which class of insulation is commonly used for induction motors and name the materials used in it?

2. What is called the frame size of a rotating machine? Explain it with necessary diagram?

3. What is the choice of specific loadings in a d.c. machine?

4. What is called accelerated commutation? How it affects the performance of brushes in d.c. machines?

5. Draw the construction diagram of a shell type transformer.

6. Why the output rating of a transformer is expressed in kVA?

7. If the mmf and air gap flux density of a three-phase induction motor are pure sinusoidal signals then write down the expression relating magnetizing current and average flux density.

8. Which equivalent circuit parameter of the three phase induction motor influences the induced emf?

9. How harmonics are reduced in the induced e.m.f. of the armature winding in an alternator?

10. What are the effects of having low short circuit ratio in synchronous generators?

PART – B (5 X 16 = 80 Marks)

11 a) i). What are the factors that influence the choice of specific magnetic loading and specific electrical loading in an electrical machine?   [8]

ii) Show that the increase in number of poles reduces weight of armature core in a rotating machine.   [8]

12. a) The armature of a 12 pole, 500 kW, 550 V generator has a simplex lap winding consisting of 2484 conductors. There are 621 commutator segments. The ratio of pole arc to pole pitch is 0.7. (i). Calculate the demagnetizing mmf per pole at half the rated current, if the brushes are shifted through two segments from the geometric neutral axis. What is

the cross magnetizing mmf per pole? (ii). Calculate the number of conductors that must be provided in each pole face if a compensating winding is used for the machine.

(OR)

12. b) Draw the winding diagram in developed form for a simplex lap wound d.c. machine with 6 poles and armature of 24 slots and 24 commutator segments. Show the position of the brushes.

13. a) Obtain the output equation of a three-phase transformer and further lay down the design procedure to be followed for a three-stepped core type transformer.

(OR)

13. b) The tank of a 150 kVA oil immersed natural cooled (ON) transformer has the dimensions 100cm x 55cm x 120 cm height. Design a suitable arrangement of cooling tubes of mean length 100 cm to limit the temperature rise to 35°C, if the full load losses to be dissipated are 5 kW. Make suitable assumptions wherever necessary.

14. a) Find the main dimensions of a 15 kW, 3-phase, 400 V, 50 Hz, 2810 rpm squirrel cage induction motor having an efficiency of 0.88 and a full load power factor of 0.9. Its specific magnetic loading = 0.5 Wb/ m^2, specific electric loading = 25,000 A/m. Take the rotor peripheral speed as 20 m/s at synchronous speed.

(OR)

14. b)   Discuss the design features of three phase slip ring induction motor.

15. a) Discuss the design of cylindrical pole three phase alternator.

(OR)

15. b) Explain how the electrical machine parameters are analysed using FEM technique.