



B.E. DEGREE EXAMINATION, April -May – 2011
VI SEMESTER
ELECTRICAL AND ELECTRONICS ENGINEERING
EE384 DESIGN OF ELECTRICAL APPARATUS

Time: 3 Hours

Max. Marks: 100

Answer all questions

PART- A (10 X 2 = 20)

1. What is an Engineering design?
2. How does the ratio $r = \phi_m / AT$ affect in the design of transformer.
3. List the assumption made in field coil of a DC machine.
4. State an empirical formula for finding the length of the air gap of in Induction motor design?
5. What are commutator losses?
6. Prove that the value of two current densities in each of two transformer windings should be equal for minimum I^2R losses.
7. How does the number of poles and slots affect the induction motor design?
8. Suggest few methods of reducing Harmonics due to field form in alternators.
9. What is the difference between power transformer and distribution transformer?
10. What is a circle diagram?

PART- B (5 X 16 = 80)

11. Determine the main dimensions, number of poles and the length of air gap of a 500 kW, 500 V, and 1000 rpm DC generator. Assume average gap density as 0.65 Wb/m^2 and the ampere conductors per metre as 25,000. The ratio of pole arc to pole pitch is 0.72 and the efficiency is 90%. Assume any other relevant data.

12a. Derive the emf equation and output equations of single phase and 3 phase transformer.

(OR)

12. (b) The tank of a 1250 kVA transformer has the dimensions, 1.50m x 0.555m x 1.75m in length, width and height respectively. The full load loss is 15 kW. Find the number of tubes for temperature rise of 40° C. Assume all other data.

13. (a) Determine the dimensions of the core, number of conductors and slots for a 3 phase, 250 kVA, 3300 V, 50 Hz, 900 rpm star connected alternator, assuming the mean flux density over a pole pitch to be 0.55 Wb/m² and the approximate number of ac/cm of air gap periphery to be 250.

(OR)

13.(b) A 150 hp, 3 phase, 2000 V, 50 Hz, 10 pole star connected IM has 3 slots/pole/phase on the stator. The flux per pole is 0.025 Wb. The air gap area is 480 cm² and the length of the pole gap is 1 mm. If the ampere turns for the iron paths are 20% those for air gap, find the magnetizing current of the motor. Assume full pitched coil and distribution factor of 0.95.

14. (a) Explain the construction and working principle of a synchronous generator and derive its output equation.

(OR)

14.(b) Determine the main dimensions of the stator and the number of slots for a 5 hp, 6 pole, 50 Hz, 415 V, and 3 phase induction motor. $B_m = 0.35$ Wb/m² and $q = 23000$ ac/m. Full load efficiency and power factor are 0.85 & 0.85 respectively. Assume the core length to be equal to the pole pitch.

15. (a). Explain the role of computers in the design of electrical machines with a neat flow chart.

(OR)

15. (b) Explain the principles finite element method in electrical machine design problems