3ϕ, 50 Hz, 1500 r.p.m. squirrel cage inductor motor use the following data: 8

Average flux density in the air gap = 0.46 wb/m^2

Ampere conductor per meter of armature periphery = 22000

Full load efficiency = 83%

Full load p.f. = 0.84 lagging

Roll No .....

EE - 603

B.E. VI Semester

Examination, December 2014

Electrical Machine Design

Time : Three Hours

Maximum Marks : 70

Note: i) Total No. of question 10.
ii) Attempt one from each unit.

Unit - I

1. a) Explain procedure of mathematical formulation of electrical machine design problem in CAD. 7

   b) What are the various advantage of CAD? 7

OR

2. a) Explain NPL method of solution of design problem. 7

   b) Describe flow chart of CAD of rotating electrical machine. 7

Unit - II

3. a) Explain the objective function for the optimal design of D.C. machine. 7

   b) Give the algorithm for optimal design of D.C. machine. 7

OR

4. a) Deduce from the first principle an expression connecting main dimension of the armature of D.C. machine. 7

   b) Find the suitable number of poles and the diameter of the core of a 400 kW, 550 V, 180 r.p.m. D.C. generator having 92% efficiency. Assume an average flux density in the air gap of about 0.6 wb/m^2 and ampere conductor per meter to be 35000. 7

Unit - III

5. a) Explain the constraint functions for optimal design of power transformer. 7

   b) Give the algorithm for optimal design of power transformer. 7

OR

6. a) Distinguish between distribution and power transformer. Also explain why power transformers are designed to have maximum efficiency at or near full load. 7

   b) State and discuss the different types of windings used in core type power transformer. 7

Unit - IV

7. a) Give the mathematical formulation for the optimal design of 3ϕ alternator. 7

   b) Give the algorithm for optimal design of 3ϕ alternator. 7

OR

8. a) Derive the output equation of synchronous machine and explain various design parameters used there in. 6

   b) Design the stator core for 10 MVA, 11 kV, 50 Hz 3ϕ, 2pole, turbo alternator based on the following information: 8

   Specific magnetic loading Bav = 0.63 tesla

   Specific electric loading = 4,8000 amp/cond/m

   Peripheral speed = 120 m/sec

   Length of air gap lg = 2 cm

   Stator winding factor kw = .955

Unit - V

9. a) Explain the constraint functions for optimal design 3ϕ induction machine. 7

   b) Give the algorithm for optimal design of 3ϕ induction machine. 7

OR

10. a) Deduce the expression for output equation of 3ϕ induction motor. 6

   b) Find the main dimensions, no. of stator ferns, size of conductor and number of stator slots of a 5 H.P., 400V,