Roll No .....

EX - 801

B.E. VIII Semester

Examination, June 2015

Computer Aided Electrical Machine Design

Time : Three Hours

Maximum Marks : 70

Note: i) Attempt any five questions.
ii) All questions carry equal marks.

1. a) What are mathematical programming methods? Explain.
   b) Enumerate the advantages of computer aided design of electrical machines over conventional approach of design.

OR

2. a) Describe the concepts and standard form of linear programming and non-linear programming techniques.
   b) Discuss the various types of optimization problems and their mathematical formulations.

3. a) Discuss how the field winding of a d.c. machine is designed.
   b) Calculate the length and diameter of the armature of a 7.5 kw, 220V, 1000 rpm, 4-pole d.c. shunt motor with following design data :
   Full load efficiency = 0.83; maximum flux density in the air gap = 0.9 wb/m^2, ac = 30,000 A/m; field form factor = 0.7; maximum efficiency occurs at full load; the field current is 2.5% of the rated current; a square pole face is used.

OR

4. a) What is meant by specific electric and magnetic loadings of a rotating machine? Discuss the factors affecting specific loadings for a d.c. machine.

   b) Explain the procedure for calculation of main dimension of DC machine.

5. a) Discuss the different factors which are taken in to account while designing the rotor for a 3-phase slipring induction motor.

   b) Draw a flow chart for optimal design of 3-phase squirrel cage induction motor for specific application.

OR

6. a) In the design of a 30 H.P., 3-phase, 440V, 960 rpm, 50Hz, delta connected induction motor, assume the specific electric loading of 25,000 ac/m; specific magnetic loading of 0.46 wb/m^2. Full load efficiency 86%, p.f. 0.87 and estimate the stator core dimension of the machine.

   b) Explain the phenomenon of cogging and crawling in an induction motor. What steps will you suggest at the design to minimize the occurrence of this phenomenon?

7. a) Explain the procedure for the design of field system of salient pole machine.

   b) Find the main dimensions of a 100 MVA, 11 kV, 50 Hz, 40 pole salient pole generator assuming air gap flux density as 0.65 wb/m^2 and ampere conductors as 40,000 per metre. The peripheral speed should not exceed 60m/sec.

OR

8. a) What are the factors which decide the selection of variables for optimal design of 3-phase alternator? Explain.

   b) Draw a flow chart for optimal design of armature winding of 3-ϕ alternator.

9. a) Explain the procedure for design of windings of power transformer.

   b) What is the effect of change of supply frequency upon the voltage, losses, leakage reactance and resistance of the winding.

OR

10. a) Explain why power transformers are designed to have maximum efficiency at or near full load.

    b) A 2000 KVA, 6600/440 Volts, 3-phase, star connected 50 Hz core type transformer has the following particulars:

    Maximum flux density = 1.3 wb/m^2

    Current density = 2.5 amps/mm^2

    Window factor = 0.3

    Overall height = Overall width

    Window area = 1¼ times core area

    Calculate the overall core dimensions. Assume the core as 6-stepped section.

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