8. Write short notes on any *two* of the following : 10 each

(i) Optimization of design and its types

(ii) Linear and Non-linear programming

(iii) Effect of SCR on design of alternator

(iv) Difference in the design of squirrel cage and slipring rotor

Total No. of Questions : 8] [Total No. of Printed Pages : 4

Roll No. .....

EX–801(N)

B. E. (Eighth Semester) EXAMINATION, June, 2011

(Electrical & Electronics Engg. Branch)

COMPUTER AIDED ELECTRICAL MACHINE DESIGN

[EX–801(N)]

Time : Three Hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : Attempt any *five* questions. All questions carry equal marks. Assume suitable data wherever necessary.

1. (a) Discuss the desired fundamental properties of magnetic, insulating and conducting materials used in the design of electrical machines. 10

   (b) Discuss the method of cooling and its advantages of a high rating turbo-alternator. 10

2. (a) Write a technical note on window space factor and specific loadings in a transformer. 10

   (b) Calculate the core and window area of a 400 kVA, 50 Hz, 3 ph, core type power transformer that is to be designed for minimum volume. To achieve minimum volume, the volume of copper should be equal to volume of iron. Assume the following data : 10

   (i) Ratio of length of the mean flux path to length of mean turn of copper = 2.

(ii) Maximum flux density in the core = 1·45 tesla.

(iii) Current density = 2·75 A/mm^2.

(iv) Window space factor = 0·15.

3. (a) Suggest the modifications in design of a transformer if : 10

(i) Magnetising current of core loss is high.

(ii) Copper loss and percentage resistance is high.

(iii) Percentage reactance is high.

(b) Determine the dimensions of core and yoke of a 200 kVA, 50 Hz, single-phase core type transformer. A square core is used with distance between limbs equal to 1·8 times the diameter of the circumscribing circle of the core. Assume voltage per turn to be 14 V, window space factor to be 0·32, max. flux density to be 1 tesla, current density to be 3 A/mm^2.

where $A_i = 0{\cdot}45\, d^2$

show all these dimensions in a sketch. 10

4. (a) What are the requirements and limitations of a good design ? 10

(b) Draw flowchart to differentiate between design and its types and computer aided machine design. 10

5. (a) Discuss briefly the changes you would suggest in the design of a three-phase squirrel cage induction motor to achieve the following : 10

(i) Increase starting torque

(ii) Increase full load power factor

(iii) Reduce slip

(iv) Increase efficiency

(v) Reduce temperature rise

(b) Obtain the approximate core dimensions of 30 HP, 3-phase, 440 V, 50 Hz, 6 pole, induction motor using the following data : 10

Sp. Magnetic loading	= 0·45 tesla
Sp. Electric loading	= 25000 abs per metre
Full load efficiency	= 0·86
Power factor	= 0·87
Assume K_W	= 0·955
L/C	= 1·5 for economical design

Also assume 2 slots per pole per phase.

Assume that its stator winding is to be delta connected for normal running. Also determine the number of stator turns and number of stator slots.

6. (a) Draw a flowchart detailing all the steps to arrive at the height of the field coil $h_f = \dfrac{I_f T_f}{10^4 \sqrt{d_f S_f P_f}}$ of a 3-phase hydrogenerator. 10

(b) Discuss the factors which influence the choice of specific magnetic and electric loading in the design of a synchronous machine. 10

7. (a) Draw a flowchart to list the various steps to design the main dimensions of a d. c. machine. 10

(b) Discuss the important factors which govern the choice of number of poles in a d. c. machine. 10