Total No. of Questions : 10] [Total No. of Printed Pages : 3

Roll No. .....

EX–801

B. E. (Eighth Semester) EXAMINATION, June, 2012

(Electrical and Electronics Engg. Branch)

COMPUTER AIDED ELECTRICAL MACHINE DESIGN

(EX–801)

Time : Three Hours

Maximum Marks : 100

Minimum Pass Marks : 35

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

1. (a) Explain how multi-objective optimization problem can be converted into single objective. 10

   (b) Explain how practical limitations of decision variables of optimization problem are incorporated into objective function. 10

Or

2. (a) Develop an algorithm for optimization of linear problem. 10

   (b) Enumerate the general approach for optimization. 10

3. (a) Explain the design procedure for design of field windings of DC machine. 10

   (b) Explain the procedure for calculation of main dimensions of D. C. machine. 10

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Or

4. Explain the detail procedure for armature design of D. C. machine. 20

5. (a) Explain the design procedure for design of main dimensions of transformer. 10

   (b) Explain the procedure for design of windings of transformer. 10

Or

6. Develop the algorithm for detail design of transfomer. 20

7. (a) If the peripheral velocity of turbo alternator is limited to 170 m/sec., what is the output unit length of the armature ? Assume suitable values of specific loadings with justification. 10

   (b) Two synchronous machines with same number of poles and running speed and with volume dimensions in the ratio 3 : 2. Compare their output rating. Armature copper losses and iron losses assuming same values of specific magnetic loading and current density for both machines. 10

Or

8. Explain the procedure for detail design of the field windir of a 3-ϕ hydrogenerator and show that the height of the field winding is given by : 20

$$h_f = \frac{AT_f \times 10^{-4}}{\sqrt{q_f s_f d_f}}$$

where $AT_f \rightarrow$ field mmf/pole at full load

$q_f \rightarrow$ permissible loss/m^2

$s_f \rightarrow$ copper space factor

$d_f \rightarrow$ depth of winding/field

9. (a) Design bore diameter and length of stator core, check the speed, suggest suitable number of ventilation duc and types of stator winding for 10 H. P., 50 Hz, 400 V 3-ϕ cage type, delta connected induction motor 1500 r. p. m. synchronous speed. Assume suitable data. 14

   (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 ? 6

Or

10. Calculate the air gap excitation for a sine wave distribution, mean gap flux of 0·018 Wb in an induction motor with the following particulars : 8-pole, stator bore = 45 cm.; core length = 22 cm.; 2 radial ventilation ducts of 1·5 cm. width, 9 slots (stator) and 7 slots (rotor) per pole; slot opening = 1·8 mm., single air gap = 0·8 mm; Carters coefficient 0·4 for the ratio of slot opening to air gap equal to 2·25. 20