207606

May, 2019
B.Tech. VI SEMESTER
Design of Electrical Systems - (EE312-C)

Time : 3 Hours]   [Max. Marks : 75

Instructions :

1. *It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*

2. *Answer any four questions from Part-B in detail.*

3. *Different sub-parts of a question are to be attempted adjacent to each other.*

4. *Assume data if missing.*

PART–A

1. (a) Mention the factors which modify the reluctance of air-gap. (1.5) CO1

   (b) Why stepped cores are used in transformers? (1.5) CO1

   (c) List the advantages of using open slots. (1.5) CO1

   (d) What happens if the air gap length of the induction motor is doubled? (1.5) CO1

   (e) Determine the total number of slots in the stator of an alternator having 4-pole, 3 phase and 6 slots per pole for each phase. (1.5) CO1

(f) State the advantages of use of a digital computer for the design of electrical machines. (1.5) CO2

(g) What do you understand by optimal design of electrical machines? (1.5) CO3

(h) What are the factors affecting the selection of circuit breaker? (1.5) CO4

(i) What are the commonly used bus bar arrangements in substations? (1.5) CO4

(j) Discuss "active copper" and "inactive copper" in the design of a DC machine. (1.5) CO1

PART–B

2. (a) Derive the output equation of the DC machine. What are the guiding factors of selection of the number of poles? (8) CO1

(b) Draw the flow chart for the design of field winding of synchronous machine. (7) CO2

3. (a) Derive the equation of temperature rise with time in electric machine. What is heating time constant? (8) CO1

(b) Describe with relevant diagram the radial ventilating system, axial ventilating system and the combined axial and radial ventilating system for the cooling of electrical machines. (7) CO1

4. (a) Obtain the expression for optimum design of a transformer based on minimum cost, minimum volume, and maximum efficiency. (8) CO3

(b) What are the various objective parameters for optimization in an electrical machine? Draw flow chart for optimal design of DC machine. (7) CO3

5. (a) What is the need for a substation in the power system? What are the points to be considered while designing the substations? What are the advantages and disadvantages of the outdoor substations as compared to indoor substations? (8) CO4

(b) Draw and explain the key diagram of 66/11 kV substation. (7) CO4

6. (a) Write a computer program to determine main dimensions and flux of a 30kW, 440V, 3 phase, 6 pole, 50 Hz delta connected squirrel cage induction motor. (8) CO2

(b) Determine the dimension of core and yoke for a 250 KVA, 50Hz, single phase core type transformer. A square core is used with the distance between adjacent limbs equal to 1.5 times the width of the largest stamping. Assuming: voltage per turn = 12 V, maximum flux density in core = 1.2 wb/m^2, window space factor = 0.3, current density = 3.5 A/mm^2. Staking factor = 0.9. (7) CO1

7. (a) Describe the temperature rise and heat dissipation in the transformer. Obtain the expression for a design of cooling tank with tubes. (8) CO1

(b) Draw and explain the layout and schematic connection of an 11kV/400V indoor substation. (7) CO4

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