

Roll No.

Total Pages : 3

BT-6/M-20

36162

ELECTRICAL MACHINE DESIGN

Paper-EE-308N

Time : Three Hours]

[Maximum Marks : 75

Note : Attempt *five* questions in all, selecting at least *one* question from each unit.

UNIT-I

1. (a) Describe the various duties and ratings of rotating electric machines. What do you mean by temperature-time curves? Explain in brief regarding various terms. 7
- (b) Define the term insulating material. What are the desirable properties of insulating materials? Explain the classification of insulating materials based on the thermal consideration with two examples of each. 8
2. (a) What is the role of filed poles in DC machine? Explain the various factors that are effected by selection of poles in a DC machine. 7
- (b) A 4 pole, 28 HP, 500 V, 600 rpm series crane motor has an efficiency of 85 percent. The pole faces are square and the ratio of pole arc to pole pitch is 0.67. Assuming an average gap density of 0.55 Wb/mand ampere conductors per meter as 17000. Obtain the main dimension of the core and particulars of a suitable armature winding. 8

UNIT-II

3. (a) Define the term leakage reactance. Write an expression for leakage reactance of a core type transformer and state the assumptions made. 7
- (b) Calculate the approximate overall dimensions for a 220 kVA, 6600/440 V, 50 Hz, 3 ϕ core type transformer for the following data: emf/turn = 10 V, maximum flux density = 1.4T, current density = 2.5 A/mm², window space factor = 0.32, overall height = overall width, iron stacking factor = 0.9. use 2 stepped core. 8
4. (a) What do you mean by synchronous machine? Draw and explain the construction of synchronous alternator. 7
- (b) Define SCR and explain its effect on synchronous machine performance. 8

UNIT-III

5. (a) Explain Carter's air gap co-efficient for 3-phase induction motor.
- (b) A 12 kW, 3 phases, 6 poles, 50 Hz, 220 V, star connected induction motor has 72 stator slots, each containing 9 conductors. Calculate the values of bar and end ring currents. The number of rotor bars is 64. The machine has an efficiency of 0.86 and a power factor of 0.9. The rotor mmf may be assumed as 85% of stator mmf. Also find the area of each bar and area of each and ring if the current density is 6 A/mm².

6. (a) Discuss the procedure for design of the stator of a single phase induction motor.
- (b) Derive the expression for torque and efficiency of single phase induction motor.

UNIT-IV

7. What is computer-aided design for machines? Explain Analytical, synthesis and hybrid methods for the design of electric machines. 15
 8. Describe and explain various types of optimization techniques in brief with their applications in design problem. 15
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