Roll No. | | | | | | | | | | | | |

Total No. of Pages : 02

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B.Tech.(EE) PT E-I (Sem.–8)

COMPUTER AIDED ELECTRICAL MACHINE

Subject Code : BTEE-605A

M.Code : 74390

Time : 3 Hrs. Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1. Write briefly :

a. Draw the BH loop for soft and hard magnetic materials and explain its significance.

b. What is window space factor in transformer design?

c. What is synchronous cusp in an induction machine?

d. As per IS specifications what is the minimum thickness of the CRGO steel sheets for electrical appliances?

e. Which class of insulation is not used in machine design and why?

f. Define cooling time constant.

g. What is the range of current density assumed for large rating transformers with and without forced oil and air cooling?

h. Write the output equation of an AC machine.

i. What is the ratio of L/τ for minimum cost and good efficiency for an induction motor design?

j. To avoid magnetic locking, how numbers of stator and rotor slots are decided in an induction motor?

SECTION-B

2. Discuss the classification and sequence of various classes of insulations. Explain them with their temperature range and one example each.

3. What are the causes of production of axial forces in core type transformer's windings? Explain the steps taken to prevent the damage to the windings on account of these forces.

4. What are the methods to improve the starting torque of an induction motor? Explain.

5. A 50 kW, 3.3 kV, 50 Hz, 8 pole, 3 phase star connected induction motor has a magnetizing current which is 35 percent of the full load current. Calculate the value of stator turns per phase if the mmf required for flux density at 30° from pole axis is 500AT. Assuming winding factor = 0.95, and full load efficiency and power factor 0.94 and 0.86 respectively.

6. The temperature rise of a transformer is 25°C and 37.5°C after one and two hours of starting from cold conditions, respectively. Calculate its final steady temperature rise and the heating time constant. If its temperature falls from the final steady value to 40°C in 2.5 hour when disconnected, calculate its cooling time constant. The ambient temperature is 30°C.

SECTION-C

7. A 250 kVA, 6600/400 V, 3 phase core type transformer has a total loss of 4800W at full load. The transformer tank is 1.25 m in height and 1m × 0.5 m in plan. Design a suitable scheme for tubes if the average temperature rise is to be limited to 35°C. The tubes have diameter as 50 mm and are spaced 75 mm from each other. The average height of tubes is 1.05m. Specific heat dissipation due to radiation and convection is 6 and 6.5W/m^2 –°C respectively. Assume that convection is improved by 35 percent due to provision of tubes.

8. A 15 kW, 440 V, 4 pole, 50 Hz, 3 phase induction motor is built with a stator bore 0.25m and a core length of 0.16m. The specific electric loading is 23000 ampere conductors per meter. Using the data of this machine, determine the core dimensions, number of stator slots and number of stator conductors for a 11 kW, 460 V, 6 pole, 50 Hz motor. Assume a full load efficiency of 84 % and power factor of 0.82 for each machine. The winding factor is 0.955.

9. A 90 kW. 500 V, 50 Hz, 3 phase, 8 pole induction motor has a star connected stator winding accommodated in 63 slots with 6 conductors per slot. If the slip ring voltage on open circuit is 400 V, find a suitable rotor winding stating: number of slots, number of conductors per slot, coil span, slip ring voltage on open circuit, approximate full load current per phase in rotor. Assume efficiency of 0.9, power factor as 0.86.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.