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B.Tech.(EE) PT E-I (Sem.-8) COMPUTER AIDED ELECTRICAL MACHINE Subject Code : BTEE-605A Paper ID : [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.
- 4. Assume any missing data appropriately.

SECTION-A

Q1 Answer briefly :

- a) Explain the choice of specific electric and magnetic loading for design of electric machines.
- b) What are the main groups of electrical conducting materials?
- c) Explain classification of insulating materials used in construction of electrical machines.
- d) What is the purpose of cooling in electrical machines? Explain hydrogen cooling and its advantages.
- e) Derive an expression for the no load current in a single phase transformer.
- f) Explain various factors that influence the selection of air gap and stator slots in electrical machines.
- g) Show that the losses in a transformer are proportional to the cube of its linear dimension.
- h) Explain the difference in efficiency calculations in transformers and AC machines.
- i) What are the major considerations to be accounted for good design of three phase induction motors?
- j) Enumerate required properties of magnetic materials used for design of electrical machines.



SECTION-B

- Q2. Find the main dimensions, of a 18 KW, 400 V, 3 φ, 4 pole, 50 Hz, 2700 rpm, Squirrel cage Induction Motor having efficiency of 0.85 and full load power factor of 0.9. Assume: Specific magnetic loading 0.52 Wb/m², Specific electric loading 24500 AC/m. Take the rotor peripheral speed as approximately 20 m/s at synchronous speed.
- Q3. Derive the equation of temperature rise of a machine when it is run under steady load conditions starting from conditions starting from cold condition.
- Q4. Explain how the main dimensions are separated in DC machines?
- Q5. Write a short note on how computers can be used in the design process of electrical machines.
- Q6. Derive an expression for real and apparent flux density in electrical machines.

SECTION-C

Q7. What are harmonics? Explain the procedure for elimination of harmonic torques in induction machines.

Draw the equivalent circuit of a squirrel cage rotor.

- Q8. a) Calculate the approximate the overall dimension for a 180 KVA, 6600/440V, 50 Hz, 3 φ core type transformer. The following data may be assumed; emf per turn = 10 V, maximum flux density = 1.35Wb/m² current density = 2.52A/mm²; window space factor = 0.3; Overall height = overall width; stacking factor = 0.9; Use a 3 stepped core.
 - b) Explain efficiency and regulation in case of transformers.
- Q9. a) Derive the output equation of AC machines in terms of its main dimensions.
 - b) Describe the procedure for design of rotor bars and end rings of an induction motor. Discuss the step by step procedure to design the rotor of a squirrel cage induction motor.