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Total No. of Questions : 09

B.Tech. (Electrical & Electronics Engg.) (Sem.–6)

ELECTRICAL MACHINE DESIGN

Subject Code : BTEEE-603A

M.Code : 72842

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. Answer briefly:

a) What are the main dimensions of a rotating machine?

b) What are the main groups of electrical conducting materials?

c) Write a note on classification of insulating materials.

d) What type of slots are preferred in induction motors and why?

e) Derive an expression for the leakage reactance of primary winding in a single phase transformer.

f) In which way the air gap length influences the design of electrical machines?

g) What do you mean by stacking factor? What is its usual value?.

h) What is magnetic leakage and leakage coefficient?

i) Why area of yoke is kept 15-20% more than the core in transformers?

j) Enumerate required properties of magnetic materials used for design of electrical machines.

SECTION-B

2. Derive an expression for the leakage reactance of a transformer with primary and secondary cylindrical coils of equal length.

3. Derive the equation of temperature rise of a machine when it is run under steady load conditions starting from conditions starting from cold condition.

4. A single phase 400 V, 50 Hz transformer is made of stampings having a relative permeability of 1000. The length of flux path is 2.5 metres. The area of cross section of the core is 25 cm ^{2} and the primary winding has 800 turns. Estimate the maximum flux and the co load current of the transformer. The iron loss at the working flux density is 2.6 W/Kg. Iron part weighs 7.8×10^3 Kg/m^3.

5. Write a short note on computer aided electrical machine design.

6. Derive the output equation of a three phase induction motor.

SECTION-C

7. Explain the different cooling methods of a transformer.

   The tank of a 1250 KVA natural oil cooled transformer has the dimensions length, width, height are l.55m, 0.65m, 1.85m.The full load torque is 13.1KW. Find the no of tubes for the transformer. Assume wb/sqr-m-per degree Celsius due to radiations = 6 and the due to convection is 6.5.The improvement in the convection due to provision of tubes is 40%, maximum temperature raise is 40 degree Celsius, length of each tube is 1m,diameter of the tubes is 50mm regarding to cooling. Neglect the top and bottom surface of the tank as regard to cooling.

8. A 15 KW, 400 V, 3 phase 50 Hz 6 Pole induction motor has a diameter of 30 cm' and core length of 12 cm. The number of stator slot is 72 with 20 conductors per slot. The stator is delta connected. Calculate the magnetising current per phase if the length of the air gap is 0.55 mm. Assume gap contraction factor as 1.2. Assume mmf required for the iron parts is 35 percent of the air gap mmf. Coil span = 11 slots.

   Explain the phenomenon of cogging and crawling in three phase induction motors.

9. Discuss the step by step procedure to design the rotor and stator of a squirrel cage induction motor. Explain clearly the factors which impose limitations in the design of electrical machines.

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.