Code No: 155BB

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, August - 2022
ELECTRICAL MACHINE DESIGN
(Electrical and Electronics Engineering)

Time: 3 Hours   **Max. Marks: 75**

Answer any five questions
All questions carry equal marks
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1.a) Explain the classification of insulating materials for electrical machinery and apparatus in relation to their thermal stability. Also give examples for each class.
  b) Explain in detail about the basic principles used in the design of electrical machines.
  [8+7]

2.a) Explain in detail about different ways of heat dissipation in electrical machines.
  b) Discuss in detail about the choice of specific electric and magnetic loadings for DC Machines.   [7+8]

3.a) Why current density in primary and secondary is taken as same in design of transformers?
  b) Calculate the main dimensions of a 100 KVA, 2000/400V, 50 Hz single phase shell type transformer.
     Volt per turn = 10V
     Flux density of core = 1.1 wb/m^2
     Current density = 1.2 A/mm^2
     Window space factor = 0.33
     The ratio of window height to window width and ratio of core depth to width of central limb = 2.5. The stacking factor = 0.9.   [5+10]

4.a) Explain in detail about the yoke design of the transformers.
  b) What are the cooling methods for cooling of transformers?   [7+8]

5.   The following data refers to a 4-pole, 3-phase induction motor;
     Number of stator conductors =1080
     Full load current/ph =12.5A
     Stator winding factor = 0.96
     Number of rotor slots = 43
     Resistance of rotor bar/slot = 0.31×10^{-4} Ω
     Resistance of end ring bar/slot = 1.32×10^{-4} Ω
     Calculate
     a) Total copper loss of rotor
     b) Rotor bar current and end ring current
     Give the design specifications of wound rotor of induction motor.   [15]

6.a) What is the necessity of air gap? Explain the factors that get effected while choosing the length of air gap in induction motors.

 b) What is short circuit current? Derive the value in squirrel cage induction motor.   [7+8]

7.a) What are the factors to be considered while designing the stator of synchronous machines? Explain.

 b) Find the main dimensions of a 2000 kVA, 187.5 rpm, 50 Hz, three phase 2.5 kV salient pole synchronous generator. The generator is to be vertical, water wheel type. The specific magnetic loading is 0.5 Wb/m ^{2} and the specific electric loading is 32000 A/m. Use circular poles with ratio of core length to pole pitch = 0.62. Specify the type of pole construction used if the runaway speed is about 2 times the normal speed.   [7+8]

8.a) Explain the different approaches of computer aided design of electrical apparatus.

 b) Discuss in detail the limitation of conventional machine design over the computer aided design.   [7+8]

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