[5460]-168

T.E. (Electrical)

DESIGN OF ELECTRICAL MACHINES (303149)

(2012 Pattern) (Semester - II) (End Sem)

Time : 2½ Hours]   *[Max. Marks : 70*

Instructions to the candidates:

1) *Attempt Q No.1 or Q.No.2, Q.No.3or Q.No.4, Q.No.5or Q.No.6, Q.No.7or Q.No.8.*
2) *Assume suitable data if necessary.*
3) *Figures to the right in bold indicate maximum marks.*
4) *Use of non-programmable scientific calculator is permitted.*
5) *Neat diagrams must be drawn wherever necessary.*

Q1) a) What is helical winding used in transformer? Why transposition is done in helical winding. **[6]**

b) Draw the position of LV and HV winding relative to the core and state the reason for the same. **[6]**

c) Write down in detail the steps to calculate the number of tubes for cooling in an oil immersed transformer. **[8]**

OR

Q2) a) Which types of material is preferred for transformer core laminations and why? What are the advantages of using mitred joints in core construction? **[6]**

b) What are different types of winding used in a transformer? Explain any one. **[6]**

c) Define and explain short time rating and continuous time rating. **[8]**

Q3) a) Which factors should be considered when estimating the length of the air gap of induction motor? Why the air gap should be as small as possible? **[8]**

b) Draw a mush winding diagram for 4 pole, 24 slot three phase induction motor armature. Use full pitched coil. Show connection for all three phases. **[10]**

OR

P.T.O.

Q4) a) What is overload capacity? What is the impact of overload capacity if higher value of ac is selected? **[8]**

b) Determine the main dimensions for three phase, 50Hz, 10kW, 400V, 4pole squirrel cage induction motor. The motor has full load efficiency of 0.85 and full load power factor 0.9 lag with winding factor of 0.96. The specific electric loading is 22000A/m and specific magnetic loading is 0.6 Wb/m². Take rotor peripheral speed of 25m/s at synchronous speed. **[10]**

Q5) a) What are different methods to improve starting torque of three phase squirrel cage induction motor? Explain any one in detail. **[8]**

b) A 12 kW, three phase, 6 pole, 220 V and star connected induction motor with 72 slots having 9 conductors per slot. Calculate the value 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 percent of stator mmf. Also find the area of each bar and area of each end ring if the current density is 6A/mm². **[8]**

OR

Q6) a) What are different types of rotor slots? Explain any one. What are the advantages of tapered slot? **[8]**

b) Derive the expression for end ring current for the rotor of three phase squirrel cage induction motor. **[8]**

Q7) a) Write detail procedure to calculate full load copper loss of a designed three phase induction motor (Without performing any test). **[8]**

b) Explain the effect of ducts on the calculation of magnetizing current of three phase induction motor. **[8]**

OR

Q8) a) Explain the effect of magnetic saturation during the determination of mmf of induction motor. **[8]**

b) A 20 kW, three phase, 50Hz, 8 pole, star connected induction motor has magnetizing current of 30% of full load current. Calculate the value of stator turns per phase, if the mmf required for the flux density at 60° from pole axis is 600A. Assume full load efficiency of 90% and full load power factor 0.85 lagging. Assume winding factor of 0.955. **[8]**

⚫︎⚫︎⚫︎⚫︎