

2014
B.E. (Electrical and Electronics Engineering)
Eighth Semester
EE-808 (I): Electrical Machine Design

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Part.

x-x-x

Que.1

- State the advantages of selecting semi closed type of slots in the stator design of three phase induction motor
- Write the formula for air-gap in case of three phase induction motor in terms of length and diameter.
- Explain the hybrid techniques available for computer aided design.
- What are the advantages of square core over rectangular core of a transformer?
- Establish a relation between apparent flux density and real flux density in rotating machines.

(5*2=10)

PART -A

Que. 2 (a) Starting from the basic EMF equation derivation, Obtain an expression for EMF per turn in terms of output of the transformer. Write a note on factor K. (5)

(b) Calculate the diameter and length of armature core of a 70KW, 240V, 900 rpm, 4 pole D.C shunt generator. The average flux density is 0.7 wb/m^2 and ac/m is 34000. The ratio of core length to pole pitch is 0.8. Full load armature drop is 9.6 V and field current is 3A. (5)

Que.3 (a) Discuss the various duties and ratings of rotating machines and give their temperature time curves. (5)

(b) Write the main causes of temperature rise in electric machines? Define primary and secondary coolants with suitable examples. Draw a well labeled diagram of combined radial and axial ventilation system for electrical machines. (5)

Que.4 Calculate approximate overall dimensions for a 200 KVA, 6600/440 V, 50 Hz, 3- ϕ core type transformer. The following data may be assumed: flux density $B_m=1.3 \text{ wb/m}^2$, Current density $\delta=2.5 \text{ A/mm}^2$, window space factor $K_w=0.3$, Overall height is equal to Overall width, Iron factor $K_i=0.9$, $emf/turn=10V$, Use 3 stepped core. For a 3 stepped core: $W_d=0.9d$; $A_i=0.6 d^2$. Verify overall height is same as that of overall width of the transformer. (10)

P.T.O.

(2)

PART -B

Que. 5 (a) With usual notation derive output equation for a three phase induction motor. (5)

(b) Enumerate the advantage and Disadvantages of providing large air gap in synchronous machine. Define 'SCR' of a synchronous machine. Discuss the effect on performance of the machine. (5)

Que.6 Determine the main dimensions, number of radial ventilating ducts, number of stator slots and the number of stator slots and the number of turns per phase of a 3.7 kW, 400V, three-phase, 4 pole, 50 Hz squirrel cage induction motor to be started by star delta starter. Assume, average air gap density= 0.45 wb/m^2 , ampere conductor/meter = 23000, efficiency= 0.85, power factor= 0.84, Winding factor= 0.955, stacking factor= 0.9 and core length to pole pitch= 1.5 (10)

Que.7 (a) Explain the steps involved in the computer aided design and analysis of electrical machines. (5)

(b) Explain in detail how the iron losses affect selection of B_{av} ? (5)

x-x-x