Exam.Code:0936
Sub. Code: 6666

2053

B.E. (Electrical and Electronics Engineering)
Sixth Semester
PC-EE-605: Electric Machine Design

Time allowed: 3 Hours **Max. Marks: 50**

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

x-x-x

Que.1

(a) Define stacking factor and give its typical value? Why stepped cores are used in transformers?

(b) What is the condition for minimum cost in the design of transformers?

(c) What are the factors considered for estimating the length of air gap in induction motors?

(d) Explain the factors that govern the separation of D and L for salient pole machines.

(e) Write down the output equation for the 1-phase and 3-phase transformer. Clearly mention all the symbols used.

(5*2=10)

PART –A

Que. 2 (a) What do you understand by continuous, short time and intermittent ratings of an electrical machine? Explain with the help of suitable diagrams. (5)

(b) A 350KW, 500V, 450 rpm, 6 pole dc generator is to built with an armature diameter of 0.87m and core length of 0.32 m. The lap wound armature has 660 conductors. Calculate the specific electric and specific magnetic loadings. (5)

Que.3 (a) Examine the different types of ventilations in electrical machines. (5)

(b) Derive the volt per turn equation of a single phase transformer. (5)

Que.4 Determine the dimensions of core and yoke for a 100KVA 50Hz single phase core type transformer. A square core is used with distance between the adjacent limbs equal to 1.6 times the width of laminations. Assume emf/turn 14V, Maximum flux density is 1.1 wb/m^2, current density is 3 A/mm^2, window space factor 0.32, stacking factor 0.9. Flux density in the yoke considered to be 80% of flux density in the core. (10)

PART –B

Que. 5 (a) With all details of the various parameters including the units derive the output equation of a 3-phase squirrel cage induction motor. (5)

(b) Design the main dimensions of a 25 kW, 3-phase, 415V, 50 Hz, 1475 rpm squirrel cage induction motor having an efficiency of 85% and full load power factor of 0.86. Assume B_{av}= 0.5T, ac = 28000A/m. The rotor peripheral velocity is 25 m/s at synchronous speed. (5)

P.T.O.

Que.6 Find the main dimensions of a 2500 KVA, 187.5 rpm, 50 Hz, 3-phase 3 KV salient pole synchronous generator. The generator is to be a vertical water wheel type. The specific magnetic loading is $0.6 wb/m^2$. The specific electric loading is 34000 Amp/m. Use circular poles with ratio of core length to pole pitch as 0.65. Specify the type of pole construction used. The runaway speed is about 2 times the normal speed (10)

Que.7 (a) What is computer aided design? How does it help in designing electrical machines? (5)

(b) Explain the procedure for separation of D and L from D^2L product while designing induction motors. (5)

x-x-x