**H-107**

Total No. of Printed Pages:2

**SUBJECT CODE NO:- H-107**
**FACULTY OF SCIENCE AND TECHNOLOGY**
**T.E. (EEP/EE/EEE)**
**Electrical Machine Design**
**(REVISED)**

**[Time: Three Hours]** **[Max.Marks: 80]**

Please check whether you have got the right question paper.

N.B
1. Q.No.1 and Q.No.6 are compulsory.
2. Attempt any two questions from Q.No.2 to Q.No.5.
3. Attempt any two questions from Q.No.7 to Q.No.10.
4. Assume suitable data wherever necessary.

## Section -A

Q.1 Attempt any five: 10

a) Define real and apparent flux density.
b) What do you mean by Gap contraction factor?
c) Explain the significance of carter's coefficient.
d) Explain the magnetic leakage & fringing.
e) Explain Simpson's rule to find mmf for teeth.
f) Explain the specific magnetic loading & specific electric loading.
g) Give the purpose of conservator & breather in transformer.
h) Where and how core loss occurs in electrical machines.

Q.2
a) What are the factors governing the design of electrical machine. 07
b) What are the limitations in electrical machine design and enlist its factors also. 08

Q.3
a) Explain in detail various factors for choice of stator slots in induction motor. 07
b) Determine the apparent flux density in the teeth of D.C machine when the real flux density is 2.15 wb/m$^2$. Slot pitch 28mm slot width 10mm & gross core length 0.35m. The no of ventilating ducts is 4, each 10mm wide. The magnetic force for the flux density of 2.15 wb/m$^2$ is 55000 A/m. the iron staking factor is 0.9. 08

Q.4
a) Explain the thermal circuit for electrical machine. 08
b) Design 50kw, 4 pole, 6000 rpm dc shunt generator, whose full load terminal voltage = 220V if $B_{max} = 0.83\ wb/m^2$ for gap and ac per meter = 30,000. Then calculate suitable dimensions of armature core of square pole face. Assume armature voltage drop = 3% of Vt & ratio of pole arc to pole pitch = 0.67. 07

Q.5 Attempt any three 15

a) Modern trend in electrical machine design
b) Design of end ring 3ph induction motor
c) Window space factor.
d) Calculations of mmf for iron path.

## Section -B

Q.6 Attempt any five: 10

a) Define heating time constant & cooling time constant.
b) Distribution transformer & power transformer. Give two comparisons.
c) Enlist the various losses in transformer.
d) Explain the causes of temperature rise in transformer.
e) List out the method of cooling of transformer.
f) List out the advantages of stepped core of transformer.
g) What are the factors to be considered in design of rotating machine?
h) Cogging and crawling of induction motor.

Q.7 a) For a transformer show that emf per turn $E_t$ is given as $E_t = K\sqrt{Q}$. 07

b) State the methods of cooling used for dry and oil immersed type of transformer 08

Q.8 a) Explain in detail the steps for determination of main dimensions for core, window & yoke. 07

b) Calculate the core and window area required for 1000 KVA, 6600/400V, 50Hz single phase core type transformer. Assume max flux density of 1.2 wb/m$^2$ & current density of 2.5 A/mm$^2$. Voltage per turn =30 volts & window space factor =0.32. 08

Q.9 a) Explain the various force in transformer under short ckt condition. 07

b) A 3ph, 50 Hz, oil immersed core type transformer has following dimensions. 08
Distance between core centres = 0.2m
Height of window = 0.24m
Dia of circumscribing circle =0.14m
$B_M = 1.25\ wb/m^2,\ \delta = 2.5\ A/mm^2$. Estimate the KVA rating. Assume $K_w = 0.2,\ At = 0.56\ d^2$ 2 stepped core.

Q.10 Attempt any three. 15

a) Design of choke coil
b) Explain evaluation of resistance in transformer.
c) What are the components of no-load current in transformer
d) Necessity of cooling tubes in transformer tank.