PVP 14

Code: EE6T2

III B.Tech - II Semester – Regular/Supplementary Examinations
March 2020

ELECTRICAL MACHINE DESIGN
(ELECTRICAL & ELECTRONICS ENGINEERING)

Duration: 3 hours Max. Marks: 70

PART – A

Answer *all* the questions. All questions carry equal marks

11x 2 = 22 M

1.

a) What is meant by statically induced emf and dynamically induced emf?
b) List any two factors to be considered for the choice of specific magnetic loading.
c) List any four types of cross sections used for the core of transformer.
d) Define Stacking factor in transformer.
e) Write down the output equation of single phase and three phase transformer.
f) What are the ranges of specific magnetic loading and electric loading in induction motor?
g) List any three types of stator windings in induction motor.
h) What is skewing?
i) How the value of SCR affects the design of alternator?

j) What is the limiting factor for the diameter of synchronous machine?

k) What is the purpose of damper windings in synchronous machine?

PART – B

Answer any *THREE* questions. All questions carry equal marks.

3 x 16 = 48 M

2. a) Derive the output equation of DC machine in terms of main dimensions and specific loading. 8 M

b) Solve the main dimension of a 200KW, 250V, 6 pole, 1000 rpm generator. The maximum value of flux density in the air gap is 0.87 Wb/m^2 and the armature conductors per meter of armature periphery are 31000. The ratio of pole arc to pole pitch is 0.67 and the efficiency is 91 percent. Assume the ratio of length of core to pole pitch=0.75. 8 M

3. a) Derive the expression of no load current in single phase transformer. 8 M

b) The ratio of flux to full load mmf in a 400 KVA, 50 Hz single phase core type power transformer is 2.4×10^{-6}. Calculate the net iron area of the transformer. Maximum flux density in the core is 1.3 Wb/m^2, and current density is 2.7 A/mm^2 8 M

4. a) List the different methods of cooling of transformers and explain any three methods in detail. 8 M

b) Inspect the main dimensions including winding conductor area of a 3-phase, Δ-Y core type transformer rated at 300 KVA, 6600/440 V, 50 Hz. A suitable core with 3-steps having a circumscribing circle of 0.25 m diameter and a leg spacing of 0.4 m is available. EMF per turn=8.5 V, δ=2.5A/mm^2, K_w=0.28, Stacking factor=0.9. 8 M

5. a) Write short notes on

(i) Design of rotor bars and slots. 6 M

(ii) Design of end rings in induction motor. 6 M

b) List any four rules for selecting rotor slots. 4 M

6. a) Briefly discuss the step by step procedure involved in the design of rotor in salient pole synchronous machine. 8 M

b) Solve the suitable number of slots and conductors per slot for the stator winding of a 3- phase 3300V, 50 Hz, 300 rpm alternator. The diameter is 2.3 m and the axial length of the core is 0.35 m. The maximum flux density in the air gap should be approximately 0.9 Wb/m^2. Assume sinusoidal flux distribution. Use single layer winding and star connection of stator. 8 M