Code: EE6T2

III B.Tech - II Semester - Regular / Supplementary Examinations-March 2019

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 are the main dimensions of a rotating electrical machine?

b) List the Indian standard specifications for transformer.

c) List the factors that governing the choice of number of armature slots in a DC machine.

d) Why the armature core of a DC machine is laminated?

e) In transformer, why the low voltage winding is placed near the core?

f) How the tertiary winding is connected in a transformer? Why?

g) Write the expression for output equation of Single Phase Transformer.

h) State the advantages of slip ring rotor over cage rotor.

i) Why the air gap of an induction motor made as small as possible?

j) What is short circuit ratio (SCR) of an alternator?

k) Define pitch factor and write the formula for the same.

PART – B
Answer any *THREE* questions. All questions carry equal marks.

$$3 \text{ x } 16 = 48 \text{ M}$$

2. a) Explain in detail about the basic principles used in the
   design of electrical machines.   8 M

   b) Illustrate the winding diagram in developed for a simplex
   lap wound 24 slot, 2 pole DC armature with 24 commutator
   segments. Also draw the sequence diagram to show the
   position of brushes.   8 M

3. a) Explain in detail about the factors that help in choosing
   different types of transformers.   8 M

   b) The current densities in the primary and secondary
   windings of a transformer are 2.2 A/mm^2 and 2.1 A/mm^2
   respectively. The ratio of transformation is 10:1 and the
   length of the mean turn of the primary is 10% greater than
   that of secondary. Calculate the resistance of secondary
   winding referred to primary and secondary. Given that the
   primary winding resistance is 10Ω.   8 M

4. a) Write the output equations of single and three phase transformers and explain different parameters. 8 M

   b) Discuss and derive the main dimensions of a three phase transformer with a net sketch. 8 M

5. a) A 90 kW, 500 V, 50 Hz, 3 phase, 8 pole induction motor has a star connected stator winding accommodated in 63 slots with 6 conductors per slot. The slip ring voltage on open circuit is to be about 410V. Find number of slots, number of conductors per slot, coil span and slip ring voltage on open circuit. Assume efficiency $= 0.85$, power factor $= 0.9$. 8 M

   b) Explain in detail about the stator design of three phase induction machine. 8 M

6. a) Explain in detail about the choice of specific electric and magnetic loadings for synchronous machines. 8 M

   b) Calculate the main dimensions of a 75 MVA, 10 kV, 50 Hz, 150 rpm, three phase water wheel generator. The average gap density is 0.6Wb/m^2 and ampere conductors per meter are 30000. The peripheral speed should not exceed 60m/sec at normal running speed in order to limit the runaway peripheral speed. 8 M