PVP 12

Code: EE6T1

III B.Tech - II Semester – Regular Examinations – May 2015

ELECTRICAL MACHINE DESIGN
(ELECTRICAL & ELECTRONICS ENGINEERING)

Duration: 3 hours Marks: 5x14=70

Answer any FIVE questions. All questions carry equal marks

1. a) What are the "main dimensions" in machine design ? What do you mean by specific loading ? 7 M

   b) Explain the role of peripheral speed on choice of D and L. 7 M

2. a) List the advantages and disadvantages of higher number of poles in d.c machine. 6 M

   b) Find the main dimensions and the number of poles of a 37 kW, 230 V, 1400 r.p.m shunt motor so that a square pole face is obtained. The average gap density is 0.5 Wb/m^2 and the ampere conductors per meter are 22000. The ratio of pole arc to pole pitch is 0.7 and the full load efficiency is 90 per cent. 8 M

3. a) Develop the output equation for a single phase as well as a three phase transformer. 6 M

b) Calculate the core and window areas required for a 1000 kVA, 6600/400 V, 50 Hz, single phase core type transformer. Assume a maximum flux density of 1.25 Wb/m² and a current density in the conductor is 2.5 A/mm². Voltage per turn = 30 V , and window space factor = 0.32. 8 M

4. Which types of windings are commonly used in shell as well as in core type transformers? Explain. 14 M

5. What are the main dimensions of induction motor ? What are the desired values of L/τ peripheral speed and width of ventilation ducts ? 14 M

6. a) How do you calculate the following for an induction motor? 6 M

i) Area of stator slots ii)Length of mean turn

iii) Stator teeth

b) Determine the approximate diameter and length of the stator core, the number of stator slots and the number of conductors for a 11 kW, 400V, 3 phase, 4 pole, 1425 r.p.m delta connected induction motor. Adopt a specific magnetic loading of 0.45 Wb/m³ and a specific electric loading of 23,000 A/m. Assume full load efficiency and power factor as 0.88 and 0.88 respectively. The ratio of core length to pole pitch is 1. The stator employs a double layer winding. 8 M

7. a) Why do we prefer use of revolving field system in synchronous machine ? 7 M

b) What are the factors to be considered to select the specific electric loading of synchronous generators ? 7 M

8. a) What are the factors to be considered for selection of armature slots in synchronous machines ? 6 M

b) Determine suitable stator dimensions for a 500 kVA, 50 Hz , 3 phase alternator to run at 375 r.p.m. Take mean gap density over the pole pitch as 0.55 Wb/m^2 , the specific electric loading as 25,000 A/m. The peripheral speed should not exceed 35 m/s. 8 M