Roll No. .....

May 2019

B.Tech. VI SEMESTER

Conventional and CAD of Electrical Machine-(EL 306)

Time: 3 Hours | Max. Marks:60

Instructions:
1. *It is compulsory to answer all the questions (2 marks each) of Part -A in short.*
2. *Answer any four questions from Part -B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART -A

Q1 (a) List some limitation of the design of electrical machines. (2)

(b) What are the considerations to be made while designing electrical machines? (2)

(c) Why does the yoke of a transformer have the larger section than the limb? (2)

(d) What are the mechanical forces produced in transformer windings? (2)

(e) Compare various types of armature windings in a DC machine. (2)

(f) What are the advantages of large number of poles in a DC machine design? (2)

(g) What is the effect of dispersion coefficient on overload capacity? (2)

(h) Give the relation between D and L for best power factor in three phase induction motors. (2)

(i) What are the causes of harmonics in the voltage and current waves of a synchronous machine? (2)

(j) What are the effects of large value of short circuit ratio on synchronous machine performance? (2)

PART -B

Q2 (a) Describe various types of enclosures used for rotating electrical machines. (5)

(b) Calculate the apparent flux density at a particular of a tooth from the following data: (5)

Tooth width = 13mm; Slot width = 11mm; Gross core length = 0.35 m; Number of ventilating ducts = 4; each 10mm width, real flux density = 2.0 wb/m2 permeability of teeth corresponding to real flux density = 31.4 x 10-6H/m; staking factor = 0.9.

Q3 (a) Derive an expression for "gap contraction factor for ducts" in electrical machine. (5)

(b) What is meant by stepped core in a transformer? Describe available choices with help of sketches. (5)

Q4 Determine the main dimensions of the core, the number of turns and the cross section of conductors for a 5kVA, 11000/440V, 50 Hz, single phase core type distribution transformer. The net conductor area in the window is 0.7 times the net cross section of iron in the core. Assume a square cross section for the core, a flux density 1.2 wb/m^2, a current density 1.5A/mm^2, and a window space factor 0.25. the height of window is 3 times its width. (10)

Q5 (a) Derive the output equation for DC machine. (5)

(b) A design is required for a 50 kW, 4 pole, 600 rpm, dc shunt generator, the full load terminal voltage being 200 V. If the maximum gap density is 0.85 wb/m^2 and the armature ampere conductors per meter are 35000, calculate suitable dimensions of armature core to give a square pole face. (5)

Assume that the full load armature voltage drop is 3% of the rated terminal voltage, and that the field current is 1% of rated full load current. Ratio of pole arc to pole pitch is 0.67.

Q6 (a) What are the factors affecting the length of air gap in a three phase induction motor? (5)

(b) Determine for a 250 kVA, 1100 V, 12 pole, 500 rpm, three phase alternator (i) air gap diameter (ii) core length (iii) number of stator conductors, (iv) number of stator slots (v) cross section of stator conductors. Assuming average air gap density as 0.6 wb/m^2 ampere conductors per meter as 28500, and the current density to be 3.5 A/m^2. (5)

Q7 (a) Write the features of computer aided design of electrical machines. Compare Analysis Method and Synthesis Method. (5)

(b) Discuss the choice of specific magnetic and electrical loading of synchronous motor. (5)

****