PVP 14

Code: EE6T2

III B.Tech - II Semester – Regular/Supplementary Examinations March 2018

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 basic factors governing the choice of insulating material in the design of electrical machines?
b) Mention any 2 advantages of increasing number of poles of D.C machines.
c) Write the output equation for the 1-phase and 3-phase transformer.
d) Compare shell type and core type transformers.
e) Which type of windings are used in core type and shell type.
f) What are the factors to be considered for choosing the type of winding for a core type transformer?
g) List any 2 methods for cooling of transformer.
h) Write the output equation of a three phase induction motor.
i) Discuss and design the rotor of non salient synchronous machine.

j) What factors are required in designing the end ring of a 3-phase squirrel cage induction motor.

k) Discuss and design the field winding of a salient pole rotor synchronous machine.

PART – B

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

3 x 16 = 48 M

2. a) Explain various factors that affect choice of poles in a DC machine. 8 M

b) Find the diameter and length of armature for a 8 kW, 4 pole, 1000 rpm, 200V shunt motor. Given: full load efficiency = 0.89; maximum gap flux density = 0.88Wb/m^2; specific electric Loading = 30000; field form factor= 0.8. Assume that the maximum efficiency occurs at full load and the field current is 3% of rated current. The pole face is square. 8 M

3. a) Deduce an expression for KVA rating of the transformer in terms of Volts per turn. 8 M

b) The full load efficiency of a 300KVA single-phase core type transformer is 98.2% at UPF. Design the number of cooling tubes necessary if the temperature rise is 35^0C. The area of the tank may be assumed as 4.92 m^2. Assume the tube diameter as 5 cm and average length of 105 cm. heat dissipation may be assumed as 12.5 W/$m^2/^0$c. 8 M

4. a) Derive an expression for the no. of cooling tubes required to limit the temperature rise in a 3-Phase transformer. 8 M

b) Determine the main dimensions of a 1000 KVA, 6600/440 V, 50Hz, 3-ph Delta/Star, Core type Oil Immersed Natural cooled (ON) transformer, temperature not to exceed 50^0 C. 8 M

5. a) Explain in detail about the design of rotor slots and rotor bars in squirrel cage induction motor. 8 M

b) Find the values of diameter and length of stator core of a 8kW, 220 V, 50 Hz, 4 pole, three phase Induction motor for best power factor. Given the specific magnetic loading =0.35 Wb/m^2; specific Electric loading = 20000 A/m; efficiency = 0.9; and power factor = 0.86. 8 M

6. a) Explain the term Short Circuit Ratio as applied in case of Synchronous Machines. How does the value of SCR affects the design of Alternators. 8 M

b) Calculate the stator main dimensions for a 3-phase, 50 Hz, 11 KV, 24 pole Salent pole alternator developing 15MVA at 0.8 PF lagging. 8 M