Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 52963

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Sixth Semester

Electrical and Electronics Engineering

EE 6604 – DESIGN OF ELECTRICAL MACHINES

(Regulation 2013)

(Common to PTEE 6604 – Design of Electrical Machines for B.E. (Part – Time) – Fifth Semester – Electrical and Electronics Engineering Regulation 2014)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define Space Factor.

2. What are the Electrical properties of insulating materials?

3. Write down the Carter's Coefficient of D.C Machine.

4. What are the factors to be considered in the design of commutator of a D.C Machine?

5. Define Window Space Factor.

6. What are the methods of cooling of transformer?

7. Write down the equation for output Co-efficient in an induction motor.

8. Why fractional slot winding is not used for induction motor?

9. What are the factors that influence the choice of specific magnetic loading in a synchronous machine?

10. Define Short Circuit Ratio of a synchronous machine.

PART B — (5 × 13 = 65 marks)

11. (a) Discuss about the factors that influence the choice of specific electric and magnetic loadings in the design of rotating machines. (13)

Or

(b) Describe the methods of measurements of temperature rise in various parts of an electrical machine. (13)

12. (a) (i) Derive the output equation of DC machine. (6)

(ii) A 5KW, 250V, 4 pole, 1500 rpm DC shunt generator is designed to have a square pole face. The specific Magnetic loading and specific electric loading are 0.42 wb/m^2 and 15000 ac/m respectively. Find the main dimensions of the machines. Assume full load efficiency is 87% and Poles arc to pole pitch ratio is 0.66. (7)

Or

(b) Calculate the MMF required for the air gab of a salient pole synchronous machines having core length of 0.2 m including 4 ducts of 10 mm each; pole arc = 0.19 m. Slot Pitch = 65.4 mm; slot opening = 5 mm. Air gap Length = 5 mm. Flux per pole = 52 mWb; Carter's Co-efficient is 0.18 for opening/gap = 1; Carter's coefficient is 0.28 for opening/gap = 2. (13)

13. (a) Explain the different methods of cooling of Transformers. (13)

Or

(b) A single Phase, 400V, 50Hz, transformer is built from stampings having a relative permeability of 1000. The length of the flux path is 2.5m; the area of cross section of the core is 2.5 × 10^{-3} m^2 and the primary winding has 800 turns. Estimate the maximum flux and no load current of the transformer. The iron loss at the working flux density is 2.6W/kg. Iron weight 7.8 × 10^3 Kg/m^3, stacking factor is 0.9. (13)

14. (a) Write short notes on : (i) Design of rotor bars and slots. (ii) Design of end rings. (7+6)

Or

(b) A 15KW, 440V, 50Hz, 3 phase induction motor is built with a stator bore 0.25m and a core length of 0.16. The specific electric loading is 23000 ampere conductors per meter. Using the data of this machine, determine the core dimensions number of stator slots and number of stator conductors for a 11KW, 460V, 6 Pole, 50 Hz Motor. Assume a full load efficiency of 84% and power factor of 0.82 for each machine. The winding factor is 0.955. (13)

15. (a) Briefly discuss the step by step procedure involved in the design of rotor in salient pole synchronous machine. (13)

Or

(b) Determine the output coefficient for a 1500 KVA, 2200 V, 3 Phase, 10 Pole, 50 Hz, star connected alternator with sinusoidal flux distribution. The winding has 60° Phase Spred Full pitch coils. ac = 30000 amps. Conductor/m, B_{av}= 0.6 Wb/m^2. If the peripheral speed of the rotor must not exceed 100 m/sec and the ratio of pole pitch to core Length is to be between 0.6. and find D and L. Assume an air-gap length of 6mm. Find also the approximate number of stator conductors. (13)

PART C — (1 × 15 = 15 marks)

16. (a) Explain the various steps involved in the design of armature winding of DC Machines. (15)

Or

(b) Explain the step by step procedure fors the design of field winding of Synchronous machines. (15)