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

Question Paper Code : 60513

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Sixth Semester

Electrical and Electronics Engineering

EE 2355/EE 65/10133 EE 605 — DESIGN OF ELECTRICAL MACHINES

(Regulations 2008/2010)

(Common to PTEE 2355/10133 EE 605 – Design of Electrical Machines for B.E. (Part-Time) Fifth Semester – EEE – Regulations 2009/2010)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define specific Electric Loading.
2. What are the major considerations in Electrical Machine Design?
3. Why square pole face if preferred?
4. Define copper space factor of a coil.
5. Why is transformer yoke designed for low flux density?
6. What are the methods of cooling of transformers?
7. List the advantages of using open slots.
8. Where mush winding is used?
9. What is runaway speed?
10. What is the limiting factor for the diameter of synchronous machine?

PART B — (5 × 16 = 80 marks)

11. (a) Discuss about the factors that influence the choice of specific electric and magnetic loadings in the design of rotating machines. (16)

Or

(b) Describe any two methods used for determination of motor rating for variable load drives. (16)

12. (a) Explain the various steps involved in the design of commutator and Brushes of a d.c. machine. (16)

Or

(b) Calculate the diameter and length of armature for a 7.5 kW, 4 pole, 1000 rpm, 220 V shunt motor. Given: full load efficiency = 0.83; maximum gap flux density = 0.9 Wb/m^2; specific electric loading = 30,000 ampere conductors per metre; field form factor = 0.7. Assume that the maximum efficiency occurs at full load and the field current is 2.5 percent of rated current. The pole face is square. (16)

13. (a) (i) Derive the output equation of a single phase transformer in terms of core and window area. (8)

(ii) Determine the diameter of core and window for a 5 kVA, 50Hz, 1-phase, core type transformer. A rectangle core is used with long side twice as long as short side. The window height is 3 times the width. Voltage per turn = 1.8 V. Space factor = 0.2, δ = 1.8 A/mm^2. Bm = 1 Wb/mm^2. (8)

Or

(b) A 250 kVA, 6600/400V, 3 phase core type transformer has a total loss of 4800 W at full load. The transformer tank is 1.25 m in height and 1 m × 0.5 m in plan. Design a suitable for tubes if the average temperature rise is to be limited to 35°C. The diameters of the tubes are 50 mm and are spaced 75 mm from each other. The average height of tubes is 1.05 m.

Specific heat dissipation due to radiation and convection is respectively 6 and 6.5 W/m^2 °C. Assume that the convection is improved by 35 percent due to provision of tubes. (16)

14. (a) Write short notes on: (16)

(i) Design of rotor bars and slots

(ii) Design of end rings.

Or

(b) A 15kW, 440V, 4 pole. 50 Hz, 3 phase induction motor is built with a stator bore 0.25 m and a core length of 0.16 m. The specific electric loading is 23,000 ampere conductors per metre. Using the data of this machine, determine the core dimensions, number of stator slots and number of stator conductors for a 11 kW, 460 V, 6 pole, 50 Hz motor. Assume a full load efficiency of 84 per cent and power factor of 0.82 for each machine. The winding factor is 0.955. (16)

15. (a) Find the main dimensions of a 100 MVA, 11 kV, 50 Hz, 150 rpm., 3 phase water wheel generator. The average gap density is 0.65 Wb/m^2 and ampere conductors per metre are 40000. The peripheral speed should not exceed 65 m/s at normal running speed in order to limit the runaway peripheral speed. (16)

Or

(b) Explain the armature winding and rotor design of turbo alternator. (16)
