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

Question Paper Code : 66189

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2011.

Sixth Semester

Electrical and Electronics Engineering

EE 2355 — DESIGN OF ELECTRICAL MACHINES

(Regulation 2008)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the major considerations in Electrical Machine Design?

2. Write down the classification of magnetic materials.

3. Show how the specific magnetic and electric loadings are interdependent.

4. Mention any two guiding factors for the choice of number of poles.

5. Define the term: 'Voltage Regulation'.

6. What are the methods by which heat dissipation occurs in a transformer?

7. Write down the equation for output coefficient in an Induction Motor.

8. Define : Stator Slot Pitch.

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 × 16 = 80 marks)

11. (a) What are the main groups of Electrical conducting materials? Describe the properties and applications of those materials. (16)

Or

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

12. (a) Explain the various steps involved in the design of Armature winding of D.C. machine. (16)

Or

(b) A design is required for a 50 kW, 4 pole, 600 rpm, d.c. shunt generator, the full load terminal voltage being 220 V. If the maximum gap density is 0.83 Wb/m^2 and the armature ampere conductors per metre are 30,000, calculate suitable dimensions of armature core to give a square pole face.

Assume that the full load armature voltage drop is 3 percent of the rated terminal voltage and that the field current is 1 percent of rated full load current. Ratio of pole arc to pole pitch is 0.67. (16)

13. (a) Discuss about temperature rise and methods of cooling in transformers.

(16)

Or

(b) A 6600 V, 60 Hz single phase transformer has a core of sheet steel. The net iron cross-sectional area is 22.6×10^{-3} m^2, the mean length is 2.23 m, and there are four lap joints. Each lap joints takes ¼ times as much reactive mmf as is required per metre of core. If B_m = 1.1 Wb/m^2, determine

(i) The number of turns on the 6600 V winding and

(ii) The no load current. Assume an amplitude factor of 1.52 and that for given flux density, mmf per metre = 232 A/m; specific loss = 1.76 W/kg. Specific gravity of plates = 7.5. (16)

14. (a) Describe the steps involved in the design of magnetising current for an induction motor from design data. (16)

Or

(b) Estimate the stator core dimensions and the total number of stator conductors for a 3Φ, 100 kW, 3300 V, 50 Hz, 12 pole star connected slip ring Induction motor. Assume : average gap density = 0.4 Wb/m^2, conductors per metre = 25,000 A/m, efficiency = 0.9, power factor = 0.9 and winding factor =0.96.

Choose main dimension to give best power factor. (16)

15. (a) Explain the step by step procedure for the design of field winding of Synchronous machine. (16)

Or

(b) A 1000 KVA, 3300 V, 50 Hz, 300 rpm, 3-phase alternator has 180 slots with 5 conductors per slot. Single layer winding with full pitch coils is used. The winding is star connected with one circuit per phase. Determine the specific electric and specific magnetic loadings, if the stator bore is 2.0 m and the core length is 0.4 m. The machine has 60° phase spread. (16)

———————