Reg. No. :

L 1267

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2008.

Third Semester

Electrical and Electronics Engineering

EE 232 — ELECTRICAL MACHINES — I

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1.   Define coefficient of coupling.

2.   What is dynamically induced emf?

3.   Compare core and shell type transformers.

4.   Why is the efficiency of transformers more than that of other rotating machines?

5.   Write the energy balance equation for generating and motoring device.

6.   What are the two types of magnetic systems? State their examples.

7.   Define pitch factor.

8.   State the assumptions made while obtaining mmf space wave of a single phase distributed ac winding.

9.   Define 'armature reaction'.

10. What are the significances of back emf?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Two identical coils A and B consisting of 1500 turns each lie in parallel planes such that 70% of the flux produced by the current in coil A link the coil B. Current of 4 A flowing in the coil A produces in it a flux of 0.04 mWb. Calculate (1) self inductance of each coil and (2) mutual inductance between them. (4 + 4)

(ii) Write short notes on 'core losses'. (8)

Or

(b) (i) A steel ring of 25 cm mean diameter and of circular section 3 cm in diameter has an air gap of 1.5 mm length. It is wound uniformly with 700 turns of wire carrying a current of 2A. Calculate mmf, flux density, magnetic flux, reluctance and relative permeability of steel ring. (10)

(ii) An air cored solenoid of mean diameter 5 cm is 80 cm long. It is wound with 1200 turns. Calculate the inductance. If the current flowing in the coil on the solenoid is changed from 5 A to – 5 A in 0.03 s, find the emf induced in the coil. (6)

12. (a) (i) Write short notes on parallel operation of transformers. (8)

(ii) Draw and explain the equivalent circuit of transformer. (8)

Or

(b) (i) Explain the construction and types of auto transformers. Also derive an expression for the saving of copper effected by using an auto transformer instead of a two winding transformer. (8)

(ii) Explain the construction transformers with necessary diagrams. (8)

13. (a) (i) Derive the expression for co energy in multiple excited system. (8)

(ii) Derive the expression for magnetic stored energy for a singly excited system. (8)

Or

(b) Explain the $i - \lambda$ characteristics of a magnetic system. Also derive the expression for co energy density. Assume the $i - \lambda$ relationship of the magnetic circuit is linear. (16)

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14. (a) (i) Prove that mmf wave of a single phase ac winding is pulsating or standing. (8)

    (ii) Derive the expression for the r.m.s value of e.m.f. induced in a.c. machines. (8)

Or

    (b) (i) Prove that the resultant mmf wave of three phase ac winding is rotating in space with speed ω but its magnitude is constant. (8)

    (ii) Derive the torque equation in round rotor machines. (8)

15. (a) (i) Draw the performance characteristics of different types of d.c. generators and explain them. (8)

    (ii) Explain the various methods of commutation. (8)

Or

    (b) (i) Explain the various methods of speed control of a d.c. motor. (8)

    (ii) A d.c. series motor is running with a speed of 800 rpm while taking a current of 20 A from the supply of 250 V. If the load is changed such that the current drawn by the motor is increased to 50 A, calculate the speed of the motor on new load. The armature and series field winding resistances are 0.2 Ω and 0.3 Ω respectively. Assume the flux produced is proportional to the current. (8)