ANNA UNIVERSITY COIMBATORE

B.E./B.TECH. DEGREE EXAMINATIONS: MAY /JUNE 2010

REGULATIONS: 2008

FOURTH SEMESTER: EEE

080280003-ELECTRICAL MACHINES I

Time: 3 Hours **Max.Marks:100**

PART-A

(20 × 2 = 40 MARKS)

ANSWER ALL QUESTIONS

1. What is meant by fringing effect?
2. Define reluctance.
3. State Lenz's law.
4. What is stacking factor?
5. Write down the emf equation of a transformer?
6. Draw the no load phasor diagram of transformer?
7. Write the condition for maximum efficiency of transformer?
8. List the applications of auto transformer?
9. Write down the equation for force in magnetic field system?
10. What is an electro mechanical system?
11. Describe multiply excited magnetic field system?
12. Define co energy?
13. Describe rotating magnetic field.
14. What is the significance of magnetic leakage in rotating machine?
15. Write down the basic expression for mmf space wave of a single coil rectangular in nature?
16. State the assumptions for peak value of the mmf wave?
17. State Fleming's left hand rule.
18. What is the necessity for starters in a dc motor?
19. What is the function of commutator?
20. State one method for compensation of armature reaction?

PART – B

(5 × 12 = 60 MARKS)

ANSWER ANY FIVE QUESTIONS

21 (a). In a rectangular electro magnetic relay, the exciting coil has 1200 turns. Cross sectional area of the core is A = 6 cm × 6 cm. neglect the reluctance of the magnetic Circuit and fringing effects. With coil current kept constant at 2A, derive expression for force on armature as a function of air gap of length x. Find the work done by the magnetic field when x decreases from 1 cm to 0.5 cm by integrating the force. (6)

(b). Compare statically induced emf and dynamically induced emf? (6)

22 (a). Discuss the origin of hysteresis and eddy current losses in electrical machines. (6)

(b). A straight conductor of 2 m length carries a current of 20A. It is lying at right angles to a uniform magnetic flux density of 0.8 T. Find: (6)

(1) The force developed on the conductor

(2) The power required to drive the conductor at a uniform speed of 25 m/s and (3) the emf induced in the conductor.

23. What are the various losses in a transformer? Derive the equivalent circuit of single phase transformer from its phasor diagram. (12)

24. A 5 KVA 200/1000 V, 50Hz, single phase transformer gave the following test results:

O.C test (LV side): 2000 V, 1.2A, 90W

S.C test (HV side): 50 V, 5 A, 110 W

(1) Calculate the parameters of the equivalent circuit referred to the LV side.

(2) Calculate the output secondary voltage when delivering 3 KW at 0.8 pf lagging, the input primary voltage being 200 V. Find the percentage regulation also.

25 (a). Derive the expression for field energy produced in doubly excited magnetic field system? (6)

(b). The magnetic flux density on the surface of an iron face is 1.6 T which is a typical saturation level value for ferromagnetic material. Find the force density on the iron face. (6)

26. With necessary diagram discuss about mmf waves of distributed AC winding in detail with equation? (12)

27 (a). The lap wound armature of a 4 – pole generator armature has 51 slots. Each slot Contains 20 conductors. What will be the emf generated in machine when driven at 1500 r.p.m. If useful flux per pole is 0.01Wb? (6)

(b). A 230 V shunt motor has an armature resistance of 0.3 Ohm and takes an armature current of 40 A on a certain load. By how much must the main flux be reduced to raise speed by 50% and 25% if the developed speed is constant? Neglect saturation and armature reaction. (6)

28 (a). Derive the torque equation of a dc machine? (6)

(b). A 223 V compound generator is supplying a load of 100 A at 220 V. The resistance of its armature, shunt and series winding are 0.1?, 50? And 0.06? Respectively. Find the induced emf and the armature current when the machine is connected in

1) Short shunt 2) Long shunt. (6)

**********THE END**********