

D 035

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2003.

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. What is meant by leakage flux?
2. State Fleming's left hand rule.
3. Why transformers are rated in kVA instead of kW?
4. Why is the efficiency of transformers more than that of other rotating machines?
5. Mark the co energy region in the  $i - \lambda$  graph.
6. What is a multiply excited magnetic field system?
7. Write the relation between electrical and mechanical degree.
8. Define distribution factor.
9. What is the function of yoke in a D.C. machine?
10. Give two reasons for failure of build up of emf in d.c. shunt generator.

PART B — (5 × 16 = 80 marks)

11. (i) Explain the various methods of commutation. (8)

- (ii) With neat sketch, explain the function of 3 point starter. (8)
12. (a) (i) What is a magnetization curve and why is it used in magnetic circuit calculations? (8)
- (ii) An iron ring of circular cross-section  $10 \text{ cm}^2$  and mean circumference  $30 \text{ cm}$  has an air-gap of  $2 \text{ mm}$ . If the ring is wound with  $500$  turns, find the exciting current to establish a flux of  $0.4 \text{ mWb}$  in the air gap. The relative permeability of iron may be assumed to be  $2500$ . (8)
- Or
- (b) (i) Explain about a.c. operation of magnetic circuits. (8)
- (ii) A straight conductor of  $1.5 \text{ m}$  length carries a current of  $40 \text{ A}$ . It is lying at right angles to a uniform magnetic flux density of  $0.8 \text{ T}$ . Find : (1) the force developed on the conductor (2) the power required to drive the conductor at a uniform speed of  $25 \text{ m/s}$  and (3) the emf induced in the conductor. (8)
13. (a) (i) What is meant by equivalent circuit of a transformer? What is its use? (8)
- (ii) A  $600 \text{ kVA}$ , single phase transformer when working at u.p.f. has an efficiency of  $92\%$  at full load and also at half load. Determine its efficiency when it operates at unity p.f. and  $60\%$  of full load. (8)
- Or
- (b) (i) Explain the back to back method of testing of two identical single phase transformers. (8)
- (ii) State and explain the necessary conditions for satisfactory parallel operation of two three phase transformers. (8)
14. (a) (i) Explain about energy stored in magnetic system. (8)
- (ii) Give a brief note on flow of energy in electromechanical devices. (8)
- Or
- (b) (i) Derive expression for coenergy in a multiply-excited magnetic field system. (8)

- (ii) The magnetic flux density on the surface of an iron face is 1.8 T which is a typical saturation level value for ferromagnetic material. Find the force density on the iron face. (8)
15. (a) (i) Explain the constructional features of elementary synchronous machines. (8)
- (ii) A 3-phase 440 kVA, 50 Hz, star connected synchronous generator running at 400 rpm is designed to develop 3600 V between terminals. The armature consists of 180 slots, each slot having one coil side with eight conductors. Determine the peak value of the fundamental mmf in AT/pole when the machine is delivering full load current. (8)
- Or
- (b) (i) Explain about rotating MMF waves in A.C. machines. (8)
- (ii) Derive an expression for induced emf in a synchronous machine. (8)
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