

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION
JUNE 2009

EE 04 405—ELECTRICAL MACHINES I

(2004 Admissions)

Time : Three Hours

Maximum : 100 Marks

Part A

1. (a) List the types of generators and their applications.
- (b) Define and explain armature reaction.
- (c) Explain the working principle of dc generators.
- (d) Illustrate the process of voltage build up of dc generators.
- (e) Write short notes on permanent magnet dc motor.
- (f) What are different types of losses in the dc generators and explain.
- (g) List different types of connections of three phase transformer.
- (h) A 10 KVA, 500/250v, single phase transformer has its maximum efficiency of 94% when delivering 90% of its rated output at unity power factor. Estimate its efficiency when delivering its full load output at P.F. of 0.8 lagging.

(8 × 5 = 40 marks)

Part B

- II. (a) Define commutation and explain the methods to improve commutation performance.

Or

- (b) (i) Explain the construction of dc machine with neat sketches. (10 marks)
- (ii) Write short notes on Dummy coils and equalizer connection. (5 marks)

- III. (a) Sketches and explain the load characteristics of shunt and series generators. (15 marks)

Or

- (b) In a 110V compound generator, the resistance of the armature, shunt and series windings are 0.06 Ω , 25 Ω and 0.04 respectively. The load consists of 200 lamps each rated at 55 w, 110v. Find the total electro motive force and armature current when the machine is connected (i) long shunt (ii) Short shunt. Ignore armature reaction and brush drop.

(15 marks)

- IV. (a) (i) Derive the torque of a dc motor. (8 marks)
- (ii) A 500 V dc shunt motor draws a line current of 5 A on light load. If armature resistance is 0.15 ohm and field resistance is 200 ohms, determine the efficiency of the machine running as a generator delivering a load current of 40 amps.

(7 marks)

Or

- (b) (i) Draw and explain the Swinburne's test. (8 marks)
- (ii) When running on no load, a 400 V shunt motor takes 5 A. Armature resistance is 0.5 ohm and field resistance 200 Ω . Find the output of the motor and efficiency when running on full load and taking a current of 50 A.

(7 marks)

- V. (a) (i) Explain the construction and working principle of the 1 ϕ autotransformer. (8 marks)
- (ii) Derive the expression for saving of cu in 1 ϕ autotransformer. (7 marks)

Or

- (b) (i) A 400/200 V, 1 ϕ transformer is supplying a load of 50 A at a power factor of 0.866 lagging. The no load current is 2 A at 0.208 power factor lagging. Calculate the primary current and primary power factor.

(8 marks)

- (ii) Draw and explain the phasor diagram of a 1 ϕ transformer operating in lagging p.f. load.

(7 marks)

[4 \times 15 = 60 marks]