

ELECTRICAL MACHINES – I
(Electrical and Electronics Engineering)

Time: 3 hours

Max. Marks: 70

PART – A

(Compulsory Question)

1 Answer the following: (10 X 02 = 20 Marks)

- (a) Why do all practical energy conversion devices make use of magnetic field as a coupling medium rather than an electric field?
- (b) What is meant by statically induced EMF?
- (c) Specify the role of inter-poles in DC machines.
- (d) What is two layer winding?
- (e) What is the significance of winding factor?
- (f) What is the purpose of yoke in d.c machine?
- (g) Mention the types of braking of d.c motor.
- (h) Give the expression for hysteresis loss and eddy current loss.
- (i) Distinguish between shunt and series field coil constructions.
- (j) Define the term armature reaction in dc machines.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 What is a multiply excited system? And derive and explain the multiply excited systems.

OR

3 (a) Compare electric and magnetic circuits.

- (b) A toroidal air core coil with 2000 turns has mean radius of 25 cm, diameter of each turn being 6 cm, if the current in the coil is 10 A. Find m.m.f, flux and flux density.

UNIT – II

4 Draw a developed diagram of a simple 2-layer lap-winding for a 4-pole generator with 16 coils. Hence, point out the characteristics of a lap-winding.

OR

- 5 (a) A 4-pole wave-wound motor armature has 880 conductors and delivers 120 A. The brushes have been displaced through 3 angular degrees from the geometrical axis. Calculate: (i) Demagnetizing amp turns/pole. (ii) Cross- magnetizing amp-turns/pole. (iii) The additional field current for neutralizing the demagnetization of the field winding has 1100 turns/pole.

- (b) Derive the expressions for calculating the demagnetizing and cross magnetizing ampere turns per pole in a DC generator with usual notations.

UNIT – III

6 Distinguish between self-excited and separately excited DC generators. How self-excited generators are classified? Give their circuit diagrams.

OR

7 Draw and explain the No- load and Load characteristics of various types of DC generator.

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UNIT – IV

- 8 (a) A 220 V, DC shunt motor is operating at a speed of 1440 r.p.m. The armature resistance is 1.0Ω and armature current is 10 A. If the excitation of the machine is reduced by 10%, and find the value of extra resistance to be put in the armature circuit to maintain the same speed and torque.
- (b) Discuss about the characteristics of DC series motor.

OR

- 9 How 4-point starter is different from 3-point starter. With a neat diagram explain the construction and working of 4-point stator.

UNIT – V

- 10 (a) In a brake test the effective load on the branch pulley was 38.1 kg, the effective diameter of the pulley 63.5 cm and speed 12 r.p.s. The motor took 49 A at 220 V. Calculate the output power and the efficiency at this load.
- (b) When running on no-load, a 400 V shunt motor takes 5 A. Armature resistance is 0.5Ω and field resistance 200Ω . Find the output of the motor and efficiency when running on full load and taking a current of 50 A. Also, find the percentage change in speed from no-load to full load.

OR

- 11 With the help of neat circuit diagram, explain Hopkinson's test and derive the relations for efficiency (both for generator and motor). Also state the merits and demerits of this method.
