Code: 13A02301 **R13**

B.Tech II Year I Semester (R13) Regular & Supplementary Examinations December 2015

ELECTRICAL MACHINES – I

(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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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 1.0 Ω and armature current is 10 A. of 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 0.5 Ω 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. 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.

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