PVP 14

Code: EE3T2

II B.Tech - I Semester – Regular Examinations – December 2015

ELECTRICAL MACHINES - I
(ELECTRICAL AND ELECTRONICS ENGINEERING)

Duration: 3 hours Max. Marks: 70

PART – A

Answer ***all*** the questions. All questions carry equal marks

11x 2 = 22 M

1. a) What are the functions of pole shoes in a DC machine?
   b) Distinguish between Lap and Wave winding.
   c) Give reasons why a DC shunt generator fail to build up its EMF.
   d) What is the significance of Retardation test?
   e) Give the applications of DC shunt, series and compound motor.
   f) Distinguish between the flux control and armature control of speed varying methods of DC motor.
   g) What is the significance of compensating winding?
   h) What is commutation? What causes sparking on the commutator surface?
   i) What are the losses in the DC machine?
   j) What is the difference between DC machine and universal motor?
   k) Why starter is used?

PART – B

Answer any ***THREE*** questions. All questions carry equal marks. 3 x 16 = 48 M

2. a) Derive the EMF equation of a DC machine from Fundamentals. 8 M

b) A 6 pole DC generator has a simplex wave winding with 144 coils of 10 turns each. The speed is 2300 rpm and resistance of each turn is 0.01 Ω. The armature is 50 cm long, 50 cm diameter. The flux density in the air gap is 0.6 Wb/m^2 and each pole subtends an angle of 120^0. 8 M

i) How many current paths are there in the winding?

ii) Find the generated EMF.

iii) Find the resistance of Armature winding.

3. a) Two dc generators having rectilinear external characteristics operate in parallel. One machine has the terminal voltage of 270 V on no-load and 220V at the load current of 30A. The other has a voltage of 280V on no-load and 220V at 40A. Calculate the output current of each machine and the bus voltage when i) the load resistance is 10ohms ii) the total load current is 50A. 8 M

b) A compound generator is supplying a load of 120 A at 120V. The shunt field, series field, and armature resistances are 30Ω , 0.05Ω, and 0.1Ω respectively. Find the generated voltage in: 8 M

i) long shunt connection
ii) short shunt connection
iii) a diverter of 0.08 Ω resistance is connected in parallel with the series field in long shunt connection. Find the changes in series field MMF. Neglect Armature Reaction.

4. a) A 250V series motor runs at 1000 rpm and takes 50A at its rated load. Its resistance is 0.3ohms. Determine the additional series resistance when the motor develops rated torque. i) at staring and ii) at 800 rpm. 8 M

b) A DC shunt motor runs at 750 RPM from 250 V supply and is taking a full load line current of 60 Amps. Its armature and field resistances are 0.4ohm and 125 ohm respectively and brush voltage drop is 2V, calculate, 8 M
i) The no load speed, for a no load line current of 6 Amp.
ii) The value of resistance to be added in series with armature to reduce full load speed to 600 RPM.

5. a) With neat diagram explain the Swinburne's test conducted on DC shunt motors. What are the advantages and limitations of this test? Enumerate all calculations. 8 M

b) The Hopkinson's test on two machines gave the following results for full load: Line voltage 250 V, line current (excluding field current) = 50 A.
Motor armature current = 380 Amp. Field currents are 5 A

and 4.2 A. Calculate the efficiency of each machine. Armature resistance of each machine = 0.02 Ω. 8 M

6. a) Explain the operation of cross field dynamos in detail. 8 M

b) Explain the three brush Dc generator in detail with a neat sketch. 8 M