

Code: EE3T2

**II B.Tech - I Semester–Regular/Supplementary Examinations
November 2016**

**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) It is necessary to employ Equalizer rings for a lap wound DC machine. Why?
- b) What are the essential properties of brushes in a DC machine?
- c) What should be the polarity of inter pole with respect to the main pole in a DC generator and a DC motor?
- d) List the essential conditions for parallel operation of DC generators.
- e) A 4-point starter is used to start and control the speed of a dc shunt motor with field weakening control. Justify.
- f) Derive the condition for maximum power output of a DC motor.
- g) Enumerate the factors on which the speed of a DC motor depends.
- h) What are the applications of DC series motor?

- i) What are the merits and demerits of Hopkinson's test?
- j) What are the applications of Three brush DC generators?
- k) Briefly explain the operation of Amplidyne.

PART – B

Answer any **THREE** questions. All questions carry equal marks.

3 x 16 = 48 M

2.

- a) With the help of neat sketches, explain the phenomenon of commutation in DC machines. State and discuss the methods adopted for minimizing sparking at the brushes.

8 M

- b) A separately excited DC generator when running at 1200 r.p.m. supplies 200A at 125 V to a circuit of constant resistance. What will be the current when speed is dropped to 1000 r.p.m. and the field current is reduced to 80%? Armature resistance = 0.4Ω and total drop at brushes = 2 V. Ignore saturation and armature reaction.

8 M

3.

- a) Two shunt generators are operating in parallel. The e.m.f. induced in one of the machine is 260 V and that induced in the other machine is 270 V. They supply together a load current of 1800A. If each machine has an internal resistance of 0.04Ω and field resistance of 50Ω , determine i) terminal voltage and ii) output of each machine.

8 M

b) Explain the voltage build-up process in DC shunt generators. Also, explain the various possible reasons for failure of voltage build-up process. 8 M

4.

a) The armature resistance of a 440V DC shunt motor is 0.24Ω . Calculate the value of different resistance elements of a starter for this motor if the maximum current is limited to 110A and the ratio of maximum current to minimum current during starting be about 1.5. 8 M

b) How does DC motor automatically adjust input to match the mechanical load on the motor? 4 M

c) Derive the condition for maximum efficiency of a DC motor. 4 M

5.

a) Hopkinson's test was conducted on two shunt motors. The supply current was 15A at 200V. The generator output current was 85A. The field currents of motor and generator were 2.5A and 3A respectively. The armature resistance of each machine was 0.05Ω . Find the efficiency of each machine under the above loading conditions. 8 M

b) Explain the method of speed control of DC motor that provides a smooth control in both the directions. 8 M

6.

a) A metadyne behaves as a constant current generator. Justify the statement with the help of its construction and necessary equations. 8 M

b) Explain the principle and operation of Rosenberg generator. Also, mention its applications. 8 M