Q.P. Code:27110

Time: 3 Hours **Marks: 80**

N.B. 1) Question No. 1 is compulsory
2) Attempt any three from the remaining Questions No. 2 to No. 6.
3) Illustrate answers with diagrams wherever necessary.

Q 1. a) Explain the concept of soft starter with the help of neat block diagram. **05**

b) Explain why regenerative braking is not possible in case of DC series motor? **05**

c) Briefly Explain the significance of Back E.M.F. **05**

d) State the various types of stepper motor & list out the different applications. **05**

Q 2. a] Explain the concept of singly excited machines and derive the expression for the electromagnetic torque. **10**

b) Explain the different types of losses in Electro magnetic circuits. Explain the precautions taken to reduce hysteresis loss and eddy current loss. **10**

Q 3. a) Explain with a neat sketch the construction of a DC machine. **10**

b) A 200 V shunt motor having armature resistance of 0.4 Ohm and shunt field resistance of 100 Ohm drives a load at 500 rpm taking 27 A. It is desired to run the motor at 700 rpm. Assuming the load torque to be constant. Find the value of resistance to be used as field regulator. Neglect saturation effect. **10**

Q 4. a) Derive the E.M.F. equation of DC Machine. **10**

b) A 20 HP, 220 V shunt motor takes a full load current of 82 A, speed 1000 rpm, armature resistance 0.1 ohm, shunt field resistance 110 ohm. It is to be braked by plugging. What resistance must be placed in series to limit the current to 120 A? Find also the initial valve of the braking torque. **10**

Q 5. a) What is commutation and explain the process of commutation in DC generator. Also mention the methods to improve the commutation process. **10**

b) A field's test on two similar series machine gave the following data: **10**

Motor: Armature current = 60 A
Voltage across armature = 500 V
Voltage across field = 40 V
Generator: terminal voltage = 450V
Output current = 46 A
Voltage across field = 40 V

Armature resistance (Including brushes) of each machine is 0.25 Ohm. Calculate efficiency of both the machines.

Q 6. a) Explain the term step angle and stepping rate in stepper motor. Also determine the step angle of a variable reluctance stepper motor with 12 teeth in stator and 8 rotor teeth. **10**

b) Explain the construction and working of permanent magnet stepper motor. **10**