

[Time: 3 Hours]

[ Marks:80]

Please check whether you have got the right question paper.

- N.B: 1. Questions No.1 is compulsory.  
 2. Solve three questions from remaining questions.  
 3. All questions carry equal marks.  
 4. Assume suitable data if required.

- Q.1** a) Explain the use of commutation in DC motor. **20**  
 b) Explain armature reaction in DC machine.  
 c) Explain difference between electric circuit & magnetic circuit.  
 d) Explain the principle of energy conversion and develop the model of an electromechanical energy conversion device.  
 e) Write the application of stepper motor.
- Q.2** a) Explain the concept of singly excited machines and derive the expression for the electromagnetic torque. **20**  
 b) Explain the electrical braking methods for DC motor.
- Q.3** a) A 230 V shunt motor running on no load and at normal speed takes an armature current of 2.5 A from 230 V supply mains. The field circuit resistance is 230 ohm and the armature circuit resistance is 0.3 ohm. Calculate the motor output and efficiency when total current taken from mains is 35 A. If the motor is used as a 230 V shunt generator. Find the efficiency and the input power for an output current of 35 A. **20**  
 b) Write a short note on doubly excited magnetic field.
- Q.4** a) Explain the construction and working of permanent magnet stepper motor. **20**  
 b) With the help of neat circuit diagram explain the Swinburns test.
- Q.5** a) Explain the methods of speed control of DC motor. **20**  
 b) The Hopkinson's test on two shunt machines gave the following result for full load. Line voltage = 250V, current taken from supply system excluding field current = 50A, motor armature current = 380 A, field current = 5 A, and 4.2 A. Calculate the efficiency of the machine working as a generator. Armature resistance of each machine is 0.02 ohm.
- Q.6** a) Explain four point starter. **20**  
 b) Write down the application of DC shunt and series motor.

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