

[Time: 3 Hours]

[ Marks:80]

Please check whether you have got the right question paper.

- N.B:
1. Question number one is compulsory.
  2. Attempt any three questions from remaining.
  3. Assume suitable data if necessary.
  4. Figures to right indicates full marks.

**Q.1** Attempt any Four

- a. Explain in brief the principle of Electromechanical Energy conversion **05**
- b. What are the drawback in three point DC motor starter. **05**
- c. Draw and explain Torque-stepping rate characteristics of stepper motor. **05**
- d. Why DC series motor never start without applying load **05**
- e. Explain the power stages in DC motor in brief.

**Q.2** a) Derive the expression for torque developed in Singly excite 10 **10**

- b) A test on two similar coupled series motors, with their field connected in series, gave the following results when one machine acted as motor and the other as generator.  
**Motor:** Armature current = 56A, Armature voltage = 590V, Field Voltage drop = 40V  
**Generator:** Armature current = 44A, Armature voltage = 400V, Field voltage drop = 40V. Resistance of armature is 0.3 ohms.  
 Calculate the efficiency of motor and generator at this load. **10**

**Q.3** a. Explain the Electrical braking methods for separately excite DC motor. **10**

- b. A 250 V shunt motor with constant main field, drives a loa4 where the torque of which varies as cube of speed. When running at 500 rpm, armature takes 40 Amps. Find the speed of motor at which it will run, if 25 ohms resistor is connected in series with the armature. Armature resistance is 0.05 ohms. **10**

**Q.4** a. Derive the expressions for Demagnetizing Ampere T:ys (ATd/pole) and Cross Magnetizing Ampere Turns (ATc/pole) in armature reaction **10**

- b) A ring has diameter of 21 cm and cross sectional area of 10 cm<sup>2</sup>. The ring is made up of semicircular sessions of cast iron and cast steel, with each joint having reluctance equal to an air gap of 0.2 mm. Find the ampere turns required to produce a flux of 8x10<sup>-4</sup> Wb. The relative permeability of cast steel and cast iron are 800 and 166 respectively. Neglect fringing and leakage effect. **10**

**Q.5** a. Explain the Variable Reluctance Stepper Motor (VRSM) **10**

- b. Design the resistance of sections of eight stud starter for 100 h.p., 500 V shunt motor. The armature current should not exceed 1.5 the full load armature current. motor full load efficiency is 94%. The total copper losses are 3.7% of input and shunt field resistance 250 ohms **10**

**Q.6** a) Explain retardation test for determination of moment of inertia of DC motor. **10**

- b) Explain the process of commutation in DC generator and men ion the methods to improve the commutation process. **10**

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