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Total No. of Pages: 02

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# B.Tech.(Automation & Robotics) (2011 & Onwards) ELECTROMECHANICAL ENERGY CONVERSION & D.C. MACHINES

(Sem.-6)

Subject Code: EE-202 M.Code: 71063

Time: 3 Hrs. Max. Marks: 60

### **INSTRUCTION TO CANDIDATES:**

- SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
- 2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
- 3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

## **SECTION A**

# 1. Answer briefly:

- a. Define energy and co-energy.
- b. Differentiate between coil pitch and pole pitch.
- c. Write the principle of reluctance motor.
- d. Give example for single and multiple excited systems.
- e. How hysteresis and eddy current losses are minimized?
- f. Why commutator is employed in DC machines?
- g. What are two unwanted effects of armature reactions?
- h. What is the necessity of starter in DC motors?
- i. Why does the energy storage in a magnetic material occur mainly in the air gap?
- j. What is the function of over-load release coil provided in a DC motor starter?

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#### SECTION-B

- 2. Show that the reaction of coupling magnetic field on the electrical or mechanical system is essential for the electromechanical energy conversion.
- 3. Define armature reaction in DC machine and explain its effects on machine performance.
- 4. Describe Ward Leonard control method. Discuss advantages and disadvantages of this method.
- 5. A 250V DC shunt motor has an armature current of 20A when running at 1000 rpm against full-load torque. The armature resistance is 0.5 Ohms. What resistance must be inserted in series with the armature to reduce the speed to 500 rpm at the same torque?
- 6. Distinguish between singly excited and doubly excited system.

### **SECTION-C**

- 7. Explain, how two DC shunt generators work in parallel, and how they share the load. List out the conditions to be satisfied for running two or more DC shunt generators in parallel.
- 8. Two coupled coils have self and mutual inductance of  $L_{11}$ = 3+0.5x;  $L_{22}$ = 2+0.5x;  $L_{12}$  =  $L_{21}$  = 0.3x over a certain range of linear displacement x. The first coil is excited by a constant current of 15A and the second by a constant current of -8A. Find out:
  - a) Mechanical work done if x changes from 0.6 to 1m.
  - b) Energy supplied by each electrical source in part (a).
- 9. a) Explain the speed control of DC series motor by:
  - i) Field diverters
  - ii) Variable resistance in series with motor.
  - b) List the different losses in a DC machine. Which of these losses are constant? Derive a condition for maximum efficiency.

NOTE: Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.

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