

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE- SEMESTER-V (NEW) EXAMINATION – WINTER 2020****Subject Code:3152001****Date:29/01/2021****Subject Name:Electro Mechanical Energy Conversion****Time:10:30 AM TO 12:30 PM****Total Marks: 56****Instructions:**

1. Attempt any FOUR questions out of EIGHT questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

|            |   | Marks     |
|------------|---|-----------|
| <b>Q.1</b> | (a) Define (1) Magnetic flux density (2) Self inductance (3) Mutual Inductance.   | <b>03</b> |
|            | (b) Define (1) Magnetic flux (2) Generated EMF (3) Induced EMF (4) Reluctance.  | <b>04</b> |
|            | (c) State basic principles of<br>(1) DC motor (2) Induction motor<br>(3) Synchronous motor (4) Stepper Motor<br>(5) BLDC Motor (6) Servo motor (7) PMDC motor | <b>07</b> |
| <b>Q.2</b> | (a) Define field energy and co-energy. What is significant of co-energy?  | <b>03</b> |
|            | (b) Explain the hysteresis and eddy current losses.   | <b>04</b> |
|            | (c) Draw and explain the torque – speed characteristic of a hysteresis motor. What are the common applications of hysteresis motor?                           | <b>07</b> |
| <b>Q.3</b> | (a) A 4 pole 50 Hz induction motor is running at 1300 rpm. Find the speed of stator magnetic field with respect to the rotor?                                 | <b>03</b> |
|            | (b) Explain DC series generator load characteristics.   | <b>04</b> |
|            | (c) Draw and explain doubly excited magnetic field system.  | <b>07</b> |
| <b>Q.4</b> | (a) Draw and explain the characteristics of a DC shunt motor.   | <b>03</b> |
|            | (b) State some important applications of stepper motors and PMDC motors.  | <b>04</b> |
|            | (c) State and Explain different approximation made while analyzing electromagnetic devices.   | <b>07</b> |
| <b>Q.5</b> | (a) A 3 phase 440 V, 50 Hz induction motor has 4% slip. Calculate frequency of rotor current.   | <b>03</b> |
|            | (b) State advantages of servo motors over large industrial motors.  | <b>04</b> |
|            | (c) Explain double field Revolving theory.  | <b>07</b> |
| <b>Q.6</b> | (a) Explain construction of PMDC motors,  | <b>03</b> |
|            | (b) Explain construction of DC servo motors.  | <b>04</b> |
|            | (c) Explain construction details of single phase shaded pole motor with suitable diagram.   | <b>07</b> |
| <b>Q.7</b> | (a) Explain various types of magnetic materials and their properties.   | <b>03</b> |
|            | (b) Explain with usual expression Faraday's law and Lenz's law.   | <b>04</b> |
|            | (c) State and Explain Ampere's law.   | <b>07</b> |

- Q.8 (a) Explain DC servomotor torque speed characteristics. **03**  
(b) State applications of PMDC motor. **04**  
(c) Explain construction and working of of 3 Phase induction motor. **07**

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