

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-V (NEW) EXAMINATION – WINTER 2023****Subject Code:3152001****Date:20-12-2023****Subject Name: Electro Mechanical Energy Conversion****Time:10:30 AM TO 01:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

- Q.1** (a) Enlist Properties of magnetic materials. **03**
 (b) Define (a) magnetic flux (b) magnetic flux density (c) self-inductance (d) mutual inductance **04**
 (c) Explain (a) ampere's law (b) Faraday's law (c) Lenz's law **07**
- Q.2** (a) Explain hysteresis and hysteresis loop. **03**
 (b) Explain the fringing and leakage effects of airgap. **04**
 (c) Explain equivalent circuits of iron core reactors and saturable reactors. **07**
- OR**
- (c) Explain the method of analysis of ferromagnetic circuits. **07**
- Q.3** (a) Why can't an induction motor run at synchronous speed? Why single-phase induction motor not self-starting? **03**
 (b) Define field energy and co-energy. What is the significance of co-energy? **04**
 (c) Explain the linear magnetic system excited by two sources and also derive the torque equation for the same. **07**
- OR**
- Q.3** (a) Explain the basic principle of operation of a DC Machine. **03**
 (b) Explain torque slip characteristics of 3-phase induction motors. **04**
 (c) Explain double field Revolving theory. **07**
- Q.4** (a) A 220-V D.C. Machine Has An Armature Resistance Of 0.5 Ohm If The Full-Load Armature Current Is 20 A, Find The Induced E.M.F. when the machine acts as a generator. **03**
 (b) Explain types of losses in D.C. Machines. **04**
 (c) Explain power flow diagrams of (a) DC machines (b) 3-phase induction motors (c) synchronous machines **07**
- OR**
- Q.4** (a) A 220-V D.C. Machine Has An Armature Resistance Of 0.5 ohm. If The Full-Load Armature Current Is 20 A, Find The Induced E.M.F. when the machine acts as a motor. **03**
 (b) Explain types of losses in 3-phase induction motors. **04**
 (c) Explain methods of starting of synchronous motors. **07**
- Q.5** (a) Explain the working principle of the induction motor. **03**
 (b) Write short note on AC servomotors. **04**
 (c) Explain various types of single-phase induction motors. **07**
- OR**
- Q.5** (a) Explain the operating principle of synchronous machines. **03**
 (b) Write a short note on PMDC motors. **04**
 (c) Explain the construction, working principle, characteristics, and applications of servomotors **07**
