

GUJARAT TECHNOLOGICAL UNIVERSITY**BE – SEMESTER- V EXAMINATION-SUMMER 2023****Subject Code: 3152001****Date: 03/07/2023****Subject Name: Electro Mechanical Energy Conversion****Time: 02:30 PM TO 05:00 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.

		Marks
Q.1	(a) Explain the construction of DC Motors.	03
	(b) Explain various types of magnetic materials and their properties.	04
	(c) State working principles of (1) Repulsion motor (2) Induction motor (3) Synchronous motor (4) Stepper Motor (5) BLDC Motor (6) Servo motor (7) PMDC	07
Q.2	(a) Explain the construction of DC Generators.	03
	(b) Explain the methods of analysis of ferromagnetic circuits.	04
	(c) What is electromechanical energy conversion? Explain generated emf with a suitable diagram.	07
	OR	
	(c) Explain double field Revolving theory.	07
Q.3	(a) Draw and explain the characteristics of a DC shunt motor.	03
	(b) Define field energy and co-energy. What is the significance of co-energy?	04
	(c) Explain power flow diagrams of 3-phase induction motors.	07
	OR	
Q.3	(a) Explain DC series generator load characteristics.	03
	(b) Define (1) Magnetic flux density (2) Self-inductance (3) Mutual Inductance (4) magnetic flux.	04
	(c) Explain power flow within synchronous motors.	07
Q.4	(a) Discuss the modifications necessary to operate a DC series motor satisfactory on single phase AC supply.	03
	(b) Explain various losses that occur in DC Machines.	04
	(c) Explain methods of starting synchronous motors.	07
	OR	
Q.4	(a) Why can't an induction motor run at synchronous speed? Why single-phase induction motor not self-starting?	03
	(b) Explain various losses that occur in 3-phase induction motors.	04
	(c) Draw and explain the equivalent circuit of a single-phase induction motor.	07

- Q.5 (a)** A stepper motor has a step angle of 2.5° . Calculate the number of steps required for the shaft to make 25 revolutions. **03**
- (b)** Classify DC Machines. **04**
- (c)** Enlist all applications of (a) Repulsion motor (b) AC series motor (c) Universal motor (d) Reluctance motor (e) Hysteresis motor. **07**

OR

- Q.5 (a)** A 3-phase, 3 stack, variable reluctance stepper motor has 20 pole on each rotor and stator stack. Calculate The step angle of this stepper motor. **03**
- (b)** Explain types of single-phase induction motors. **04**
- (c)** Enlist all applications of (a) Permanent Magnetic DC (PMDC) Motors (b) Brushless DC (BLDC) motors (c) AC and DC servo motors. **07**