

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE – SEMESTER- VIII EXAMINATION-SUMMER 2023

Subject Code: 2181919

Date: 28/06/2023

Subject Name: Robotics

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) Define robot anatomy. List different types of joints used in Industrial applications.	03
	(b) Define and explain following terms: (1) Workspace (2) Load carrying Capacity (3) Speed of Response (4) Range	04
	(c) Explain with example “Forward and Inverse Kinematics”	07
Q.2	(a) Explain programming methods used in robotic system.	03
	(b) State various properties of Robotic sensors.	04
	(c) Explain DH- representation for forward kinematics.	07
	OR	
	(c) Enlist different types of drives used in Robotics system. Explain each in detail.	07
Q.3	(a) Enlist various properties of grippers.	03
	(b) Which are the selection criteria for purchase of a robot for any Industrial application?	04
	(c) Explain various applications of Robotics. Highlight few future applications of robots.	07
	OR	
Q.3	(a) What is Jacobian. What is a relation of Jacobian with singularity?	03
	(b) Explain 4-bit rotary optical encoder using neat sketch.	04
	(c) Which are various approaches for Robot Dynamics? Explain any one in detail with example.	07
Q.4	(a) Find the coordinates of point P $(10,20,40)^T$ relative to the reference frame after a rotation of 30° about the x-axis.	03
	(b) Mention various applications of Robotic Vision systems. Compare with Human Vision System.	04
	(c) Enlist various types of grippers. Draw a neat sketch of any two mechanical grippers.	07
	OR	
Q.4	(a) Define path and trajectory.	03
	(b) Draw a block diagram of Robotic Vision System.	04
	(c) Explain Roll-Pitch-Yaw configuration with neat sketch.	07

- Q.5** (a) Discuss mapping velocity vectors. **03**
(b) Explain Robot cell layouts-Robot (i) centered cell (ii) In-line robot cell. **04**
(c) Explain third order polynomial trajectory planning and write in a matrix form. **07**

OR

- Q.5** (a) Explain any two robotic sensors with working principle. **03**
(b) State the significance of the homogeneous coordinate transformations usage in robotic manipulators analysis. **04**
(c) Explain Linear function with Parabolic Blend for Trajectory planning. **07**
