Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–V (NEW) EXAMINATION – WINTER 2024

Subject Code:3151110 Date:25-11-2024

Subject Name: Robotics and Automation

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.**

			Marks
Q.1	**(a)**	How do Asimov's Law of Robotics laws aim to regulate the behavior of robots?	**03**
	(b)	Describe the evolution of robots through various generations.	**04**
	(c)	Define the concept of degrees of freedom in robotics.Provide examples of different robotic systems with varying degrees of freedom and explain their applications.	**07**
Q.2	**(a)**	Compare and contrast microprocessors and microcontrollers in the context of robotic controllers.	**03**
	(b)	Explain the working of mechanical Grippers in brief.	**04**
	(c)	Compare the principles of operation of DC motors and stepper motors in robotic systems. How are these motors interfaced with robotic controllers?	**07**
		OR	
	(c)	Explain the importance of peripheral interfacing in microcontroller-based robotic systems. Provide examples of common peripheral devices used in robotics.	**07**
Q.3	**(a)**	Explain pressure Sensors.	**03**
	(b)	Explore the role of sensors and actuators in robotics.	**04**
	(c)	Illustrate the construction of an LVDT used for displacement measurement in robotics and explain its working principle.	**07**
		OR	
Q.3	**(a)**	Discuss the proxy sensor.	**03**
	(b)	Describe different types of actuators commonly used in robotic systems and their significance.	**04**
	(c)	Explain the classification of robot programming languages. How are robot languages categorized based on their levels (high-level, low-level) and functionality (task-level, robot-level)?	**07**
Q.4	**(a)**	Explain off-line robot programming in short?	**03**
	(b)	Describe the structure and purpose of the Robot Operating System (ROS).	**04**
	(c)	Explain the path planning techniques briefly.	**07**
		OR	
Q.4	**(a)**	How can Raspberry Pi be used as a low-cost robotic platform?	**03**
	(b)	Explain the concept of inverse kinematics in robotic systems.	**04**
	(c)	Explain the classification of robots based on their coordinate systems. Provide appropriate diagrams to support your explanation.	**07**

Q.5	**(a)**	Differentiate Palletizing and De palletizing.	**03**
	(b)	Explain the factors to consider when selecting a robot for a particular application.	**04**
	(c)	Compare the different types of robot cell layouts. How do they differ in design, functionality, and application?	**07**

OR

Q.5	**(a)**	Explore the use of robots in manufacturing applications.	**03**
	(b)	Explain the factors to consider when selecting a robot for a particular application.	**04**
	(c)	Explain the factors to consider when selecting a robot for a particular application. How do considerations like payload, speed, degrees of freedom, and precision affect the choice of a robot?	**07**

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