GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–VI EXAMINATION – SUMMER 2025

Subject Code: 3164208   **Date: 30-05-2025**

Subject Name: Introduction to Robotics

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)**	What is a robot? List some of its applications.	**03**
	(b)	State Asimov's laws of robotics.	**04**
	(c)	List the advantages and disadvantages of using a robot, its chief characteristics and the need for automation.	**07**
Q.2	**(a)**	What are some of the typical kinematic pairs/joints used in a robot and the associated degree of freedom?	**03**
	(b)	Explain forward and inverse kinematics and D-H parameters.	**04**
	(c)	Describe the typical co-ordinate systems and reference frames used in robotics.	**07**
		OR	
	(c)	A point P[7, 3, 1]^T is attached to an end effector of a robot and is subjected to the following transformations about the **fixed reference frame**: **1.** Rotation of 90° about the y-axis; **2.** Followed by a rotation of 90° about the x-axis; **3.** Followed by a translation of [4, -3, 7]. Find the total transformation matrix, and the transformed coordinates of point P.	**07**
Q.3	**(a)**	Describe different drive systems used in robotics.	**03**
	(b)	Describe the different types of actuators used in robotics.	**04**
	(c)	Explain DC and AC motors, its types in detail and list out the advantages and disadvantages (for e.g., the heat dissipation characteristics etc.).	**07**
		OR	
Q.3	**(a)**	Explain the difference between a gripper and an end effector.	**03**
	(b)	List out the various advantages and disadvantages of different actuators.	**04**
	(c)	Explain the different types of grippers and the criteria on which those grippers are selected.	**07**
Q.4	**(a)**	What are sensors and why are they important?	**03**
	(b)	Explain roll, pitch, yaw and Euler angles.	**04**
	(c)	Explain various internal sensors that are commonly used in robotics.	**07**
		OR	
Q.4	**(a)**	What are mobile robots and what are the different mechanisms through which the mobility is achieved.	**03**
	(b)	Explain path planning and trajectory planning.	**04**
	(c)	Explain various sensor characteristics and the criteria on which they are selected.	**07**
Q.5	**(a)**	Explain WAIT, SIGNAL and DELAY commands using a small code block.	**03**
	(b)	Explain VAL, RAIL, AML and Python languages used in robotics.	**04**
	(c)	Explain in detail the role of AI, its need, and applications in the field of robotics.	**07**
		OR	
Q.5	**(a)**	Explain the different types of learning methods in ML.	**03**
	(b)	Explain what is Genetic Algorithm and Artificial Neural Network.	**04**
	(c)	Explain the different programming methods and generation of programming languages used in robotics.	**07**

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