Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME – SEMESTER – III (New) • EXAMINATION – WINTER - 2020

Subject Code: 3730808 Date:02/01/2021

Subject Name: Robotics Engineering

Time: 10:30 AM TO 12:30 PM Total Marks: 56

Instructions:

1. **Attempt any FOUR questions out of EIGHT questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	What do you understand by robot workspace? Explain the following performance measuring indices: (a) Condition Number (b) Manipubality Index.	**07**
	(b)	Discuss the inverse kinematics for robot manipulators with example.	**07**
Q.2	**(a)**	Find force and torque of SCARA robot configuration.	**07**
	(b)	Differentiate joint space vs. cartesian space for trajectory generation.	**07**
Q.3	**(a)**	Derive an expression for the direct kinematics of a simple cylindrical robot.	**07**
	(b)	What is robot programing? Explain in detail various types of robot programming.	**07**
Q.4	**(a)**	Enlist and explain the various generations of robotics languages in detail.	**07**
	(b)	Differentiate between path planning and trajectory planning. Elaborate generalized motion control laws for robotics manipulators.	**07**
Q.5	**(a)**	Write the short note on independent joint PID control.	**07**
	(b)	Elaborate the workspace version of the PD control law results in exponential trajectory traking.	**07**
Q.6	**(a)**	Elaborate the purpose of using machine vision techniques in robots.	**07**
	(b)	List any 3 types of arms used in industrial robot manipulators. Elaborate D-H representation of robotic manipulator.	**07**
Q.7	**(a)**	Enlist and explain image processing technics used for machine vision system in robotics.	**07**
	(b)	Explain Jacobian work envelop. Write a short note on forward kinematics.	**07**
Q.8	**(a)**	What do you mean by tracking error? Write the algorithm for robotic arm dynamic control.	**07**
	(b)	Explain edge detection technique of machine vision in depth.	**07**

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