GUJARAT TECHNOLOGICAL UNIVERSITY
ME – SEMESTER – III (New)– EXAMINATION – WINTER-2019

Subject Code: 3730808   **Date: 16-11-2019**

Subject Name: Robotics Engineering

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.**

Q.1	**(a)**	Enlist the different types of joint commonly use in robots. Sketch any two of them.	**07**
	(b)	Discuss the inverse kinematics for robot manipulators with example.	**07**
Q.2	**(a)**	Explain reciprocal condition number and manipubality index.	**07**
	(b)	Describe design considerations on trajectories. Explain 4-3-4 trajectory.	**07**
		OR	
	(b)	Discuss the Roll-Pitch-Yaw (RPY) transformation with neat sketch.	**07**
Q.3	**(a)**	Derive an expression for the direct kinematics of a simple cylindrical robot.	**07**
	(b)	Elaborate Cartesian configuration with neat sketch.	**07**
		OR	
Q.3	**(a)**	Enlist and explain the steps to calculate moment and force of robot with its nomenclature.	**07**
	(b)	Enlist and explain the steps to calculate force and torque of robot with its nomenclature.	**07**
Q.4	**(a)**	What do you understand by robot workspace? Explain the following performance measuring indices: (a) Condition Number (b) Manipubality Index.	**07**
	(b)	Explain edge detection technique of machine vision in depth.	**07**
		OR	
Q.4	**(a)**	Elaborate image processing techniques with any one industrial application	**07**
	(b)	Enlist and explain methods of robot programing.	**07**
Q.5	**(a)**	Write the difference between robot open and closed loop control system.	**07**
	(b)	Write the short note on independent joint PID control.	**07**
		OR	
Q.5	**(a)**	What do you mean by tracking error? Write the algorithm for robotic arm dynamic control.	**07**
	(b)	Classify robotic control system. Explain any one in detail.	**07**

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