Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME SEMESTER– III (NEW) EXAMINATION – SUMMER 2017

Subject Code: 2730808 **Date: 02/05/2017**

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)**	Explain the robot anatomy in brief.	**07**
	(b)	Discuss the inverse kinematics for robot manipulators with example.	**07**
Q.2	**(a)**	Enlist the different indices and explain any two.	**07**
	(b)	Discuss the Roll-Pitch-Yaw (RPY) transformation with neat sketch.	**07**
		OR	
	(b)	Derive an expression for the direct kinematics of a simple cylindrical robot.	**07**
Q.3	**(a)**	Discuss the Hamilton's principle of least action.	**07**
	(b)	Compare the Lagrange-Euler approach with Newton-Euler approach for dynamic modeling of robot manipulators.	**07**
		OR	
Q.3	**(a)**	Explain the potential energy of robotic arm in brief.	**07**
	(b)	What do you mean by trajectory planning? Write the difference between path and trajectory.	**07**
Q.4	**(a)**	Describe the proximity sensors that are based on inductive or capacitive properties of materials.	**07**
	(b)	The second joint of a SCARA manipulator is required to move from 30° to 150° in 5 seconds. Find the cubic polynomial to generate the smooth trajectory for joint. What is the maximum velocity and acceleration for this trajectory?	**07**
		OR	
Q.4	**(a)**	Enlist the criteria for selection of translational and rotary actuators.	**07**
	(b)	Classify the grippers and discuss any two.	**07**
Q.5	**(a)**	Write the difference between robot open and closed loop control system	**07**
	(b)	Discuss the liner feedback second-order control system for robot manipulators.	**07**
		OR	
Q.5	**(a)**	Write the short note on independent joint PID control.	**07**
	(b)	What do you mean by tracking error? Write the algorithm for robotic arm dynamic control.	**07**

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