Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – II • EXAMINATION – WINTER • 2014

Subject code: 1720906 **Date: 05-12-2014**

Subject Name: Robotics

Time: 02:30 pm - 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 given terminologies in regard to robotics: (1) Rich, (2) Repeatability, (3) Cycle Time, (4) Degree of freedom, (5) Pay Load,(6) Work envelope, (7) Speed of response	**07**
	(b)	Explain why homogeneous coordinates are required in modeling of robots manipulation.	**07**
Q.2	**(a)**	What do you mean by robot configuration? Explain 2P, 2PR, and 3Rconfiguration.	**07**
	(b)	List and Explain the different types of drives used in Robot. Also compare them.	**07**
		OR	
	(b)	Explain different types of joints in robots.	**07**
Q.3	**(a)**	Describe the desire features in the sensors use for robots.	**07**
	(b)	Distinguish between Langrangian and Newtonian Mechanisms. With suitable example for each.	**07**
		OR	
Q.3	**(a)**	Explain model based control for robot manipulator.	**07**
	(b)	Write the objective of robot safety. Discuss the different level of robot safety.	**07**
Q.4	**(a)**	Derive transformation matrix for Euler angles D-H representation of forward kinematics.	**07**
	(b)	Explain Homogeneous transformations in Robot kinematics.	**07**
		OR	
Q.4	**(a)**	Calculate the velocity of the tip of the two-link, planar RR-manipulator arm as shown in Figure1.	**07**

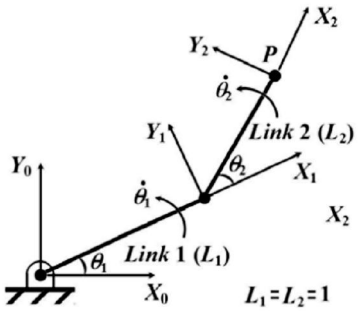

Figure:1

	(b)	Explain with Example ñForward and Inverse kinematicsò.	**07**
Q.5	**(a)**	What is robot vision? Explain different types of vision sensors.	**07**
	(b)	Explain various types of gripper mechanism. Explain design procedure of anyone in detail.	**07**
		OR	
Q.5	**(a)**	A 5 Kg rectangular block is gripped in the middle and listed vertically at a velocity of 1 m/s. If it accelerates to this velocity at 27.5m/s and between gripped pad and block is 0.43, calculate the minimum force that will prevent slippage.	**07**
	(b)	What are robot programming languages? Explain any one of the robot programming method.	**07**

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