Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII • EXAMINATION – SUMMER • 2015

Subject Code: 173402 **Date: 04/05/2015**

Subject Name: Industrial Robotics

Time:02.30pm-05.00pm **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 classification of Industrial robot with neat sketch each.	**07**
	(b)	i)	Explain briefly SCARA robot.	**04**
		ii)	Explain briefly the use of a robot in a palletizing operation.	**03**
Q.2	**(a)**	i)	What is end effector? Explain briefly.	**03**
		ii)	What are the types and requirement of gripper?	**04**
	(b)		What do you mean by RCC gripper? Explain with neat sketch.	**07**
			OR	
	(b)		The following data relate to a mechanical gripper using friction to grasp an object: Weight of the part = 30N Coefficient of friction between the gripper pad and the object = 0.3 Length: l_1= 72mm; l_2= 48mm; l_3=18mm;l_4=54mm Diameter of the piston of the pneumatic cylinder=78mm Factor of safety= 1.4 If the gripper is accelerating down with an acceleration =9.81m/s^2; calculate: i) The gripper force to retain the part; ii) Actuation force required to obtain this gripping force; iii) The pressure needed to operate the piston; iv) The Power required if the discharge is 0.018m^3/s.	**07**
Q.3	**(a)**	i)	Discuss briefly ‘Digital control of electric motors”.	**03**
		ii)	Explain briefly the following: i) Double acting cylinders ii) Telescopic cylinders	**04**
	(b)		What are the pneumatic valves to control pneumatic actuators? Explain each with suitable diagram.	**07**
			OR	
Q.3	**(a)**	i)	Describe briefly the following external state sensors: i) Strain gauges ii) Electromagnetic sensors	**04**
		ii)	Explain Compliance sensors	**03**
	(b)		What are the range sensors with application? Explain any two.	**07**
Q.4	**(a)**	i)	Explain briefly the components of a vision system.	**04**
		ii)	Explain briefly Absolute and Incremental optical encoders.	**03**

	(b)		What do you mean by Illumination techniques in machine vision? Explain its process with diagram.	**07**
			OR	
Q.4	**(a)**		How the three degrees of freedom is given into the reverse kinematic in robotics.	**07**
	(b)		What do you mean by division? How and where it is useful in robotics.	**07**
Q.5	**(a)**	i)	Enlist the considerations which must be handled by any robot programming method.	**03**
		ii)	What are the Robot programming languages? Explain any one in brief.	**04**
	(b)		What are the motion commands for robot programming for manipulation?	**07**
			OR	
Q.5	**(a)**		Differentiate AGV and RGV with their applications and benefits.	**07**
	(b)		What do you mean by economic analysis of robot? Explain any one.	**07**

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