Seat No.: _____

(B)

Enrolment No.____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER- II (Old course)• REMEDIAL EXAMINATION - SUMMER 2015 Subject Code: 1720906 Date:18/05/2015 Subject Name : Robotics

Time:	02:30 pm to 5:00 pm Total Marks: 70	
Instructio	ons:	
1 2 3 Q.1(A)	 Attempt all questions. Make suitable assumptions wherever necessary. Figures to the right indicate full marks. What is robotics ? Explain robot anatomy and its application in mechanical engineering 	05
(B)	Explain importance of degree of freedom in robotics and EXPLAIN RPP, RRP configuration of robot.	09
Q.2. (A)	Define following with respect to robotics. Load carrying capacity, work volume, end effectors, resolution OR	05
(A)	Derive basic link transformation matrix using Danavit Hartengberg parameters.	05
(B)	What is inverse kinematics ? Explain guideline to get close form solution for inverse kinematics.	09
Q.3(A)	A 3 degree of freedom roll pitch-yaw wrist having following configurations. Obtain direct kinematic model. Where ai αi di i are D-H parameters.	(6)

Link i	ai	αί	di	i
1	0	90 °	0	1
2	0	90°	0	2

 Image: second second

Link i	ai	αί	di	i
1	5	90 °	0	1
2	0	90 °	D2	0
3	0	0	D3	0
4	0	0	0	4

End effector transformation matrix is given as

$$T_{E} = \begin{bmatrix} -3.5 & 0.4 - 0.8 - 90 \\ 0.4 & 0.8 - 0.5 - 46 \\ 0.8 & -0.5 & 0 & 50 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

Q.3(A) Figure shows the linkage mechanism and dimensions of a gripper used to handle a work part for machining operation. The gripper force is determined to be 150N. Determine the actuating force F_a applied to the plunger.(Assume Suitable data)



(B)	Give Eulerøs angle representation for the rotation of arm and gripper.	07
Q.4(A)	Explain Proximity Sensors in Details	07
(B)	State the characteristics of robotic sensors. Explain rotary incremental optical	07
	Encoder with neat sketch	
	OR	
Q.4(A)	How do incorporate image processing in Robot	07
	A joint of a robot manipulator traverses from an initial position of 20° to a final	07
(B)	position of 80° in 6 seconds. Assume a fifth degree polynomial and a starting	
	acceleration of 5 deg/sec2 and final retardation of 10 deg/sec2. Derive the	
	expression for $\theta(t)$ and also compute the angular position at end of 4 seconds	
Q.5(A)		07
	Define following technical terms in robotics:	
	1. Accuracy 2. Repeatability 3. Play back robot 4. Resolution	
(B)	Define Trajectory planning.	07
	OR	
Q.5(A)	What are the different Mode for Programming Robot	07
		07
(B)	Explain robot centered compliance (RCC) device for assembly operation	

07