

#25

Sem, VIII (R)

BE

BIO

Robo Medicine

50: 1ST HALF-13 (S)-JP

Con. 9533-13.

YTIET/UB/ENGG/BM/SEM-VIII/RM/

(REVISED COURSE)

Date: 24/05/13  
24 May 2013

GS-3850

(3 Hours)

[ Total Marks : 100

- N.B.** (1) Question No. 1 is **compulsory**.  
 (2) Answer any **four** from remaining questions.  
 (3) Assume any data if **needed**; specify **clearly**.

1. (a) What are the different drive technologies used in robotics? 3  
 (b) What is meant by direct kinematics? 3  
 (c) What are the kinematics parameters? Explain. 4  
 (d) Explain Tool Configuration Vector and its significance in IKP. 3  
 (e) What are the work-space fixtures? 3  
 (f) What are the template matching techniques used in robotic vision? 4
2. (a) Explain the terms :— 10  
 (i) Reach  
 (ii) Stroke  
 (iii) Repetability  
 (iv) Precision  
 (v) Accuracy.  
 (b) Classify the robots based on work envelope geometrics. 10
3. (a) Explain D-H algorithm and write down the LCD of SCARA robot (ADEPT ONE). 10  
 (b) Find the Arm matrix for SCARA robot and find the tool tip position of the robot when the joint variables are :— 10  

$$q = \left[ \frac{\pi}{4}, -\frac{\pi}{3}, 120 \text{ mm}, \frac{\pi}{2} \right]^T$$

Joint distance  $d = [877, 0.0, d_3, 200]^T$  mm  
 Link length  $a = [425, 375, 0.0, 0.0]$  mm
4. (a) Find the inverse kinematics of five axis articulated robot [Rhino XR-3]. 15  
 (b) Explain why inverse kinematics solution is not unique for generic robots. 5
5. (a) Explain how the linear interpolation with parabolic blend eliminate the infinite acceleration requirement on the trajectory of the robots. 10  
 (b) Explain the pick and place operation in trajectory planning. 10
6. (a) Explain the bounded deviation algorithm method used for achieving straight line path in tool configuration space. 6  
 (b) Explain area descriptors and line descriptors. Compare merits. 7  
 (c) Write a short note on perspective transformation. 7
7. (a) Explain the Gross motion and Fine motion planning techniques. 10  
 (b) Explain the applications of robotics in Bio-medical Engineering. 10

