 (Library) Sem-VIII |Rev| ETRX| Comp 25/5/09
Elective II : Robotics.

Con. 3357–09. **(REVISED COURSE)** **VR–4125**

(3 Hours) **[Total Marks : 100**

N.B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions out of remaining **six** questions.

1. (a) Discuss the differences between fixed and flexible automation. **5**
   (b) What is linear interpolation with parabolic blends ? What are the advantages ? **5**
   (c) Define the following terms : Tool Path, Tool Trajectory, DOF, Precision, Accuracy. **5**
   (d) Define Kinematic Parameters. **5**

2. (a) Explain the edge detection algorithm. **10**
   (b) Explain Bounded Deviation Algorithm. **10**

3. (a) What is image smoothening ? Explain how it is done on a binary image. **10**
   (b) Construct the arm matrix using homogeneous transformation matrices for a 2–DOF articulated robot. Draw neat diagram. **10**

4. (a) Determine the tool configuration vector of SCARA robot, when – **10**

$$q = \left\{\frac{\pi}{6}, \frac{\pi}{3}, 120, \frac{\pi}{4}\right\}^T$$

$$a = \{425, 375, 0, 0\}^T \text{ mm}$$

$$d = \{877, 0, q_3, 200\}^T \text{ mm}$$

   (b) Explain guarded and constrained motion. **10**

5. (a) Explain the effect of moment of inertia on the dynamic performance of a robot. **10**
   (b) What is an Inverse Kinematics problem ? What are the methods of solving it ? Compare numerical approaches over analytical approaches. **10**

6. (a) Explain the PNP motion trajectory in details. **10**
   (b) Explain position uncertainty and velocity uncertainty. **5**
   (c) Define Total work envelope, Joint space work envelope and Dexterous work envelope with their relevant formulae and explain each term in them. **5**

7. Write short notes on :– **20**
   (a) NC and CNC machines
   (b) Perspective transformation
   (c) Robot programming
   (d) Linear interpolation with parabolic blends.
