

Total No. of Questions :12]

SEAT No. :

[Total No. of Pages :3

**P1705**

**[4859]-46**

**B.E (Mechanical)**

**ROBOTICS**

**(2008 Course) (Semester - II) (Elective - III) (402049 C)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) Answer 3 questions from section I and 3 questions from section II.*
- 2) Answers to the two sections should be written in separate books.*
- 3) Figures to the right indicate full marks.*
- 4) Neat diagrams must be drawn wherever necessary.*

**SECTION - I**

- Q1)** a) Explain the six degrees of freedom associated with the manipulator with neat sketch. [6]
- b) Describe various characteristics used to specify Industrial Robot. [10]

OR

- Q2)** a) In a robot, twisting joint wrist assembly can rotate through 10 full revolutions and is required to have a resolution of 0.2°. Find out the required bit storage capacity for achieving this resolution. [8]
- b) Explain the term 'compliance' in terms of a robot? Explain types of compliance. [8]
- Q3)** a) Differentiate between vacuum and magnetic grippers. [4]
- b) State different types of proximity sensors and explain any one in detail.[6]
- c) Which sensor can be used along with the gripper to sense whether the object is slipping? Explain its working principle. [6]

OR

**P.T.O.**

- Q4)** a) Explain the design consideration of gripper selection. [8]  
 b) With neat sketch explain range sensors used in robot. [8]
- Q5)** a) What are advantages of PID feedback controller over PD controller. [4]  
 b) Explain control law of partitioning. [6]  
 c) Explain different types of actuators used in industrial robots. [8]

OR

- Q6)** a) Explain different types of controllers used in industrial robots. [8]  
 b) The second joint of the **SCARA** manipulator is required to move from  $\alpha_2 = 30^\circ$  to  $150^\circ$  in 5 sec. Find the cubic polynomial to generate smooth trajectory of the joint. What is the maximum velocity possible for this trajectory? [10]

### **SECTION - II**

- Q7)** a) Explain with suitable sketch, the difference between forward and inverse kinematics. [12]  
 b) Describe the concept of acceleration of rigid body. [6]

OR

- Q8)** a) Write short notes on : [12]  
 i) Kinematic Redundancy  
 ii) D-H parameters.  
 b) Explain with suitable example, the concept of Newton-Euler's dynamic formulation. [6]
- Q9)** a) What are the different types of commands used in robot programming? [8]  
 b) Write short notes on Image Processing Techniques. [8]

OR

- Q10)a)** Explain and compare the different method of robot programming. [8]  
b) What is need of vision system in robot? Classify the robotic vision system. [8]

- Q11)a)** Write short notes on simulation. [8]  
b) Explain in brief, economical aspects for robot design. [8]

OR

- Q12)a)** Write short notes on 'Artificial Intelligence'. [8]  
b) Write short notes on Future of Industrial robots. [8]

*EEE*