## [4458] - 445

## B.E. (Mechanical) (Semester - II)
## ROBOTICS
## (2008 Course) (Elective - III (c))

*Time : 3 Hours]*        *[Max. Marks :100*

*Instructions to the candidates:*

1) *Answer any three questions from each section.*
2) *Answers to the two sections should be written in separate books.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Figures to the right indicate full marks.*
5) *Use of electronic pocket calculator is allowed.*
6) *Assume suitable data, if necessary.*

## SECTION - I

**Q1)** a) Explain the five basic robot configurations according to the work envelope and applications. **[10]**

b) Define Repeatability, Precision and Accuracy of Robot? Why repeatability is important design characteristics? **[6]**

OR

**Q2)** a) How does the SCARA arm geometry differ from the vertical articulated arm? **[4]**

b) Why is the SCARA arm more ideal for assembly applications? **[4]**

c) Explain the term "Compliance" in terms of a robot? Explain types of Compliance. **[8]**

**Q3)** a) Discuss various types of grippers used in robotics. What is the meaning of the term "end effector"? **[8]**

b) Which sensor can be used along with the gripper to sense whether the object is falling? Explain the working principle. **[8]**

OR

*Q4)* a) Explain the Design considerations of gripper selection. **[8]**

b) Compile a list of sensors that might be used in robotic systems. For each sensor, give an application. **[8]**

*Q5)* a) Explain the advantages/disadvantages of using pneumatics vis a vis hydraulics as power source for drives in Robotics. **[8]**

b) A joint in a PTP robot, Which rotates from an initial angle of 5° to a final angle of 65° in 5 sec with a constant velocity. Determine the position of the joint in 1,2,3,4 secs and plot the results. **[10]**

OR

*Q6)* a) Enlist the different Components used in transmission systems of a robot. Write advantages & disadvantages of each in perspective of accuracy of robot. **[8]**

b) Explain different types of controllers used in robots. **[10]**

### SECTION - II

*Q7)* a) {UVW} is obtained from {XYZ} by rotation of 90° about Z axis followed by rotation of 90° about U axis. Then {UVW} locates a point P at U = 20, V = 30 and W = 40. Determine its coordinates with respect to {XYZ}. **[10]**

b) With the help of suitable illustration, explain the significance of D-H Parameters. **[8]**

OR

*Q8)* a) 2 DOF planar RR manipulator has /1=120mm, /2=75mm. Determine joint angles so that free end is located at (100,70). **[8]**

b) Write short notes on : **[10]**

i) Singularity,

ii) Kinematic Calibration.

*Q9)* a) What is the need of Sampling and quantization. **[8]**

b) Write short note on "Development of languages for recent robot systems". **[8]**

<div align="center">OR</div>

**Q10)** a) Write a short note on "Image Acquisition". **[8]**

      b) Explain WAIT, SIGNAL and DELAY commands in Robot Programming Language. **[8]**

**Q11)** a) Write a short note on "Need and application of Artificial Intelligence".**[8]**

      b) Discuss in details the future scope for robotisation? **[8]**

<div align="center">OR</div>

**Q12)** a) Write a short note on "Tools and Techniques of Simulation". **[8]**

      b) Discuss the Safety aspects for robot and associated mass. **[8]**

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