

Total No. of Questions : 12]

SEAT No. :

P1071

[4659]-134

[Total No. of Pages : 4

B.E. (Production)

b - INDUSTRIAL ROBOTICS

(2008 Course) (Elective - I) (Semester - I) (411084)

Time : 3Hours]

[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 answer books.*
- 3) *Neat diagrams must be drawn wherever necessary*
- 4) *Assume suitable data, wherever necessary.*

SECTION-I

Q1) a) What is Automation? Explain its types. Explain the role of robot in automation? [8]

b) Differentiate between resolution and accuracy of robot with the help of neat sketch. Also explain the repeatability of robot. [8]

OR

Q2) a) What is Robot Anatomy? How it is compared with human system? [8]

b) Explain with neat sketch six degrees of freedom associated with the robot manipulator. [8]

Q3) a) For a pick and place type of robot, the link parameters table is given below: [8]

i	α_{i-1}	a_{i-1}	d_{i-1}	θ_{i-1}
1	0	0	0	30^0
2	-90	0	2	0^0
3	0	3	0	90^0

Determine the location of the end point of the link 3 with respect to the base.

b) Explain Denavit Hartenberg Representation. [8]

OR

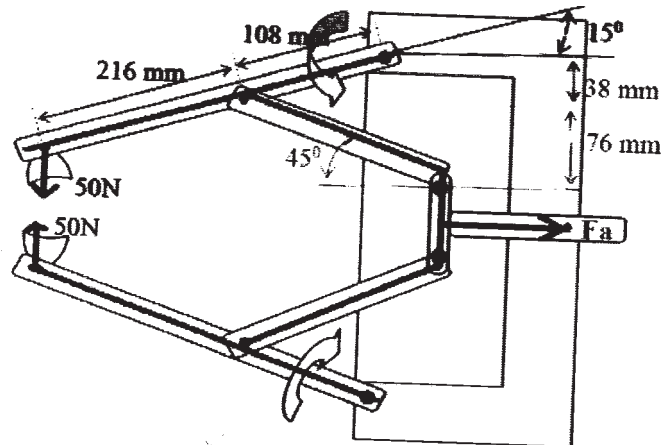
P.T.O.

- Q4) a)** Explain the Forward kinematics associated with planar 3R manipulator. [8]
- b)** For a pick and place type of robot, the link parameter table is given below: [8]

i	α_{i-1}	a_{i-1}	d_{i-1}	θ_{i-1}
1	0	0	0	45°
2	-90°	0	2	-90°
3	0	5	0	60°

Determine the location of the end point of the link 3 with respect to the base.

- Q5) a)** For the given data in the mechanical gripper design of following figure, Calculate the required actuating force if the gripper force is to be 50 N. [10]



- b)** Discuss the various considerations in gripper design and selection. List the different types of gripper. [8]

OR

- Q6) a)** Explain with neat sketch: [8]
- Gear and Rack method of actuating the gripper
 - Cam-actuated gripper
 - Screw-type gripper actuation
 - Linkage actuation
- b)** Describe: [10]
- Vacuum gripper
 - Ultrasonic gripper

SECTION-II

Q7) a) Define a Robot Sensor. Explain the basic function of Sensor. **[8]**

b) Explain: **[8]**

- i) Image acquisition
- ii) Sampling
- iii) Image Processing
- iv) Image Processing techniques

OR

Q8) a) State various Sensing devices used in Robot workcell. **[8]**

b) The given data represents 8 x 8 arrays of pixels. Each element in the array indicates the grey level value of the pixels. **[8]**

- i) Construct histogram for the array and obtain appropriate threshold value.
- ii) Convert the picture into a black and white image. The data is as:

10	11	10	11	12	12	12	12
13	15	17	17	17	17	15	13
14	17	19	19	19	19	18	14
13	17	19	20	20	19	18	13
12	17	19	20	21	19	18	12
12	17	19	19	19	19	18	12
11	15	18	18	18	18	15	11
12	11	10	11	12	12	12	12

- Q9)** a) Explain various methods used to enter the programming command into the controller memory. [8]
- b) Explain generations of Robot programming Language. [8]

OR

- Q10)**a) Explain 'WAIT', 'DELAY', 'SIGNAL', 'DEPART' commands with suitable example. [8]
- b) What are the different drives used in Robot? State the advantages and disadvantages of hydraulic drives in robot. [8]
- Q11)**a) How is software and hardware of robot, handshaking with PC done?[9]
- b) Explain the working of RS 232C interface used in Robotics system.[9]

OR

- Q12)**a) Describe the following applications of robot stating their configurations.[9]
- i) Spot welding.
- ii) Machine loading and unloading.
- iii) Spray Painting.
- b) Write a note on current and future applications of Robot. [9]

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