

NOV-DEC-2012

Total No. of Questions : 12]

SEAT No. :

P989

[Total No. of Pages : 3

[4264] - 445

B.E. (Mechanical)

ROBOTICS

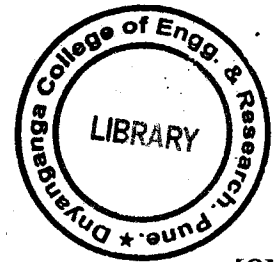
(2008 Pattern) (Elective - III) (Semester - II)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) Answer any 3 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 logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
- 6) Assume suitable data, if necessary.

SECTION - I

- Q1)** a) Explain the robot anatomy with figure. [8]
- b) Compare the cylindrical co-ordinate and articulated configuration robot on the basis of
- i) Work Volume
 - ii) Accuracy and Repeatability
 - iii) Mechanical Flexibility
 - iv) Dexterity
 - v) Applications
- [10]

OR

- Q2)** a) Explain the degree of freedom associated with robot arm and wrist. [6]
- b) A Cartesian robot has a slide range of 1.5 m and it is desired that it will have a control resolution of 2.8 mm on this axis. Determine the bit storage capacity which control memory must possess to accommodate this level of precision. [6]
- c) Explain the different joints used in robots. [6]

P.T.O.



- Q3)** a) What are the different considerations in the design of the gripper? [8]
 b) A rectangular block weighing 12 kg is gripped at the middle and lifted vertically. If it accelerates at 25 m/s^2 and the coefficient of friction between the gripping pad and the block is 0.42. Draw gripper force analysis and calculate gripping force. [8]

OR

- Q4)** a) Explain important characteristics of robot sensors. [8]
 b) State various types of sensors in robot. Explain capacitive and Ultrasonic sensors. [8]

- Q5)** a) Classify robot drives. [6]
 b) Write short notes on Gear motor and Piston Motor. [10]

OR

- Q6)** a) Explain the Modeling and control of a single joint in robot. [8]
 b) One of the joint of articulated robot has to traverse from initial angle of 20° to final angle of 84° in 4 seconds. Using a third degree polynomial calculate the joint angle at 1, 2 and 3 seconds. [8]

SECTION - II

- Q7)** a) Explain steps to implement Denavit Hertenberg convention for robot Manipulator. [10]
 b) A point 'P' is attached to a frame (XYZ) is subjected to the following transformations, but all transformations relative to the current moving frame are as follows. [8]
 i) A rotation of ' α ' angle about the OX - axis.
 ii) Then a translation of 'a' units along OX axis.
 iii) Followed by a rotation of ' θ ' angle about the OZ-axis.

Write homogenous transformation matrix to find new coordinate point of a frame.

OR

- Q8)** a) Sketch and explain the procedure to obtain robot joint Jacobian matrix. [8]
 b) Derive an equation to calculate static force in two link arm manipulator. [10]

- Q9)** a) Explain three major functions of machine vision system. [8]
 b) Enlist different ways to segment an image and explain any one in detail. [8]

OR

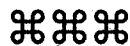
- Q10)** a) Enlist the capabilities and Limitations of lead through programming methods. [8]
b) Discuss the general features of robot programming language. [8]

- Q11)** a) Explain various techniques used for representing knowledge in artificial Intelligence. [8]
b) Explain possible schemes to represent the problem in artificial intelligence. [8]

OR

Q12) Write short notes on :

- a) Economical aspects to design Robot. [6]
b) Robot simulation Tools. [5]
c) Singularities in robot. [5]



www.sppuonline.com

