

(3 Hours)

[Total Marks: 80]

- N.B. (1) Question No. 1 is compulsory.
(2) Attempt any three questions from remaining.
(3) Assume suitable data wherever necessary.

Q1) Answer the following questions:

- a) Define the following terms: Tool Path, Tool Trajectory, Degree of Freedom, Precision and Accuracy. (20)
b) Define robot kinematic parameters. (05)
c) What are Generalised Voronoi Diagrams (GVD) and their use in motion planning. (05)
d) Explain perspective transformation and its relevance. (05)

Q2) a) Explain significance and use of DH algorithm. Develop DH representation of a four axis SCARA robot. (15)

b) Explain the significance of major and minor axes. (05)

Q3) a) Write a brief note on Robot classification. (10)

b) Develop the Inverse Kinematic solution for a two axis planar robot. (10)

Q4) a) Explain robot pick-and-place operation. (10)

b) Explain four fundamental operations for merging of frame K-1 with frame K. Obtain the general link coordinate transformation matrix T for mapping the (k-1)th frame into the kth frame. (10)

Q5) a) Explain robot motion planning using Bug 1 and Bug 2 algorithm. (10)

b) Explain role of line and area descriptors for analyzing shape of an object. (10)

Q6) Write short notes on any two: (10x2) (20)

- (a) Potential functions.
(b) Wave front planner.
(c) Cartesian space trajectory.
(d) Template matching algorithm.