Paper / Subject Code: 53002 / Elective II 1)Robotics

[Total Marks:80]

(3 Hours)

NB.
- **(1) Question No.1 is compulsory.**
- **(2) Attempt any three questions from remaining.**
- **(3) All questions carry equal marks.**
- **(4) Assume suitable data wherever necessary.**

Q.1 Answer any **four** of the following:

a)	Define Kinematic Parameters.	(5)
b)	Explain the conditions for the existence of Inverse Kinematics problem.	(5)
c)	Explain repeatability, precision and accuracy.	(5)
d)	Discuss briefly on wave front planner.	(5)
e)	Differentiate between path and trajectory.	(5)

Q.2 a) Obtain the inverse kinematic analysis of a 3 axis planar articulated robot (10)

b) Give the steps involved in constructing homogeneous (10)
transformation matrix which maps frame k coordinates into frame
k-1 coordinates and obtain the link coordinate transformation
matrix T mapping coordinate frame k to coordinate frame k-1.

Q.3 a) With a suitable example explain differential motions of a frame with (10)
respect to
  i. Differential Translation
  ii. Differential Rotation
  iii. Differential Transformations

b) What is Visibility graph? Explain an algorithm to construct visibility (10)
graph.

Q.4 a) Explain robot motion planning using Bug 1 and Bug 2 algorithm. (10)

b) What is a GVD? Sketch all the GVD's resulting due to the basic (10)
interactions of the obstacle .Derive the necessary equations.

Q.5 a) Explain Joint Space Trajectory Planning using third order (10)
polynomial.

b) Explain iterative processing operators with examples. (10)

Q.6 Write short notes on any **four** of the following: (20)
- a) Jacobian.
- b) Tool Configuration Vector
- c) Robot Classifications.
- d) Lagrangian Mechanics.
- e) Homogeneous Coordinate Transformations.