

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY  
FIRST SEMESTER M. TECH DEGREE EXAMINATION**

**Electronics & Communication Engineering- Interdisciplinary Engineering  
(Robotics and Automation)**

**04EC6903 Robotics System Configuration**

Max. Marks: 60

Duration: 3 Hours

**PART A**

*Answer All Questions*

*Each question carries 3 marks*

1. Differentiate between Gantry Robot and SCARA Robot.
2. Validate the statement “inverse kinematic problem is a complex procedure than direct kinematic problem”
3. Define trajectory, Differentiate between trajectory and path.
4. Discuss the significance of dynamic modelling in robot manipulators.
5. Examine the disadvantages of a linear PID Control Scheme; suggest a control scheme for better control action with justification.
6. Explain the block diagram of a point-to-point motion control of a robot manipulator.
7. An image is digitized with 512 samples per line and 512-line scan. Determine the number of bits required to represent the image as a grey level image with 4 bits for coding grey levels?
8. Discuss about the environmental sensors used in robot system.

**PART B**

*Each question carries 6 marks*

9. (a) Differentiate between major axes and minor axes of robotic manipulator.  
(b) Define the term “Degrees of freedom”.
- OR
10. Illustrate how DH algorithm is used in the direct kinematic modeling?
  11. Examine the solvability of inverse kinematic model, with analysis of existence and nonexistence of solutions.
- OR
12. Illustrate the workspace diagram of a 2- DOF manipulator with neat sketches.
  13. Derive the equation for a cubical polynomial for the trajectory planning with proper representation coefficients.
- OR
14. One degree of freedom manipulator with rotary joint is moving from  $113^\circ$  to  $120^\circ$  in 7 seconds. Find the coefficients of a cubic polynomial to interpolate a smooth trajectory. Find maximum velocity and maximum acceleration.
  15. Classify the Newton Euler method and Lagrange’s Euler method in detail.
- OR
16. Illustrate the dynamic modelling of a 2 DOF manipulator.
  17. Discuss the classification of different linear control schemes used in robotic arm.
- OR
18. Classify servo control problem and disturbance control problem with suitable examples.

19. Illustrate with the example of a humanoid robot, what are the sensors used in robotics.

OR

20. Vision controlled robotic control is highly used in modern day robotics. Explain the significance with proper illustrations.