

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIRST SEMESTER M. TECH DEGREE EXAMINATION
Electronics & Communication Engineering-Interdisciplinary Engineering
(Robotics and Automation)
04EC6903—Robotic System Configuration

Max. Marks : 60

Duration: 3 Hours

PART A

Answer All Questions

Each question carries 3 marks

1. Explain the classification of joints of robotic manipulator?
2. Differentiate joint angle and link twist angle of robotic system?
3. What are the steps in trajectory panning?
4. What are the steps for building servomotor controlled robot arm.
5. How PD control can be implemented in robotic manipulator?
6. What are the limitations of a single axis PID controller?
7. What are the specifications of quality control robotic manipulator?
8. Explain the safety sensors used in robotic systems?

PART B

Each question carries 6 marks

9. Explain all possible classifications of Robotic manipulators.

OR

10. Let $F = \{f^1, f^2, f^3\}$ and $M = \{m^1, m^2, m^3\}$ be two initially coincident fixed and mobile orthonormal coordinate frames, respectively. Given the coordinates of a point q w.r.to mobile coordinate frame as $[q]^M = [0, 0, 10, 1]^T$. If M is translated along f^2 by 3 units and is rotated about f^3 by radians, find the homogeneous coordinates of the point q w.r.to F
11. Inverse kinematics is difficult to solve than direct kinematics problem. Justify with example?

OR

12. How DH algorithm can be implemented in 3DOF SCARA robotic manipulator?
13. A robotic manipulator joint is required to move from $a=50^\circ$ to $a=120^\circ$ in 30 seconds. Find the cubic polynomial to generate a smooth trajectory for the joints. Find the maximum velocity and acceleration of the trajectory, when initial velocity is 2m/s and final velocity is 2.2 m/s

OR

14. What are the steps in trajectory planning? Explain point to point and continuous functions in trajectory planning?
15. Explain the significance of torque control in the dynamic model.

OR

16. How dynamic model can be done using Lagranges equation?
17. Classify different linear control schemes used for robotic controllers?

OR

18. Draw the block diagram and explain the operation of point to point motion controlled robotic manipulator?

19. Explain the difference between status sensors and environmental sensors. Explain various pneumatic sensors used in robotic sensors?

OR

20. What are the applications of vision controlled robotics system?