



INSTITUTE OF AERONAUTICAL ENGINEERING (Autonomous)

B.Tech VI Semester End Examinations (Regular), November– 2020

Regulation: IARE–R16

INTRODUCTION TO ROBOTICS

Time: 2 Hours

(AE)

Max Marks: 70

Answer any Four Questions from Part A

Answer any Five Questions from Part B

PART – A

1. State the historical development of robotics. [5M]
2. Differentiate clearly with reference to 2-jointed manipulator of RR type and LL type. [5M]
3. Point out the necessity of trajectory planning in robotics. [5M]
4. Explain with a neat diagram about DC servomotor. [5M]
5. Classify robot work cell and explain any two types. [5M]
6. Write a short note on spatial resolution, accuracy and repeatability. [5M]
7. Explain the Newton – Euler formulation of robot dynamics. [5M]
8. List out the advantages of spray painting by robots. [5M]

PART – B

9. Explain the mechanical grippers with a neat sketch. [10M]
10. Write the design considerations to be made while selecting a gripper. [10M]
11. Explain about homogeneous transformation and its importance [10M]
12. Frame {2} is rotated w.r.t frame {1} about the x-axis by an angle of 60° . The position of the origin of frame {2} as seen from frame {1} is ${}^1D_2 = [757]^T$. Obtain the transformation matrix 1T_2 , which describes frame {2} relative to frame {1}. Also, find the description of point P in frame {1} if ${}^2P = [246]^T$. [10M]
13. Determine the equation of motion for a single link manipulator given the mass and length of the link. [10M]
14. Explain the potential energy as applied to robot arm dynamics analysis. [10M]
15. A single-link robot with a rotary joint is motionless at $\theta=20^\circ$. It is desired to move the joint in a smooth manner to $\theta=100^\circ$ in 3 seconds. Find the coefficients of a cubic that accomplishes this motion and brings the manipulator to rest at the goal. Plot the position, velocity, and acceleration of the joint as a function of time. [10M]
16. Enlist the main elements of a pneumatic system used in robot and explain their functions briefly. [10M]
17. Compare benefits and drawbacks of pneumatic, hydraulic and electric actuators [10M]
18. Explain about application of robots in arc welding operation. [10M]