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10ME766

Seventh Semester B.E. Degree Examination, June/July 2023
Robotics

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. State joint link parameters. With a neat diagram obtain the joint link parameters for a spatial 3R manipulator. **(10 Marks)**

b. With a neat diagram represent the different types of joints used in robots with their degrees of freedom. **(04 Marks)**

c. Explain the different configurations of industrial robotics with sketch, Selecting any two. **(06 Marks)**

2 a. Explain with a neat sketch of SCARA manipulator. **(10 Marks)**

b. Explain briefly direct kinematics of 3R manipulator. **(10 Marks)**

3 a. Explain the features of Jacobian matrix for a serial manipulator. **(10 Marks)**

b. What is singularity in robotics? What happens at the singularity? **(04 Marks)**

c. What do you mean by parallel manipulators and serial manipulators? **(06 Marks)**

4 a. State the Lagrangian formulation for equations of motion and explain the related factors. **(06 Marks)**

b. Discuss the Euler Lagrangian for 2R robot manipulator. **(14 Marks)**

PART – B

5 a. Define trajectory planning. Explain third order polynomial trajectory planning. **(10 Marks)**

b. Explain joint space versus Cartesian space schemes. **(10 Marks)**

6 a. With a neat block diagram, explain basic components of a control system in a robot manipulator. **(10 Marks)**

b. With a neat block diagram, explain 3 types of transfer functions. **(10 Marks)**

7 a. Compare the features of hydraulic, pneumatic and electric actuator used in robots. **(12 Marks)**

b. Explain with a neat sketch construction and operation of 4 pole stepper motor. **(08 Marks)**

8 a. Sketch and explain incremental encoder. **(08 Marks)**

b. Explain with neat sketch optical proximity sensor. **(08 Marks)**

c. List out the different types sensors used in robots. **(04 Marks)**

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