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10ME766

Seventh Semester B.E Degree Examination, Feb./Mar. 2022
Robotics

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions, selecting at least 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. With the help of a neat sketch derive the direct Kinematics [Kinematic model] of a SCARA robot. (14 Marks)
- b. Explain the term forward Kinematics and Inverse kinematics. (06 Marks)
- 3 a. Explain in brief, the differential translation and rotations. (08 Marks)
- b. Explain static forces on manipulators. (12 Marks)
- 4 a. Briefly discuss the following as applied to a robot manipulation:
 - i) potential energy (12 Marks)
 - ii) kinetic energy (08 Marks)
- b. Explain Lagrange-Euler formulation for robotic manipulator.

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. Explain PID controller with respect to their characteristics feature and transfer functions. (10 Marks)
- b. Explain with schematic diagram force control of single mass manipulator. (10 Marks)
- 7 With a neat sketch, explain the following :
 - a. Hydraulic actuator
 - b. Electrical actuator
 - c. Stepper motor. (20 Marks)
- 8 a. List and briefly explain “sensor characteristics” in robot function. (10 Marks)
- b. With a neat sketch explain : i) LVDT ii) Resolvers. (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.