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10MA74

Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019
Industrial Robotics

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Define Industrial Robot and differentiate between Automation and Robotics. **(06 Marks)**

b. Explain in detail, chronological developments in robotics technology for significant applications. **(08 Marks)**

c. List the advantages, disadvantages and applications of industrial robots. **(06 Marks)**

2 a. List and explain any two geometrical configurations of robotic system. **(08 Marks)**

b. With an example, explain resolution, accuracy and repeatability of robotic system. **(06 Marks)**

c. What are end effectors and explain different types of it? **(06 Marks)**

3 a. With a block diagram, explain the typical control system configuration for robot joint. **(06 Marks)**

b. List and explain different types of robot controllers. **(08 Marks)**

c. Explain various transient response parameters for a second order system. **(06 Marks)**

4 a. Explain direct and inverse kinematics. **(06 Marks)**

b. Derive the direct kinematic equation for a cylindrical arm. **(08 Marks)**

c. Briefly, explain D-H notation for a robot manipulator. **(06 Marks)**

PART – B

5 a. Explain kinetic energy and potential energy as applied to robot arm dynamics. **(06 Marks)**

b. Using the L-E formulation, determine the equation for motion for a RP manipulator shown in Fig.Q.5(b). **(10 Marks)**

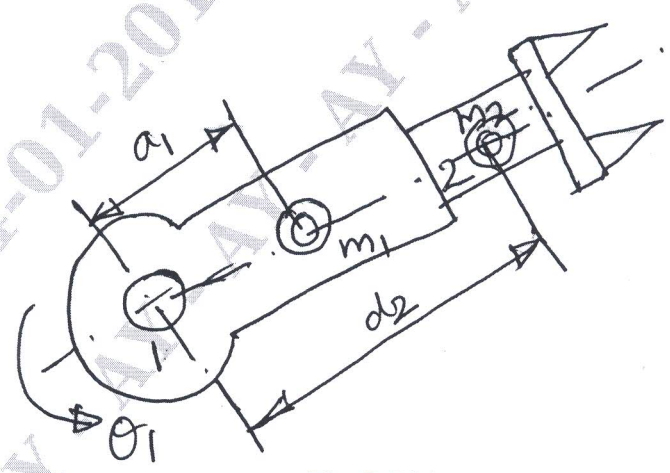

Fig.Q.5(b)

c. Explain in brief Newton-Euler equation. **(04 Marks)**

6 a. Using a block diagram, explain various parameters of trajectory planning. **(08 Marks)**

b. A single link robot with a rotory is motionless at $\theta = 15°$. It is desired to move the joint in a smooth manner to $\theta = 75°$ in 3 sec. Find the coefficients of cubic polynomial which accomplishes the motion to rest. **(04 Marks)**

c. Explain 4-3-4 trajectory planning. **(08 Marks)**

7 a. Explain different methods used for programming a robot. **(08 Marks)**

b. With a block diagram, explain the robot programming language structure. **(08 Marks)**

c. With an example, explain task programs. **(04 Marks)**

8 a. List the desirable features of robot sensors. **(04 Marks)**

b. Sketch and explain the elements of a robot-vision system. **(10 Marks)**

c. Explain the following:

i) Proximity and Range sensors

ii) Tactile sensors. **(06 Marks)**

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