Code No: 137GR

R16

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech IV Year I Semester Examinations, December - 2019

ROBOTICS

(Common to ME, MSNT)

Time: 3 Hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A

(25 Marks)

1.a) What is the load carrying capacity of the robot? [2]
b) Sketch the work volume of cylindrical robot. [3]
c) What is composite rotation matrix? [2]
d) What are world coordinates? [3]
e) What is an arm singularity? [2]
f) What is forward differential motion model? [3]
g) What are the parts of pneumatic actuator? [2]
h) What is the purpose of rotating wiper in potentiometer? [3]
i) What is the reason for using a robot in stamping press operation? [2]
j) What are bowl feeders? [3]

PART – B

(50 Marks)

2.a) What are the present and future applications of robots.
b) What are the common four configurations of a robotic arm? [10]

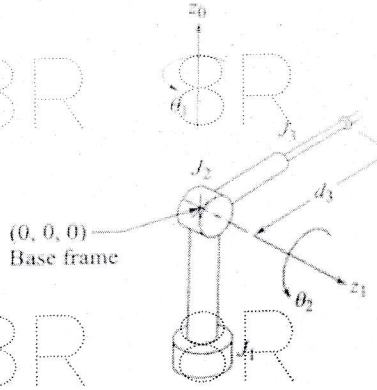
OR

3.a) Describe the various components of an industrial robot.
b) Describe the three types of automation under the category of an industrial robot. [10]

4.a) How the joint coordinates and world coordinates are related?
b) Find the matrix transformation of a line which is rotated by 30^0 to Y axis, followed by translation of -5 units on Y axis followed by rotation of 60^0 to Y axis. [10]

OR

5. Establish the link parameters and find the final transformation matrix for the following 3 DOF manipulator as shown in figure. [10]



6. Discuss the Newton Euler algorithm carried out for the complete dynamic formulation of an n-dof manipulator. [10]

OR

7.a) The second joint of a SCARA manipulator is required to move from 30^0 to 150^0 in 5 sec. Find the cubic polynomial to generate the smooth trajectory of the joint. What is the maximum velocity and acceleration for this trajectory.

b) What are the various intermediate constraints on the intermediate points of the trajectory. [10]

8. Discuss about the principles and types of electric motors. [10]

OR

9. Discuss about any three types of tactile sensors. [10]

10.a) What is a palletizing operation where robot finds an application.

b) How robot is used for any machining operation. [4+6]

OR

11.a) What are the various parts joining tasks where robot is involved.

b) What are series assembly systems. [4+6]

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