Code No: 117HA

R13

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech IV Year I Semester Examinations, November/December - 2017
ROBOTICS
(Common to AME, ME)

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, c as sub questions.

PART - A

(25 Marks)

1.a)	Define the term robotics	[2]
b)	Describe the relation between automation and robotics	[3]
c)	What is manipulator kinematics?	[2]
d)	What is homogenous transformations?	[3]
e)	What is robot arm dynamics?	[2]
f)	Write about Euler angles.	[3]
g)	What is a hydraulic actuator?	[2]
h)	Draw the block diagram of trajectory planning.	[3]
i)	Define robot applications in manufacturing.	[2]
j)	Describe material transfer applications.	[3]

PART - B

(50 Marks)

2.a) Distinguish an automation and a robot.
  b) Classification the robot by any two coordinate systems. [5+5]

OR

3.a) Explain the working principle of proximity sensors used in robots.
  b) Discuss some of the important considerations in the design of grippers. [5+5]

4.a) Derive rotation in the y-z plane using the geometric approach.
  b) For the point $a_{uvw} = (6,2,4)^T$ rotate 30^0 about the y-axis followed by translation of 6 units along X-axis. [5+5]

OR

5.a) For the point $a_{uvw} = (6,2,4)^T$ Translate 6 units along y-axis, followed by rotation of 30^0 about x-axis.
  b) Write the forward kinematics for any manipulator based on D-H convention. [5+5]

6.a) Differentiate clearly with reference to 2-jointed manipulator of LL type.
  b) Find the joint space singularities of the cylindrical coordinate robot. [5+5]

OR

7.a) Find the manipulator Jacobain matrix J(q) of the five-axis spherical coordinate robot.
  b) Describe newton-Euler formulation in dynamic modeling of robotics control. [5+5]

8.a) A manipulator with a single link is to rotate from 30^0 to 100^0 in 2 seconds. The joint velocity and acceleration are both zero at the initial and final positions. Determine the coefficient of a quadratic polynomial that accomplishes the motion.

b) Differences between open-loop and closed-loop control systems. [5+5]

OR

9.a) Explain any one method of splitting a joint trajectory.

b) List the types of manipulators employed for travelling from point-to-point motion types. [5+5]

10.a) Describe the material handling operations.

b) Explain simple pick-and-place operation of the robot. [5+5]

OR

11.a) Describe the pelletizing operation of material transfer application of a robot.

b) Explain loading and unloading of material handling in die casting process. [5+5]

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