Code No: 158BG **R18**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech IV Year II Semester Examinations, July - 2023
INDUSTRIAL ROBOTICS
(Mechanical Engineering)

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

Note: i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A

(25 Marks)

1.a)	What are future applications of robots?	[2]
b)	How tools can be used as end effectors?	[3]
c)	What is rotation and translation of a manipulator? Discuss.	[2]
d)	How a frame is assigned to a link?	[3]
e)	What are singularities of a manipulator? Explain.	[2]
f)	Differentiate between path and trajectory.	[3]
g)	Classify robots according to the drive system.	[2]
h)	What is a tactile sensor? How it function?	[3]
i)	What is APT?	[2]
j)	What is the type robot used for spray painting?	[3]

PART – B

(50 Marks)

2. What are different configurations of robots used and describe them along with their applications? [10]

OR

3.a) Write a short note on Vacuum gripper used in robot access.
b) What are the various factors in gripper's design and selection? Derive the equation for force? [5+5]

4. Determine the transformation matrix T that represents a translation of a unit along x-axis, followed by a rotation of angle α about x-axis followed by a rotation of θ about the rotated z- axis. [10]

OR

5. What are the parameters for a link for kinematic modelling? Which of these parameters are variable and which are constant for a revolute and prismatic joint? [10]

6. Express the inverse transform technique for Euler angles solution upto inconsistent solution. [10]

OR

7. Explain the use of cubic polynomial fit via point for a smooth trajectory of robot path. [10]

8.a) Explain the different types of electrical drives used in robot actuation.
b) Compare electrical, pneumatic and hydraulic actuators based on their characteristics. [5+5]

OR

9. Give situations where robot requires noncontact sensors? Identify suitable noncontact sensors for these applications and explain their working? [10]

10.a) Explain different types of stepper motors used in the operation robots.
b) What do you understand by robot programs? Discuss for loading and unloading process. [5+5]

OR

11.a) How the robot language is structured?
b) What are the various motion command used for robot movement? [5+5]

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