

R16

Code No: 137GR

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech IV Year I Semester Examinations, March - 2021

ROBOTICS

(Common to ME, MSNT)

Time: 3 Hours

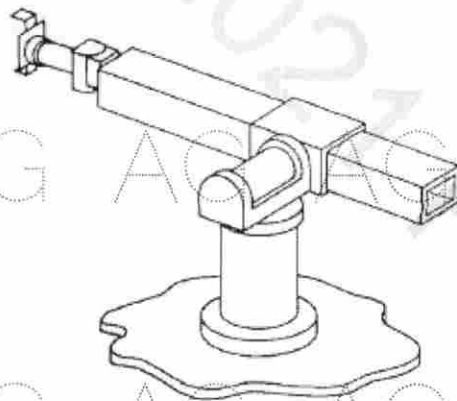
Max. Marks: 75

Answer any Five Questions

All Questions Carry Equal Marks

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- 1.a) What are the speed capabilities and load carrying capacity of the current industrial robots.
- b) What are the capabilities and limitations of an end effector? [8+7]
- 2.a) What are the three degrees of freedom associated with the arm and the body?
- b) How repeatability and compliance measures the precisions of the robot's movement? [7+8]
- 3.a) How the equivalent angle axis is represented?
- b) A position vector  $v = 4i + 3j + 2k$  is rotated by  $30^\circ$  about Y axis, followed by rotation about Z axis by  $60^\circ$ , followed by rotation about X axis by  $45^\circ$ , followed by translation of +3 units in Z direction. Find the final homogeneous transformation matrix of v. [7+8]
4. Explain the DH matrix representation for a Stanford robot by establishing link coordinate system. [15]



- 5.a) Describe the features of prismatic and rotary joint jacobians.
- b) Discuss about the forward differential motion model. [8+7]
- 6.a) Describe the features of electric actuators.
- b) Explain the working principle of encoders. [7+8]
- 7.a) What are the applications of resolvers.
- b) Discuss about any two tactile sensors. [7+8]
- 8.a) Discuss various machine loading and unloading operation for machining process.
- b) What are the basic three categories of robotic inspection system? [8+7]

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