Code No: 56084 **R09**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year II Semester Examinations, December - 2018
ROBOTICS
(Automobile Engineering)

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

Answer any five questions
All questions carry equal marks
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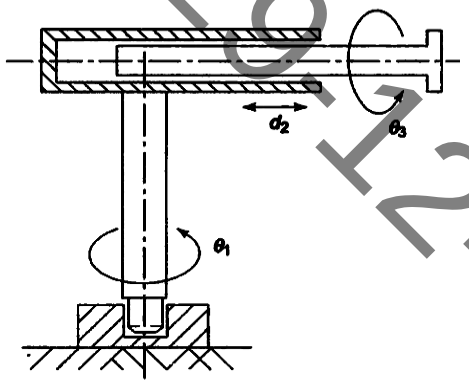
1. Draw and explain the four basic configurations of robot. Compare their relative merits and demerits. [15]

2. A vector P= 3i -2j+5k is first rotated by 90^0 about X-axis, then by 90^0 about Z-axis. Finally it is translated by 6 units along Y-axis. Determine the new position vector p. [15]

3. For a 3-DOF manipulator arm shown in figure 1 assign frames and obtain the joint link Parameters. Also determine the forward kinematic model of tool tip with respect to Base. [15]



Figuire 1 A 3-DOF RPR-configuration manipulator

4. Determine the Jacobian matrix for a 3-DOF articulated arm with three revolute joints (Figure 2). [15]

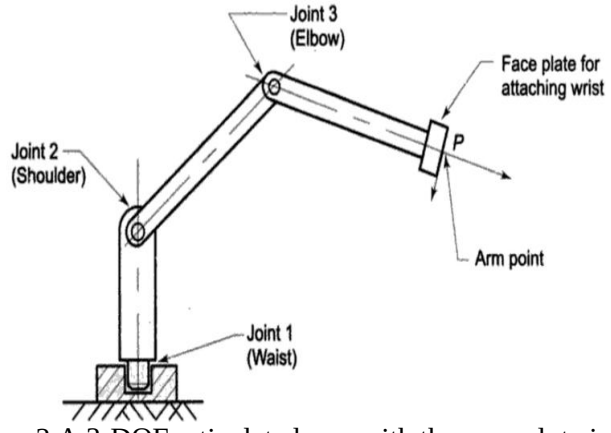


Figure 2 A 3-DOF articulated arm with three revolute joints

5. Derive the expression for joint Torques for 2-DOF Planar manipulator with revolute joints using Lagrange-Euler formulation. [15]

6. A single link manipulator is to be moved from an initial angle of 20^0 to a final angle of 90^0 via a path point at 60^0. Find the coefficients of two polynomials that are connected at the via point with continuous acceleration at the via point. The robot cover the first segment (20^0 to 60^0) in 3sec and the second segment (60^0 to 90^0) in 10 seconds. [15]

7.a) Briefly Explain the Working principle of potentiometers.
b) Differentiate Stepper motor and D.C motor drives of a robot. [7+8]

8. Explain briefly about different assembly operations that are performed by the robots. [15]

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