

**R09**

**Code No: 56084**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**B. Tech III Year II Semester Examinations, May - 2019**

**ROBOTICS**

**(Automobile Engineering)**

**Time: 3 hours**

**Max. Marks: 75**

**Answer any five questions  
All questions carry equal marks**

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- 1.a) Classify the robot by control system.
- b) What general aspects are considered for gripper selection and design? [7+8]
- 2.a) One end A of the line AB, is at origin. It is rotated by  $30^{\circ}$  about Z direction, followed by +3 units in Y direction, followed by  $30^{\circ}$  rotation about X-axis. Determine the final position of the point.
- b) How equivalent angle is represented? [8+7]
3. Establish the joint link parameters for a 3 DOF articulated arm with three revolute joints. [15]
- 4.a) Differentiate the prismatic and rotary joint jacobian.
- b) Determine the manipulator jacobian matrix for 2 DOF articulated arm with two rotary joints. [7+8]
5. Discuss the steps involved in Newton Euler formulations for 2 DOF planar manipulator. [15]
- 6.a) How a trajectory is formed with a trapezoidal velocity profile.
- b) The motion of a joint having 3 DOF, is constrained by an actuator that can produce a maximum acceleration of  $0.35 \text{ rad/s}^2$  and maximum velocity of  $15 \text{ rad/s}$ . if trapezoidal velocity profile is assumed, determine the trajectory of the joint. [7+8]
- 7.a) Describe the principle of electric actuator.
- b) How the two types of encoders determine the position of the component. [7+8]
8. How the machine loading and unloading operation is automated using a robot. [15]

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