GALGOTIAS UNIVERSITY

| ADMISSION NUMBER |
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# School of Engineering

**B.TECH Mechanical Engineering in E-Vehicles and Autonomous Vehicles**
**Semester End Examination - Jun 2024**

**Duration : 180 Minutes**
**Max Marks : 100**

## Sem VI - G3UC602B - Robotics

*General Instructions*
*Answer to the specific question asked*
*Draw neat, labelled diagrams wherever necessary*
*Approved data hand books are allowed subject to verification by the Invigilator*

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| **1)** | What are the ethical considerations surrounding the development and deployment of autonomous robots in society? | K1(2) |
| **2)** | Explain briefly the kinematics and dynamics of a robot. | K2(4) |
| **3)** | Explain MOTION commands used in robot programming. | K2(6) |
| **4)** | Illustrate the terms accuracy, resolution, repeatability and speed of movement, load carrying capacity and reliability. | K3(9) |
| **5)** | Illustrate a list of factors that should be considered while evaluating a robot for welding capabilities. | K3(9) |
| **6)** | Examine how the Jacobian can be used to calculate the required joint torques or forces to achieve a desired end-effector force or position. | K5(10) |
| **7)** | Analyze the relationship between joint velocities and end-effector velocities in a redundant manipulator. | K4(12) |
| **8)** | Explain a comprehensive definition of a robot, including its essential characteristics and capabilities. Discuss how this definition distinguishes a robot from other types of machines or devices. | K5(15) |
| **9)** | A two-link manipulator with rotational joints is shown in Fig Calculate the velocity of the tip of the arm as a function of joint rates. Give the answer in two forms—in terms of frame {3} and also | K5(15) |

in terms of frame {O}.

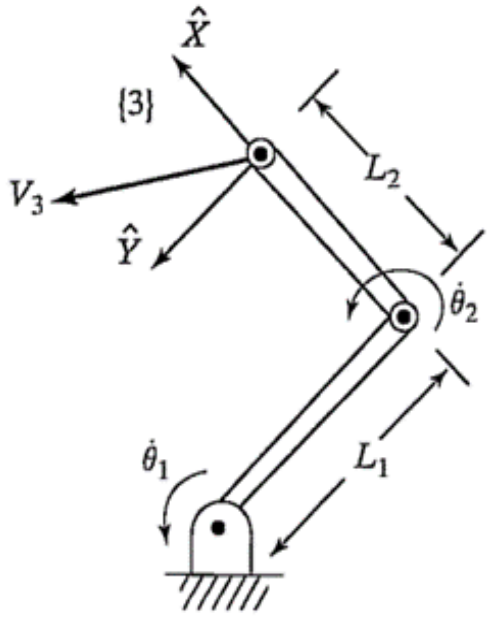


FIGURE 5.8: A two-link manipulator.

**10)** Elaborate in brief the history of robots. What are factors that slow down the growth and implementation of robotics technology ? K6(18)