

**Full Marks: 30**

**Time: 1 hours**

**Answer any 5 questions (5×6=30)**

1. Explain Homogeneous Transformation Matrices applied in Robotics. Explain the difference between fixed angle representation of rotation and Euler angle representation of rotation. (3+3)
2. With proper sketches explain resolution, accuracy and repeatability. (2+2+2)
3. What is work volume of robot? Explain the elements of a robot system. (2+4)
4. What is End effector? Draw and explain a Cartesian coordinate configuration of robot. (2+4)
5. Derive the rotational matrix between two rotated frames. From this derive the rotational matrix about principal axis Z. (4+2)
6. Derive the direct kinematic model of a cylindrical arm. (6)