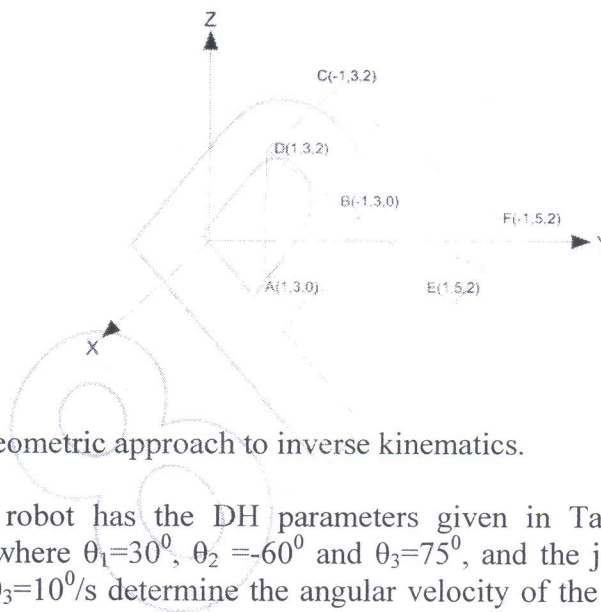


Answer any Five Questions
All Questions Carry Equal Marks

1. Classify the robots by the coordinate system and control system.
2. A triangular prism with coordinates of its vertices indicated relative to the fixed reference frame OXYZ is shown in figure. The prism is moved to the new position with a rotation of $+90^\circ$ about X - axis, a rotation of -90° about Z-axis and a translation of 5 units in the y- direction. Explain the steps and procedure for the same.



3. Describe the geometric approach to inverse kinematics.
4. A three joint robot has the DH parameters given in Table. If the robot is in the configuration where $\theta_1=30^\circ$, $\theta_2=-60^\circ$ and $\theta_3=75^\circ$, and the joint velocities are $\dot{\theta}_1=-3^\circ/s$, $\dot{\theta}_2=-5^\circ/s$ and $\dot{\theta}_3=10^\circ/s$ determine the angular velocity of the end effector with respect to the base frame.

DH Parameters

Joint	d	a	α	θ
1	0.5	0.8	90°	Θ_1
2	0.2	1.2	90°	Θ_2
3	0	0.15	0	Θ_3

5. Explain about the equations formulated based upon the Newton Euler formulations.
6. The path traced by a joint of a robot manipulator is described by the fifth degree polynomial. The joint has to start from an initial angle of 10° to 20° . The starting acceleration and the ending deceleration 2 deg/sec^2 . The velocities being zero, find the equation of motion for the joint. The range is covered in 2 sec.
7. Explain the principle behind the working of position sensors and give their classification.
8. Describe the robot's application in assembly and inspection system in a manufacturing industry.