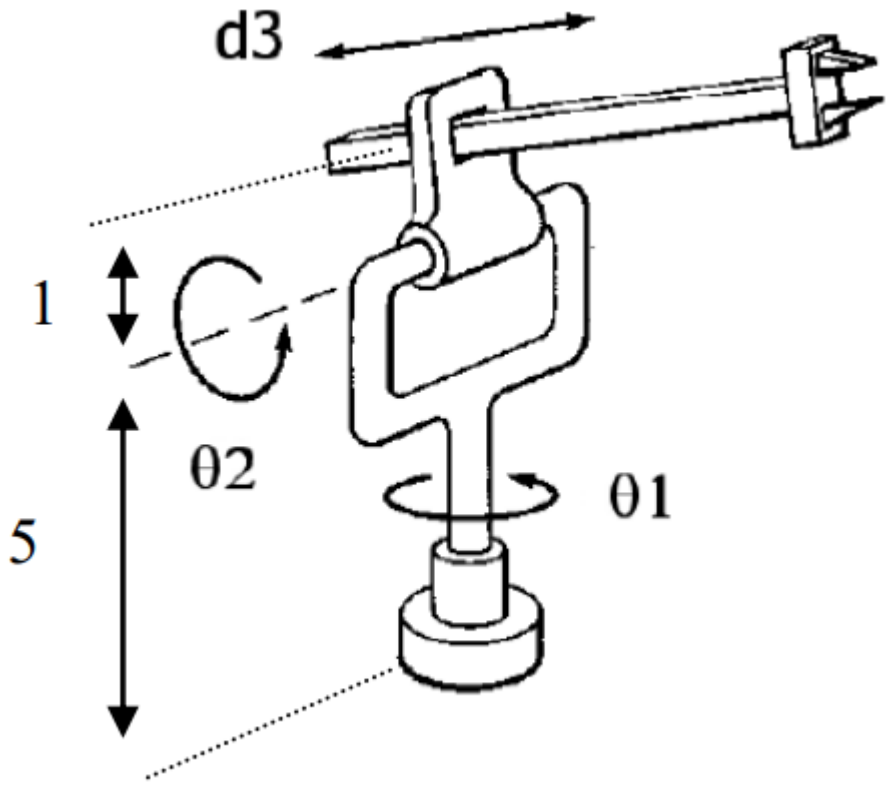
Question 1

For the 3-DOF RRP robot shown in Fig

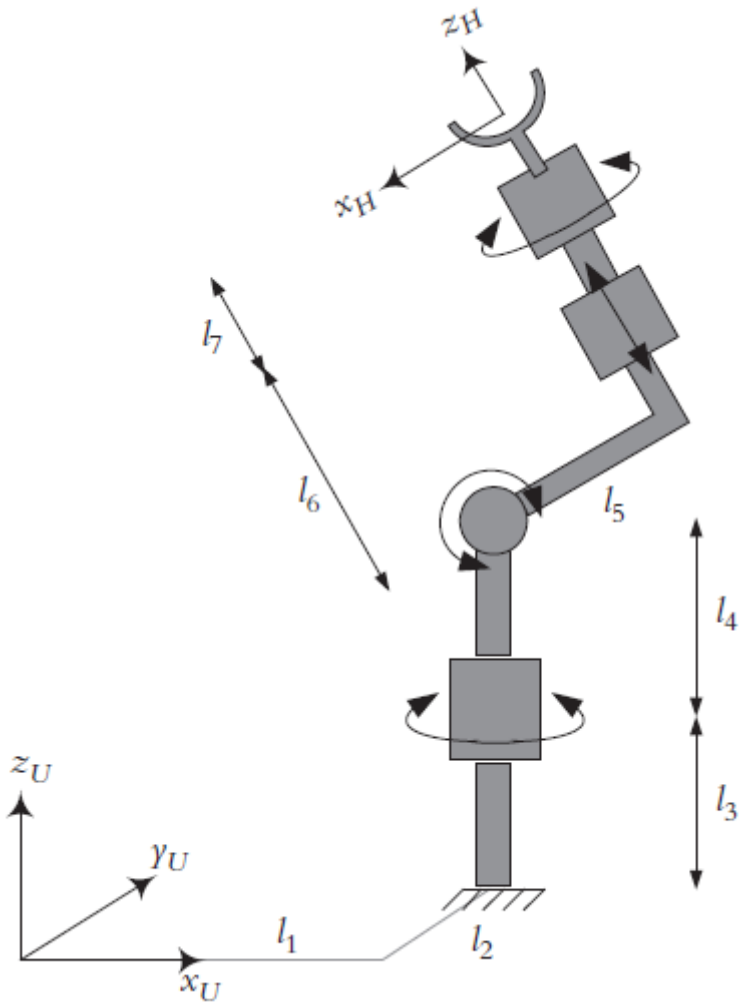
- Assign appropriate frames for the Denavit-Hartenberg representation.
- Fill out the parameters Table.
- Write all the Link Matrices.
- Derive the forward kinematic equations for the robot



Question 2

For the given specialty designed 4-DOF robot

- Assign appropriate frames for the Denavit-Hartenberg representation.
- Fill out the parameters table.
- Write an equation in terms of A matrices that shows how ${}^{U}\mathbf{T}_{\mathbf{H}}$ can be calculated.



Question 3

The link parameter of a RRR robot is given below:

Link	α	a	θ	d
1	90	0	θ_1	0
2	0	10	θ_2	0
3	0	10	θ_3	0

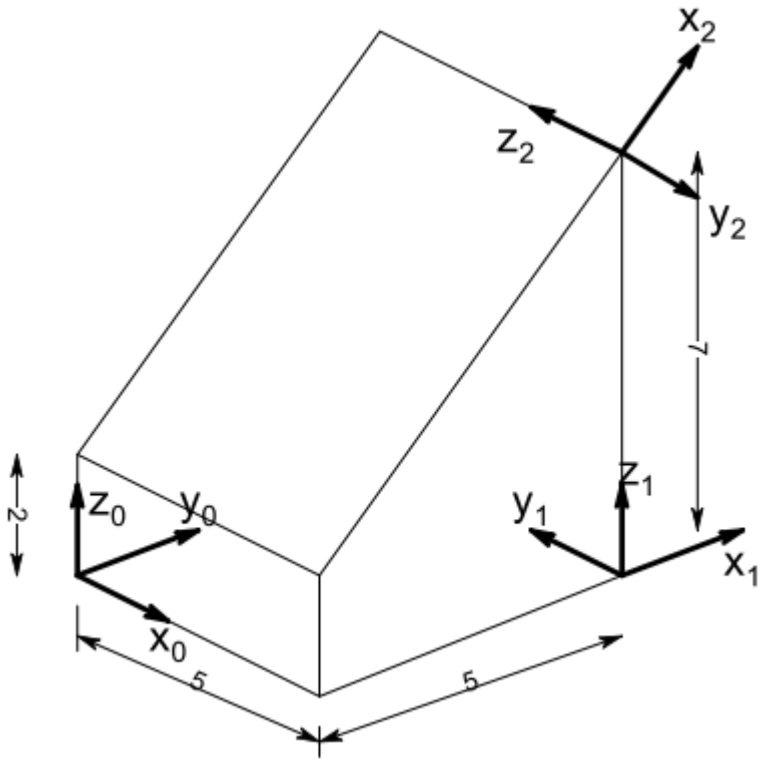
If $^{0}\mathbf{T}_{3}$ is given by

$$^{0}T_{3} = \begin{bmatrix} 0 & -0.7071 & -0.7071 & 6.1237 \\ 0 & 0.7071 & -0.7071 & 6.1237 \\ 1 & 0 & 0 & 15 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

Determine the values of the joint angles θ_1 , θ_2 , and θ_3 that result in the given position and the orientation of the end-effector.

Question 4

For the figure shown in the following Figure, find the homogeneous transformation matrices ${}^{i-1}\boldsymbol{A}_i$ and ${}^{0}\boldsymbol{A}_i$ for $i = 1, 2$ between the coordinate frames.



Question 5

A frame B shown below, is rotated 90° about the z-axis, then translated 3 and 5 units relative to the n- and o-axes respectively, then rotated another 90° about the n-axis, and finally, 90° about the y-axis. Find the new location and orientation of the frame.