

Questions:

1. (20 points) Give the definitions of the following terms in robotics.

- 1) Accuracy:
- 2) Repeatability:
- 3) Major axes:
- 4) Minor axes:

2. (35 points) Draw the workspace for a planar PRP robot with the following properties: range of first joint is 0.5m-2m, range of second joint is $210^\circ - 300^\circ$, range of third joint is 0.5m-1 m.

3. (45 points)

a) Calculate the transformation matrix representing a series of transformations:

Step 1. a rotation of -45° about the Y-axis of reference frame,

Step 2. a translation of $[2, -4, 5]$ along the X, Y, and Z axes of the current frame,

Step 3. a rotation of 60° about X-axis of reference frame.

(b) In Step 3, to achieve the same transformation (same physical movement), what is the equivalent transformation matrix relative to the current frame in step 3? (Note: For question (b), symbolic solution is ok.)

