Assignment 4

The due date for submitting this assignment has passed. Due on 2018-03-07, 23:59 IST.

Submitted assignment

1) To reach a point (2,2) m in the XY plane, what should be the joint angles \( \theta_1, \theta_2 \) required for the 2R manipulator shown in the figure? Assume \( l_1 = 2 \) m and \( l_2 = 1 \) m.

\[
\text{(31.48°, 58.52°) or (41.41°, -41.41°)}
\]

2) The first link \( l_1 \) of the RP manipulator shown in the figure is 0.5 m long. The second link slides and always maintains an angle of 90° with respect to the first link. Find the position of the end-effector when the first link makes an angle of 30° with the X axis and the second link stretches out a distance of 0.2 m.

\[
\text{(31.48°, 41.41°) or (58.52°, -41.41°)}
\]
3) In the given figure if the end-effector has to reach $(x_E, y_E) = (0.8, 0.9)\, \text{m}$, find the values of $s$ and $\theta$. Assume $l_1 = 0.7\, \text{m}$, $\alpha = 60^\circ$ and $s$ is non-negative.

No, the answer is incorrect.
Score: 0
Accepted Answers:
- $(0.533, 0.077)\, \text{m}$

$(1.54\, \text{m}, 81.42^\circ)$
- $(0.52\, \text{m}, 23.16^\circ)$
- $(1.12\, \text{m}, 60.56^\circ)$
- $(0.69\, \text{m}, 78.14^\circ)$

No, the answer is incorrect.
Score: 0
Accepted Answers:
4) The 3R manipulator shown in following figure has the following link properties. \( l_1 = 1 \text{ m}, \ l_2 = 0.6 \text{ m} \) and \( l_3 = 0.3 \text{ m} \). The successive angles \((\theta_1, \theta_2, \theta_3)\) made by the links are 60°, -20° and 30°, respectively. What will be the position and orientation of the end effector?

\[
(0.69 \text{ m}, 78.14^\circ)
\]

5) Find position and orientation of the end-effector of an RPR manipulator shown in the figure for the following data given. \( l_1 = 0.8 \text{ m}, \ l_2 = 0.3 \text{ m}, \ s = 0.5 \text{ m}, \ theta_1 = 50^\circ, \ theta_3 = 30^\circ \) and \( alpha = 20^\circ \).

\[
(1.06, 1.53) \text{ m}, 70^\circ
\]
6) The end effector of the RPR manipulator shown in the figure has to reach a point \((12,13)\) cm in the XY plane with \(30^\circ\) orientation. What values of the input coordinates \((\theta_1, s, \theta_3)\) are required to achieve this? Assume \(l_1= 10\) cm, \(l_2= 5\) cm, \(a = 90^\circ\) and \(s\) is non-negative.

\[(1.097, 1.122)\) m, \(60^\circ\)

7) Find the coordinate of point E in 2R-RPR manipulator shown in the figure when \(l_1 = 5\) cm, \(l_2 = 2\) cm, \(l_3 = 4\) cm, \(d = 1\) cm, \(s_4 = 4\) cm and \(\theta = 45^\circ\).

\[(93.58^\circ, 8.31\) cm, 26.42\(^\circ\)]

\[(26.42^\circ, 8.31\) cm, 93.58\(^\circ\)]

\[(86.14^\circ, 7.29\) cm, 43.82\(^\circ\)]

\[(43.82^\circ, 7.29\) cm, 86.14\(^\circ\)]

No, the answer is incorrect.
Score: 0
Accepted Answers:

\[(93.58^\circ, 8.31\) cm, 26.42\(^\circ\)]

No, the answer is incorrect.
Score: 0
Accepted Answers:
8) To reach the end-effector of a 2R-RPR manipulator shown in the figure at (12, 5) cm requires $\theta$ and $s_4$ to be _____ and _____. respectively. The manipulator possesses following properties: $l_1 = 8$ cm, $l_2 = 4$ cm, $l_3 = 7$ cm, and $d = 3$ cm. Fill in the blanks with correct set of data.

$$\begin{align*}
(2.05, -3.55) \text{ cm or } (5.26, 4.61) \text{ cm}
\end{align*}$$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$$(-12.56^\circ, 4.63 \text{ cm}) \text{ or } (57.80^\circ, 3.6 \text{ cm})$$

9) For the given data calculate the end-effector position ($x_E, y_E$) and orientation $\phi$ of the 3RPR manipulator shown in the figure. $l_1 = 8$ cm, $d = 3$ cm, $s_2 = 5$ cm, $s_4 = 7$ cm and $s_5 = 3$ cm.
10) To reach the end-effector of a 3RPR manipulator shown in the following figure at (20,20) cm with an orientation of \(60^\circ\) requires \(s_2\), \(s_4\) and \(s_5\) to be _____, _____, and ______, respectively. The manipulator possesses following properties. \(l_1 = 8\) cm and \(d = 4\) cm. Fill in the blanks with correct set of data.

No, the answer is incorrect.
Score: 0
Accepted Answers:

\([(2.81, -0.30) \text{ cm}, -62.05^\circ]\) or \([(5.99, 4.79) \text{ cm}, -1.96^\circ]\)

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\([(2.81, -0.30) \text{ cm}, -62.05^\circ]\) or \([(5.99, 4.79) \text{ cm}, -1.96^\circ]\)

(20.661, 19.324, 16.785) cm

(18.162, 21.143, 15.825) cm

(25.812, 26.621, 14.124) cm

(32.716, 30.109, 25.178) cm

No, the answer is incorrect.
Score: 0
Accepted Answers:

(20.661, 19.324, 16.785) cm