Week 4 - Assignment 4 - Part 1(MCQ/MSQ/NM)

The due date for submitting this assignment has passed. Due on 2021-02-17, 23:59 IST.

As per our records you have not submitted this assignment.

Instructions:
- If not explained all symbols have same meaning as in the lectures.
- Use the D-H convention followed in the course wherever mentioned.
- In some options to the MCQ/MSQ the text may not be adjacent to checkbox (circle or square). Consider the text just below it for such cases.
- Please note this week has 2 assignments : 1 online (MCQ/MSQ/NM) and 1 subjective. Total marks for the week will be calculated on the basis of both of the submissions.

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1) What is the degrees of freedom of the 3-UPU manipulator shown in the figure below?

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 2.9, 3.1

2) The number of loop-closure constraint equation used to solve the direct kinematics problem is

- equal to the degrees of freedom of the parallel manipulator.
- equal to the total number of joints in a parallel manipulator.
- equal to the total number of actuated joints in the parallel manipulator.
- less than the total number of passive joints in the parallel manipulator.

No, the answer is incorrect.
Score: 0
Accepted Answers:
*less than the total number of passive joints in the parallel manipulator.*

3) The set of constraint equation required to solve the direct kinematics problem in parallel manipulators

2 points
of redundancy, Human arm, and flexible robots

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22/06/2021
Robotics: Basics and Selected Advanced Concepts - - Unit 6 - Week 4 Kinematics of Parallel Robots

- are unique.
- are obtained by considering all the loops present in the parallel manipulator.
- must be equal to the number of passive joints used in the problem formulation.
- must be equal to the number of actuated joints in the parallel manipulators.

No, the answer is incorrect.
Score: 0
Accepted Answers:
*must be equal to the number of passive joints used in the problem formulation.*

4) For the 3-RPS parallel manipulator discussed in the lecture, the direct kinematics problem

- can be solved in closed form.
- involve elimination of two passive joint variables and obtaining a single equation in one joint variable.
- results in at most eight possible configurations.
- can always give a real solution.

No, the answer is incorrect.
Score: 0
Accepted Answers:
*involve elimination of two passive joint variables and obtaining a single equation in one joint variable.*
*results in at most eight possible configurations.*

5) For the 6-6 Stewart-Gough platform discussed in the Lecture, the position and the orientation of the top platform are as follows:

\[
R_b \mathbf{t} = (0, 0, 1)^T
\]

\[
R_b [R_i] = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}
\]

with \( P_0 \mathbf{p}_i = 0.5 \begin{bmatrix} \cos \left( \frac{(i-1)\pi}{3} \right), \sin \left( \frac{(i-1)\pi}{3} \right), 0 \end{bmatrix}^T \) and

\[
R_b \mathbf{b}_i = 1 \begin{bmatrix} \cos \left( \frac{(i-1)\pi}{3} \right), \sin \left( \frac{(i-1)\pi}{3} \right), 0 \end{bmatrix}^T \text{ where } i = 1, \ldots, 6 \text{ denotes the leg number.}
\]

What is the value of the actuated variable \( l_3 \)?

No, the answer is incorrect.
Score: 0
Accepted Answers:
*(Type: Range) 1.1,1.3

6) Assertion (A): The inverse kinematics problem of a parallel manipulator is easier to solve than the direct kinematics problem.

Reason (R): We don't have to solve for the passive joint variables in case of inverse kinematics.

- Both (A) and (R) are true.
- (A) is true but (R) is false.
7) A parallel manipulator cannot be assembled if

- the values of active joint variables are real.
- the values of active joint variables are zero.
- the values of passive joint variables are imaginary.
- the values of passive joint variable are zero.

No, the answer is incorrect.
Score: 0
Accepted Answers:
the values of passive joint variables are imaginary.

8) For a four-bar mechanism, let the link lengths be \( l_0 = 8 \), \( l_1 = 3 \), \( l_2 = 8 \), and \( l_3 = 4 \). For the following two cases:

1. \( a = 4.5 \) and \( b = 3.5 \)
2. \( a = 6 \) and \( b = 2 \)

with \( l_2 = a + b \), the coupler curves obtained will intersect at how many points?

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 3.9,4.1

9) The direct kinematics equations of a 6-6 Stewart-Gough platform

- are more easily solved using task space variables.
- involve nine quadratic equations in nine task space variables.
- involve six quadratic and three linear equations in nine task space variables.
- have not yet been solved.

No, the answer is incorrect.
Score: 0
Accepted Answers:
are more easily solved using task space variables.
involve six quadratic and three linear equations in nine task space variables.