

ME 380: Kinematics and Machine Dynamics Nomenclature, Mobility, and Transmission Angle

1 How to use this assignment

In this assignment, students will learn various mechanism nomenclature, mobility of mechanisms, and how to compute the transmission angle.

- The instructor will provide questions and provide intermittent help.
- This activity provides the opportunity for the students to get familiar with the mechanism nomenclature. They get introduced to basic mechanisms and definitions.
- Students will spend approximately 30 minutes on this activity.
- This activity will be submitted and graded.

2 Learning objectives

After completing this assignment, students will be able to

- They will be able to compute the degree of freedom (mobility) of mechanisms.
- They will be able to identify and compute the transmission angle.

3 Assignment completion instructions

1. Planning

- What will the instructor need before the activity?
- What will the student need before the activity?
 - Pencil and paper
 - Calculator

2. Source material(s) for the activity

- Lecture notes
- Resources placed on Piazza.

3. Introduction and warm-up practice activity for the students

- Introduction and instructions
 - Remember the names of mechanisms
 - Recall the idea of degrees of freedom of a rigid-body in the plane and in space.

- Warm-up and practice
 - Brainstorm
 - Think, pair, share: Express how to compute the mobility of mechanisms.
- 4. Main activity
 - Students can submit a soft-copy via email or hand-in a hard-copy per group.
 - This activity graded.
- 5. Wrap-up / reflection
 - Peer review
 - Have a neighboring group review your work.
 - Neighboring group should provide opinion about whether or not the solution and its development are correct.
 - After the peer review is done, the owner group tries to incorporate the suggestions and improve the solution.
 - 3-2-1 Countdown
 - One-minute paper

4 Conclusion and moving forward

This activity reminds the students about the general nomenclature. It reinforces the computation of degrees of freedom, classification of four-bar mechanisms, and computation of transmission angles.

5 Grading criteria

- Preparation
- Critical thinking
- Technical expertise
- Adherence to assignment guidelines
- Timeliness

5.1 Peer reviewer notes

1. Check if the mobility of the given mechanism is correct.
2. Check if the transmission angle is identified and correctly computed.

5.2 Preparation and content

Students can prepare for this assignment by reviewing the lecture notes. Specifically, students should review ...

5.3 Creativity and communication

Students should be able to explain their thinking process to a fellow student in order to make sure that they have learnt the material.

5.4 Critical thinking

Students should try and visualize the motion of a given mechanism. They should think about how much force/torque a link can apply to another link at different relative positions.

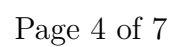
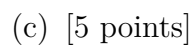
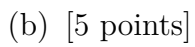
5.5 Engagement with topic

Every student should be able to and attempt to explain how they think about the problem to a fellow student.

5.6 Technical expertise

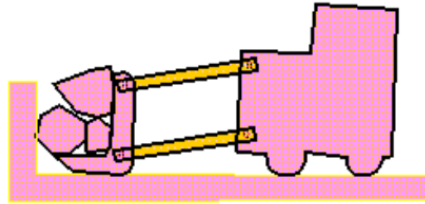
Visualization.

(a) [5 points]

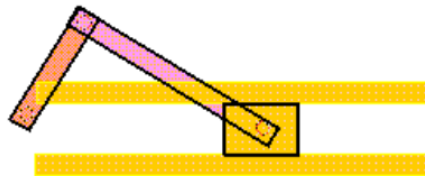


2. [20 points] Identify the type of linkages (four-bar, slider-crank, etc.) for the following mechanisms.

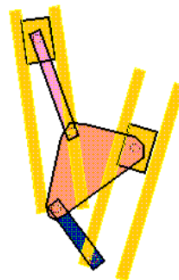
(a) [5 points]



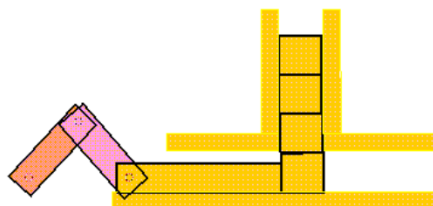
(b) [5 points]



(c) [5 points]

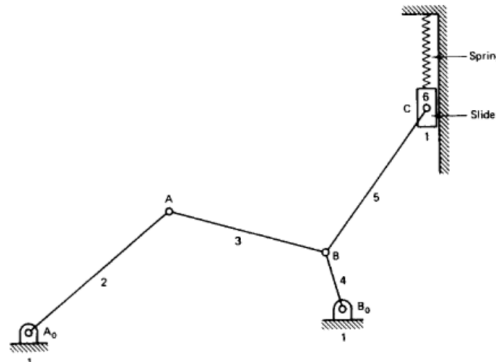


(d) [5 points]

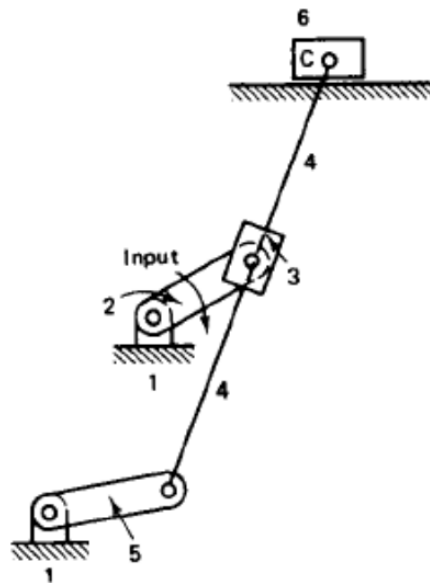


3. [20 points] Determine the transmission angles for the following mechanisms.

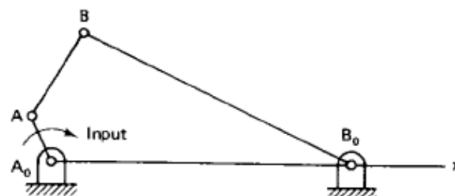
(a) [5 points] 6-bar mechanisms where link 6 is the input and link 2 is the output.



(b) [5 points] The two quick-return shaper mechanisms where link 2 is the input and link 6 is the output.



(c) [5 points] Determine the maximum and minimum transmission angles for the following four-bar linkage with dimensions: $A_0B_0 = 6\text{cm}$, $A_0A = 1\text{cm}$, $AB = 2\text{cm}$, $BB_0 = 6\text{cm}$.



4. [30 points] Perform all the numerical problems in the “Welcome activity” in Julia, Matlab or Python.

If you choose to use Julia, you can either get an account from www.nextjournal.com or download Julia at www.julialang.org and run it on your own machine. The latter is the preferred method.

Whenever you get stuck, please refer to the official Julia documentation at docs.julialang.org contains detailed information about everything related to Julia. (*If still stuck, please ask me.*)