

Homework 7: Instant Centers Part1

● Graded

Student

Shihong Yuan

Total Points

29.75 / 30 pts

Question 1

(no title)

17.75 / 18 pts

1.1 Mechanism 1ab

3.5 / 3.5 pts

✓ - 0 pts Correct

- 3.5 pts Missing
- 1 pt Incorrect I23
- 1 pt Incorrect I13
- 1 pt Incorrect I12
- 0.5 pts Incorrect IC calculation.
- 0.5 pts Small error

1.2 Mechanism 2ab

3.5 / 3.5 pts

✓ - 0 pts Correct

- 3.5 pts Missing
- 0.5 pts Incorrect I12
- 0.5 pts Incorrect I13
- 0.5 pts Incorrect I14
- 0.5 pts Incorrect I23
- 0.5 pts Incorrect I24
- 0.5 pts Incorrect I34
- 1 pt Missing/Extra instant center
- 2 pts Multiple Missing/Extra instant centers
- 0.5 pts Labelling error

1.3 — Mechanism 3ab

3.5 / 3.5 pts

✓ — 0 pts Correct

- 0.5 pts Incorrect I13
- 0.5 pts Incorrect I24
- 0.5 pts Incorrect I14
- 0.5 pts Incorrect I12
- 0.5 pts Incorrect I23
- 0.5 pts Incorrect I34
- 0.5 pts Incorrect IC calculation
- 0.5 pts Minor labeling issue
- 1 pt No labels
- 3.5 pts Missing

1.4 — Mechanism 4ab

5.25 / 5.5 pts

– 0 pts Correct

– 0.5 pts Incorrect/missing IC calculation

✓ — 0.25 pts 1 incorrect Instant Center

- 0.5 pts 2-3 incorrect Instant Centers
- 1.5 pts 4-6 incorrect Instant Centers
- 2.5 pts 7-9 incorrect Instant Centers
- 3.5 pts 10-12 incorrect Instant Centers
- 4.5 pts 13-15 incorrect Instant Centers
- 5.5 pts Missing

1.5 — Neatness/completion

2 / 2 pts

✓ — 0 pts No Issues

- 0.5 pts Diagrams excessively messy/difficult to read
- 1 pt Missing key parts

Question 2

(no title)

12 / 12 pts

2.1 (no title)

2 / 2 pts

✓ - 0 pts Correct

- 0.5 pts number of instant centers not computed

- 0.2 pts missing an IC

- 0 pts [Click here to replace this description.](#)

2.2 (no title)

3 / 3 pts

✓ - 0 pts Correct

- 1 pt Missing equation

- 3 pts Incorrect

- 1 pt incorrect location

- 1 pt Incorrect direction

- 0.5 pts Equation wrong

- 2 pts 2 equation wrong

- 3 pts Incorrect

- 1 pt Direction missing

2.3 (no title)

2 / 2 pts

✓ - 0 pts Correct

- 2 pts Missing

- 0.5 pts Partial correctness

- 1 pt incorrect

2.4 (no title)

1.5 / 1.5 pts

✓ - 0 pts Correct

- 0.75 pts Incorrect, the correct is no.

- 1.5 pts Missing

- 2 pts [Click here to replace this description.](#)

2.5 (no title)

3.5 / 3.5 pts

✓ - 0 pts Correct

- 0.2 pts No negative sign needed, just magnitude

- 1 pt Incorrect Magnitude Definition

- 2 pts Missing equation

- 0.5 pts Partially Correct Magnitude Definition

- 0.5 pts Incorrect diagram

- 3.5 pts Missing

- 1 pt missing diagram

Question 3

Penalties

0 / 0 pts

✓ - 0 pts Correct

- 3 pts No Pages Assigned

- 3 pts Less than 1 day late

- 6 pts Less than 2 days late

- 9 pts Less than 3 days late

Questions assigned to the following page: [1.1](#), [1.2](#), and [1.5](#)

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Problem 1 [18 pts]:

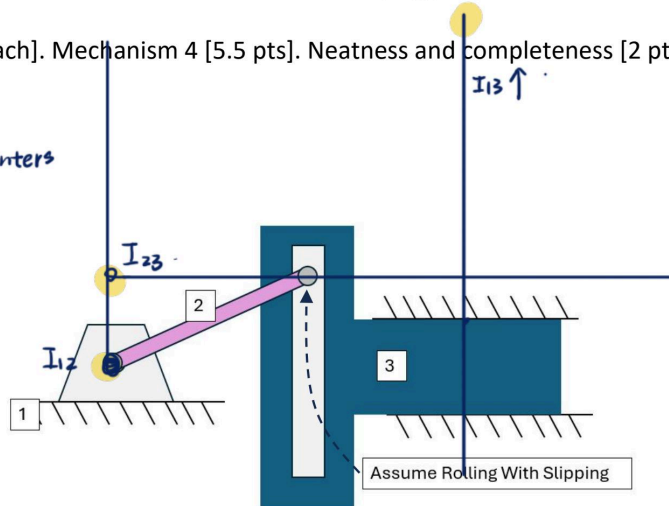
For the five mechanisms shown below:

- (a) Compute how many instant centers should there be in the mechanism.
 (b) Identify all instant centers (ICs) for the mechanism using a linear graph to track them. Use the labeling convention from class to label each instant center, e.g., I_{13} . Show construction lines if needed (Rules 2,3,5).

Mechanisms 1-3 [3.5 pts each]. Mechanism 4 [5.5 pts]. Neatness and completeness [2 pts].

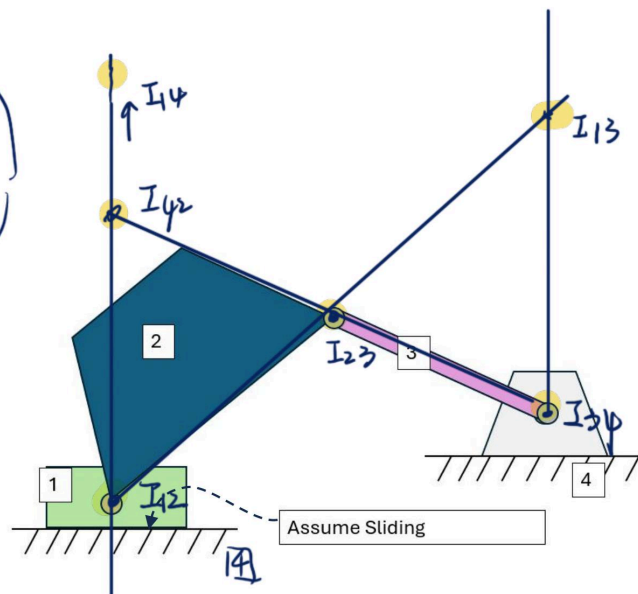
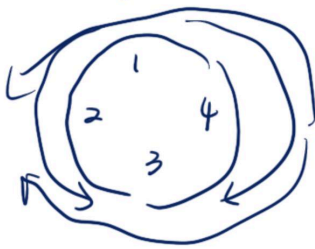
Mechanism 1

(1) $C_3^2 = 3$ instant centers



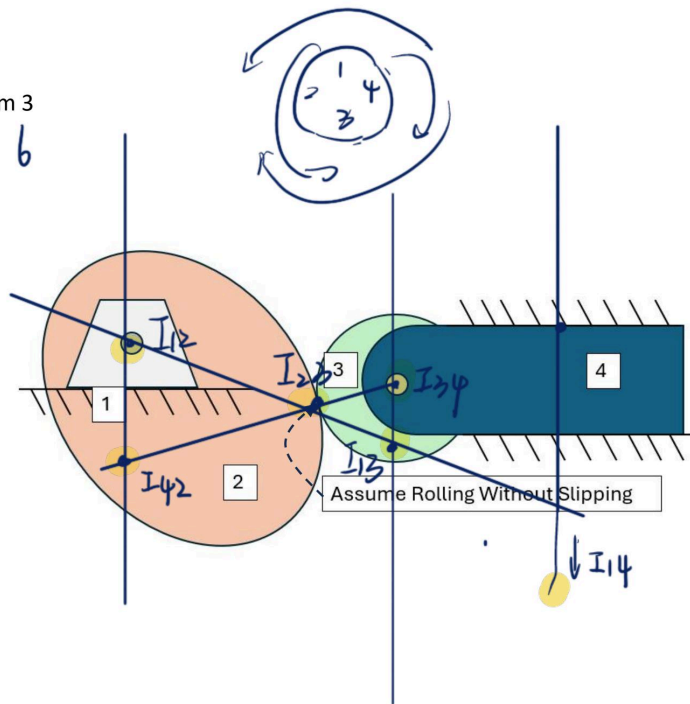
Mechanism 2

(1) $C_4^2 = 6$



Questions assigned to the following page: [1.3](#), [1.5](#), and [1.4](#)

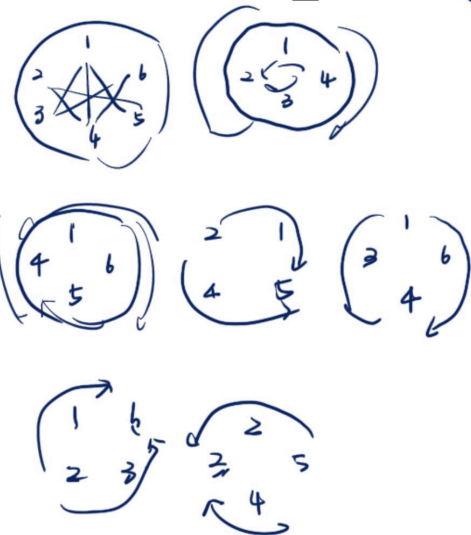
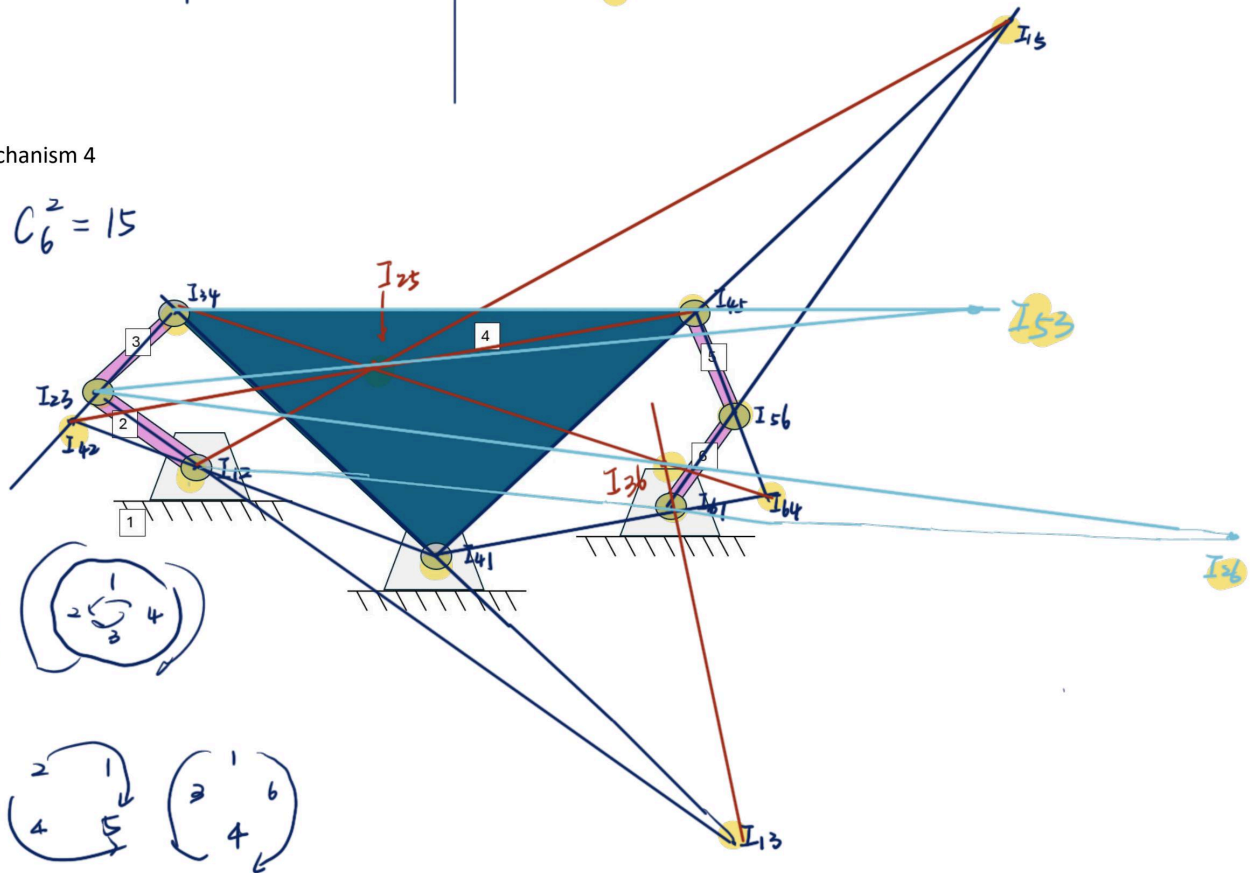
Mechanism 3
 (1) $C_4^2 = 6$



$mle5 \rightarrow I_{23}$

Mechanism 4

(1) $C_6^2 = 15$



Questions assigned to the following page: [2.1](#), [2.2](#), [2.3](#), [2.5](#), and [2.4](#)

Problem 2 [12 pts]: Using Instant Centers

Consider the mechanism drawn below. The ultimate goal of this problem is to graphically illustrate and determine the magnitude and direction of the linear velocity at point C using instant centers. Assume that the input constant angular velocity ω_4 is known.

- Identify all instant centers for this mechanism. Follow steps (a) and (b) in Problem 1. [2 pts]
- Use geometry to draw \vec{V}_B (velocity of point B) with its appropriate direction (make sure to indicate any known angles) and magnitude (length) in the figure. You can define the length of segments using $|XY|$ notation, for the distance between points X and Y [3 pts].
- Write a symbolic equation to solve for the angular velocity of the link ABC (let's call it ω_3) [2 pts].
- Does the angular velocity of link ABC differ with location on the link? Explain why. [1.5 pts]
- Define the magnitude and draw \vec{V}_C (velocity of point C) with its appropriate direction in the figure. You must indicate the exact angle of this vector with respect to a known line (Hint: the line connecting to a particular instant center) [3.5 pts].

Show all work to reach your answers!

(1)



$$C_4 = 6$$

$$(2) V_B = \omega_4 \cdot |O_4 B|$$

$$(3) \omega_3 \cdot |I_{13} B| = \omega_4 \cdot |O_4 B|$$

$$\omega_3 = \omega_4 \left| \frac{O_4 B}{I_{13} B} \right|$$

(4) No, it doesn't differ. Because it is a rigid body

$$\omega_A = \omega_B = \omega_C$$

all ω are same

$$(5) V_C = \omega_4 \left| \frac{O_4 B}{I_{13} B} \right| \cdot |I_{13} C|$$

Question assigned to the following page: [3](#)

Select one of the following options:

- a) My answer was created by a Gen AI algorithm, and I have not modified it
- b) My answer was created by a Gen AI algorithm, and I have made some minor changes.
- c) My answer was created by a Gen AI algorithm, and I have made major changes.
- ☒ d) My answer was created solely by myself.
- e) If I used Gen AI, I used ____ (name of program).