As a student at Union College, I am part of a community that values intellectual effort, curiosity and discovery. I understand that in order to truly claim my educational and academic achievements, I am obligated to act with academic integrity. Therefore, I affirm that I carried out the work on this exam with full academic honesty, and I rely on my fellow students to do the same.

For this Exam, I understand that:

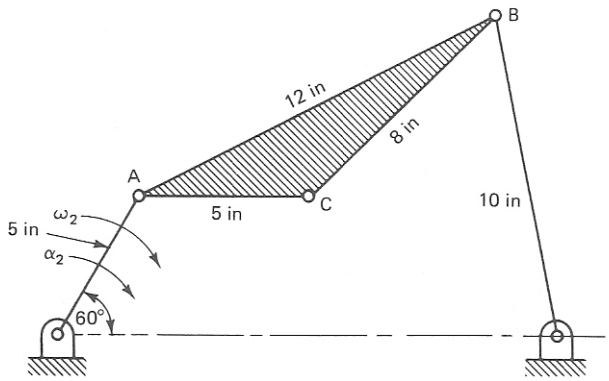
1. Once I start the solution to a problem on this exam I **must** work alone in writing out the solutions to the problems in this exam.
2. Once I start the solution to a problem on this exam I **cannot** copy solutions to the problem from any person or resource.
3. Once I start the solution to a problem on this exam I **cannot** use any electronic resources to assist me in the solution to the questions on this exam except for the computer programs that I developed in this course and my calculator to only performing appropriate calculations on the exam.
4. I **can** study the posted solution, study any other solution, and/or discuss the solution with anyone prior to writing out the solutions.
5. Once I start the solution to a problem on this exam I must complete it.

Signature: _____

Print Name: _____

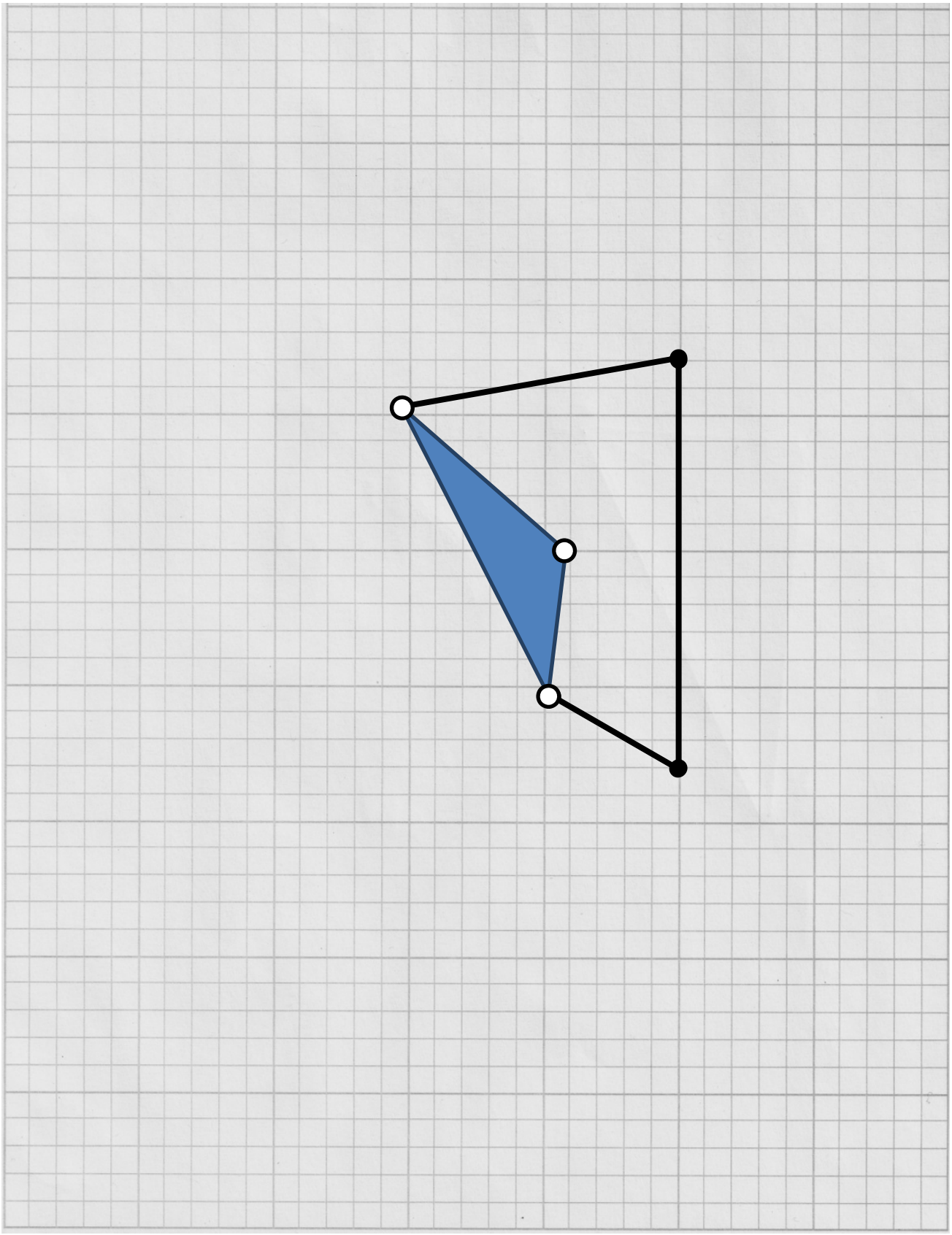
Exam Date: _____

PROBLEM 1 (35 pts): The figure below shows a four bar mechanism. The length of the base link O_2O_4 is 15 in, all other dimensions of the link are shown in the figure. Link 2 is rotating at $\boldsymbol{\omega}_2 = -25\frac{1}{s}$, and $\boldsymbol{\alpha}_2 = -180\frac{1}{s^2}$.



1b. Use the program/tool that you developed in class to calculate all the important parameters. Print out your solution. Print the solution such that it **all fits on a single page** and staple it **directly behind this page**. Make sure that I can read your output.

1a. Use the figure on the next page, find all instant centers then use the instant centers to verify your calculated results for V_A, V_B, V_C, ω_3, and ω_4.

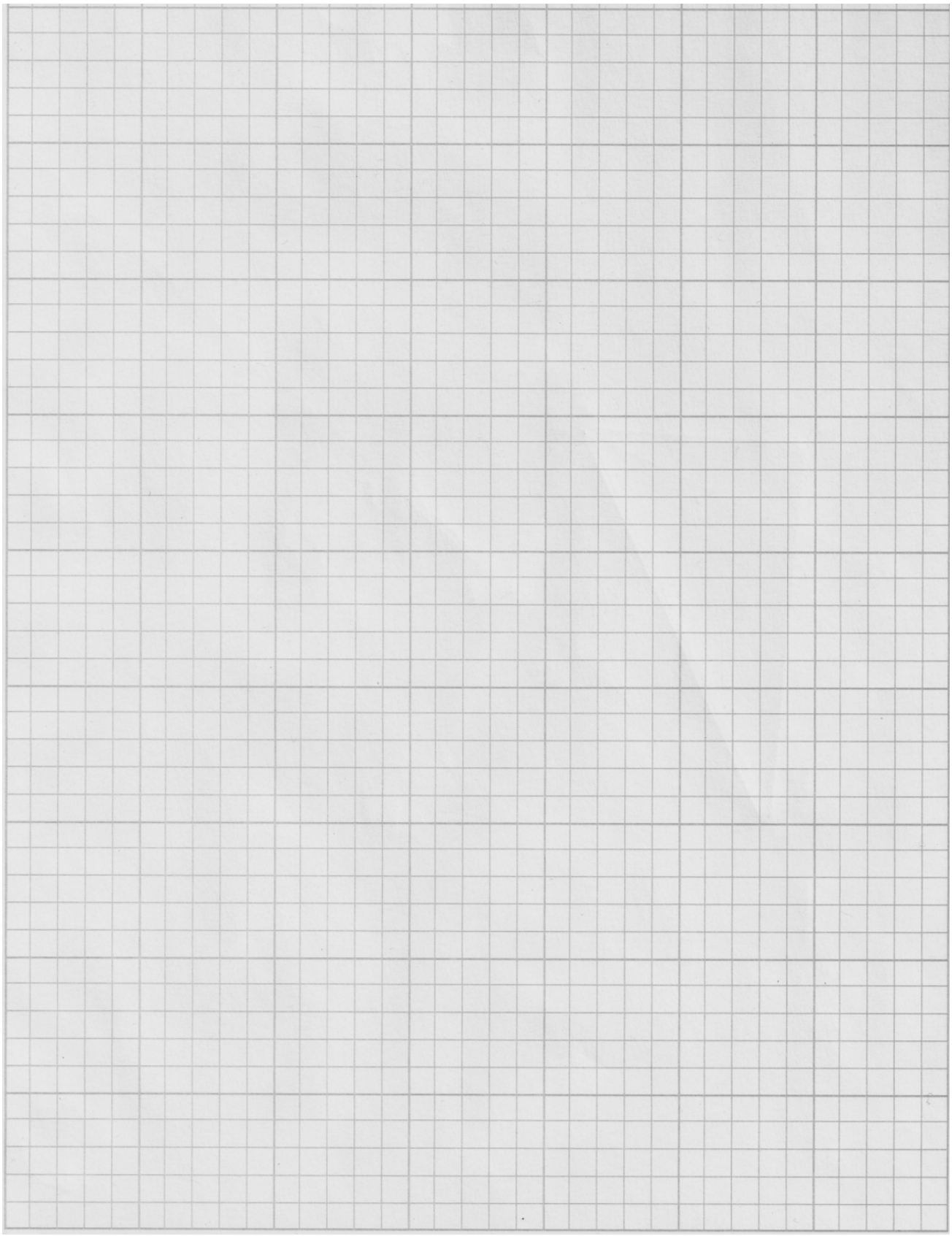


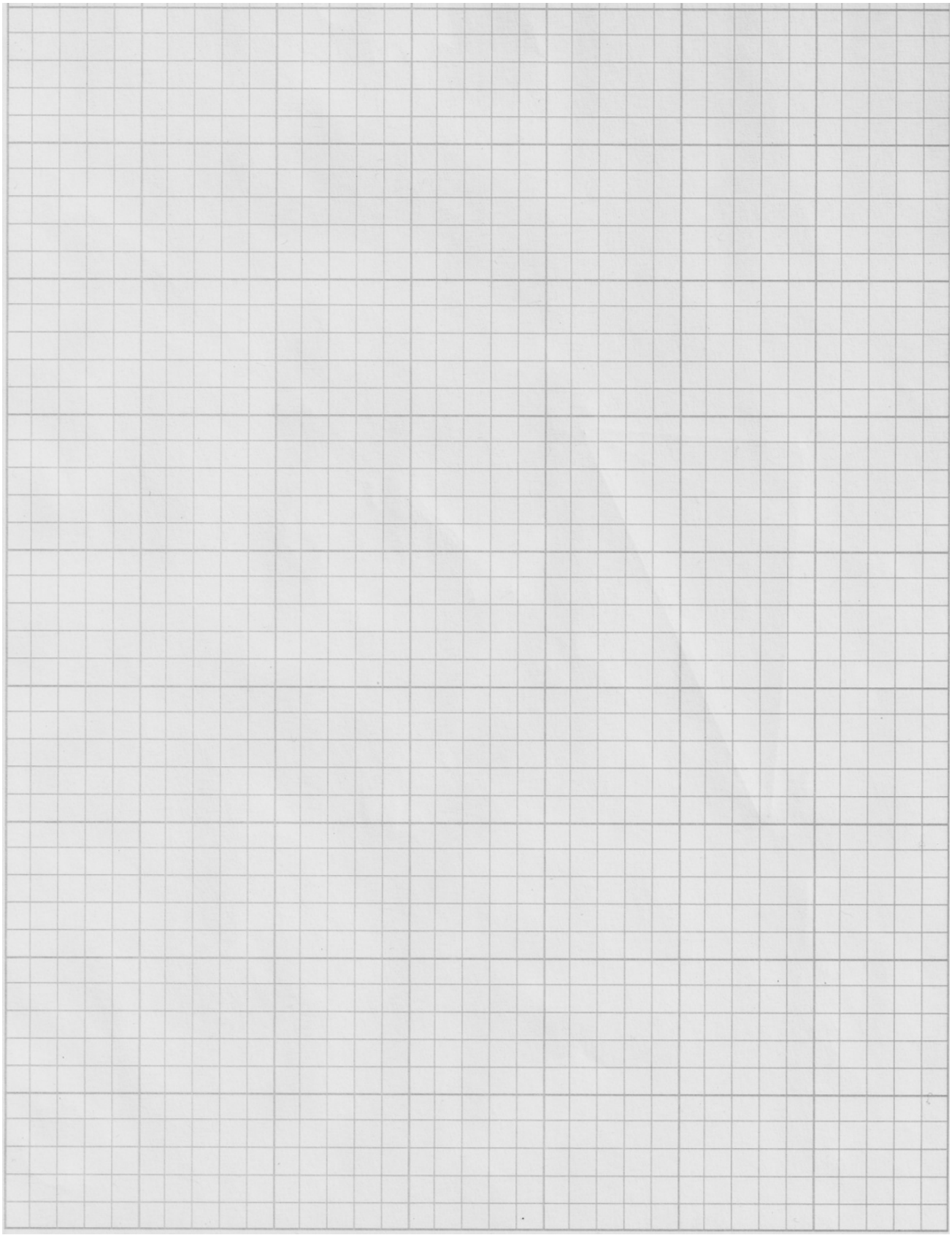
PROBLEM 2 (35 pts): A slider crank linkage has the following dimensions.

Link 2	Link 3	Offset	θ_2	ω_2	α_2
5.5m	21m	2m	55	-20 $\frac{1}{s}$	5 $\frac{1}{s^2}$

2a. Using the program that you have been developing, calculate all the critical parameters associated with this linkage in both of the possible configurations. Print out the results of your program and staple it **directly behind this page**.

2b. Using the grid paper on the next two pages, draw the mechanism in both the open and crossed configurations. Find the instant centers in the open configuration and verify the velocity of the slider that you calculated in the previous section.





PROBLEM 3 (30 pts): Find the mechanical advantage for the hood mechanism shown.