This homework assignment contains two “word” problems only. Compose a single document using your favorite word editor that has your answers to the 2 questions. **Be sure to show your work. Correct answers without a show of your approach will receive partial credit only.** Although you may discuss the homework with your fellow students, you cannot discuss solutions, as that would be a violation of the university's honor policy. If you write code to reach a solution, then provide that code as proof of work. Ask if something is not clear.

**Question 1**: (25 pts) Assume the following four code statements:

\[
\begin{align*}
S1 & : x = x * y; \\
S2 & : y = x - y; \\
S3 & : y = x + y - z; \\
S4 & : z = x + y
\end{align*}
\]

Assume that \(x\) is initially set to 2, \(y\) is initially set to 4, and \(z\) is initially set to 6, and further assume that S1 through S4 are executed atomically. For each of the following Programs A-D, what are the possible final values of \(x\) and \(y\) and \(z\) for any program that runs to completion. **Provide ALL possible final values. Be sure to explain your answer. If a program will not complete (stalls indefinitely), explain why.**

A. S4; S2; S1; S3
B. co S2; // S1; // S3; S4 oc
C. co await (x > y) S1; S2; // S3; S4; oc
D. co await (x > y) S2; S1; // S4; S3; oc

**Question 2**: (25 pts). We’ve discussed in lecture different topologies, and how some are better suited than others for execution of concurrent programs. Three topologies are shown below, where N is network, M is memory, and P is processor. P includes registers, ALUs, AND cache. M is main access memory.

For each of the topologies i-iii, enumerate and discuss briefly (a few sentences for each such suffice):

A. What is a disadvantage / possible shortcoming of a system with such a topology
B. What advantage(s) does the topology afford?
Keep in mind that one topology might have a shortcoming in terms of memory access, while another topology’s major shortcoming might be concerned with network latency. The Network is intended to be interpreted in the general sense; for example if i’s 2 Ps, N and M are all on chip, then consider the network as a bus, but if you consider that i’s 3 Ps are physically separated from the shared memory by hundreds of miles, then the Network should be thought of as a network with packet switching capabilities. Regardless of how you think of the Network it shouldn’t change your analysis much, because it is the number of entry points and exit points in the Network, and the number of dedicated paths and distances between different components that are the crucial factors. Answer the two questions for each topology in the general sense, but be specific. Don’t say, “Memory access is bad.” Instead, you could say, “Memory access is problematic because ______.”

For each topology i, ii, and iii, also provide

C. Pseudocode of a concurrent program that would be well suited for that topology, and explain WHY the code that you are providing is well suited for use on that topology. 5-10 lines of pseudocode for each answer should suffice. If A and B for each topology is well reasoned, then writing pseudocode should be straightforward.

**Submission.** Submit via canvas:

- A document (.doc, .docx, or .pdf) with your answers to the questions.

**Rubric**

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<th>Question/Component</th>
<th>Points</th>
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<td>Qs 1, 2</td>
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