

15-110 Check5 - Written Portion

Name:

AndrewID:

Complete the following problems in the fillable PDF, or print out the PDF, write your answers by hand, and scan the results.

When you are finished, upload your check5.pdf to **Check5 - Written** on Gradescope.
Note that there is no programming portion of this check.

Written Problems

[#1 - Hw4 Code Review - 5pts](#)

[#2 - Levels of Concurrency - 15pts](#)

[#3 - Concurrency Trees - 30pts](#)

[#4 - Pipelining - 30pts](#)

[#5 - Internet Definitions - 10pts](#)

[#6 - RSA Encryption - 10pts](#)

Written Problems

#1 - Hw4 Code Review - 5pts

It's time for code reviews again! This is the second **code review** of the semester, where you will meet with a course TA to go over the code you wrote for a previous assignment. The TA will point out things you're doing well and areas where your code can be cleaner (even if it works already!)

To receive five points for the Hw4 code review, sign up for and attend a code review session with a TA. We'll release more details about how to sign up for and attend these sessions via Piazza.

#2 - Levels of Concurrency - 15pts

Can attempt after Levels of Concurrency lecture

Which of the following concepts does **not** involve running multiple tasks at exactly the same time? **Select all answers that apply.**

- Circuit-level concurrency
- Multitasking
- Multiprocessing
- Distributed Computing

For each answer selected, write **up to 20 words** about what that concept does instead.

#3 - Concurrency Trees - 30pts

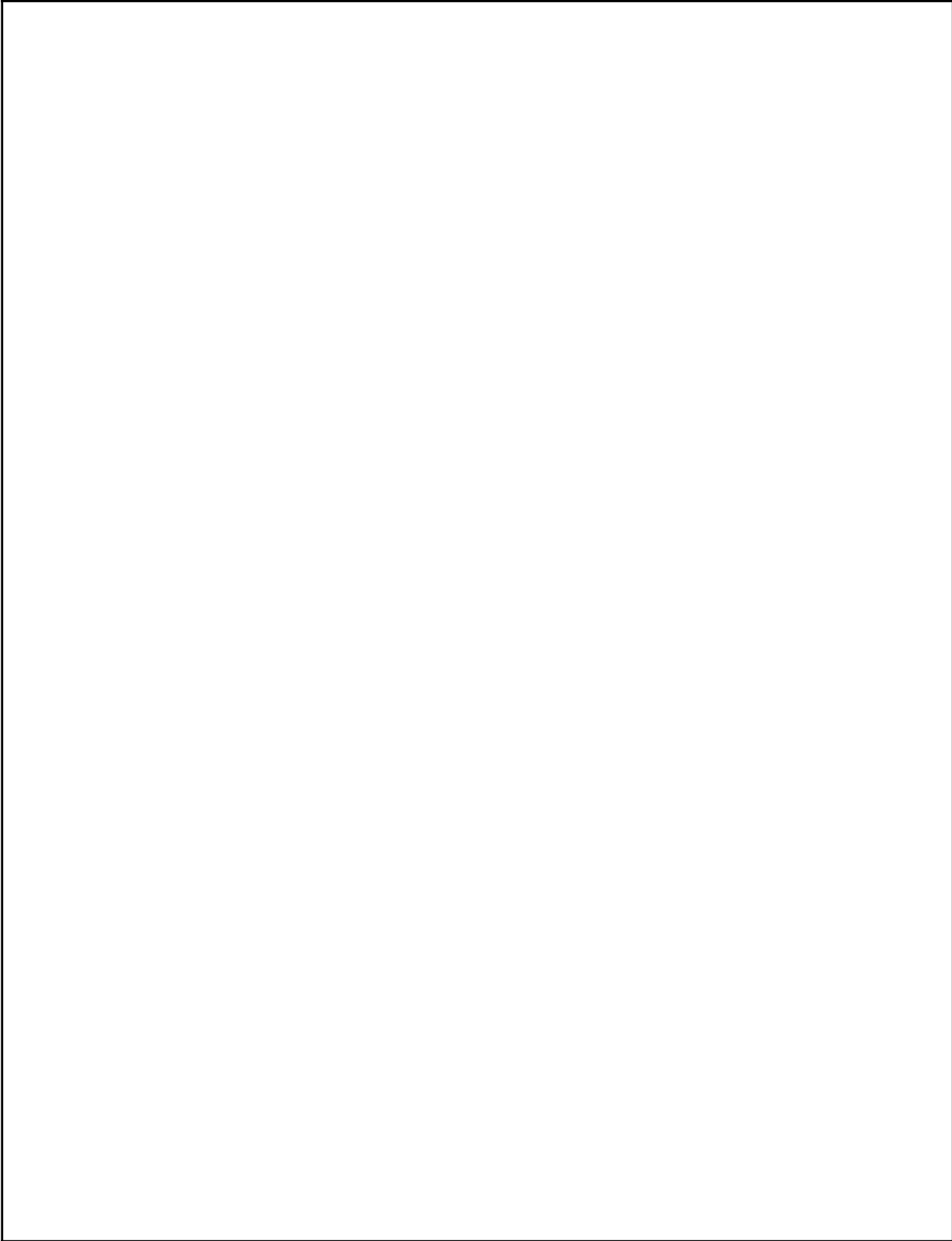
Can attempt after Levels of Concurrency lecture

Exponentiation (raising a base to a power, like 2^4) can be computed concurrently by first multiplying pairs of bases (e.g., $2*2$) together, and then multiplying those products together ($4*4$), and continuing until there is only one answer (16).

Draw a concurrency tree that computes 2^7 and upload your tree into the next page. You can do this with a picture of a physical drawing or an online image editing tool (like Google Drawings). To upload the image, use the same approach you used on Hw2.

Note that you should only use **multiplication** as operations, not exponentiation.

How many total steps does this tree take?	
How many time steps does this tree take?	



#4 - Pipelining - 30pts

Can attempt after Parallel Programming lecture

A factory with four workers produces custom t-shirts. To make a t-shirt, the workers follow this process:

- [Sm] Set up supplies (for measuring) (5 minutes)
- [M] Measure the fabric (5 minutes)
- [Sc] Set up supplies (for cutting) (5 minutes)
- [C] Cut out the pattern (5 minutes)
- [Sw] Set up supplies (for sewing) (5 minutes)
- [W] Sew it all together (5 minutes)
- [F] Fold the shirt (5 minutes).

Note that setup occurs **once** before starting either measuring, cutting, or sewing; you could then hypothetically measure/cut/sew as many times as you want in a row. But when you set up new supplies for a task, you put away the supplies for the previous task.

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Originally each worker made one shirt at a time, with all four workers working in parallel. Each of the cells in the following table represents five minutes, with the whole table representing an hour of work. Fill in the cells with the letters representing the steps to demonstrate the original system the factory used.

Worker	00:00	00:05	00:10	00:15	00:20	00:25	00:30	00:35	00:40	00:45	00:50	00:55
A												
B												
C												
D												

How many complete, folded shirts could be made by four workers in one hour with the original system?	
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Recent budget changes have led to new restrictions. Now the workers have to share a single sewing machine; in other words, **only one worker can sew at any given point in time**. They decide to use a new approach to make things more efficient.

Create a new schedule that uses **pipelining** to increase the efficiency of the shirt-making process. (**Hint:** think about the most efficient way to split up the tasks.)

Worker	00:00	00:05	00:10	00:15	00:20	00:25	00:30	00:35	00:40	00:45	00:50	00:55
A												
B												
C												
D												

How many complete, folded shirts could be made by four workers in one hour using the new pipeline?	
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#5 - Internet Definitions - 10pts

Can attempt after How the Internet Works lecture

Fill in the blanks in the following statements with appropriate terms from the Internet lecture.

The internet relies on _____, a type of machine used to pass packets around the world between computers.

The DNS server translates URLs into _____, and passes that information back to your computer via packets.

#6 - RSA Encryption - 10pts

Can attempt after Authentication and Encryption lecture

Subra wants to send Farnam a message encrypted using RSA. What step(s) would **Subra** have to take while generating a message to ensure that Farnam can decrypt and read the message?