15-110 - Quiz5 - 11/22/2021

Name: _____ andrewID: _____

- This quiz tests material from weeks 1-10 of the course (primarily weeks 8-10).
- You have **20 minutes** to take the quiz.
- If you have a clarification question, raise your hand and a proctor will come help you.
- You must complete the quiz **individually**. You may refer to paper notes during the quiz, but do not communicate with anyone else.

1. Free Response - Concurrency Trees [31pts]

Draw the concurrency tree for the following expression:

```
(a / (c * (d + 3))) * ((g * f) / (h + 7))
```

Concurrency Tree:

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

2. Code Reading - Try/Except [28pts]

Consider the following code (with line numbers provided):

```
1:  a = input("A:")
2:  b = input("B:")
3:
4:  aList = [ a[2], a[1], a[0] ]
5:  try:
6:      bNum = int(b) // 2
7:  except:
8:      bNum = 2
9:  print(aList[0:bNum])
```

Below are four possible entries a user could provide. If the code runs without errors on the entries, write what the code would print. On the other hand, if an error is displayed in the interpreter when the code runs, write 'ERROR' followed by the line number that causes the error. For example, if an error occurs due to Line 1, write **ERROR 1**.

User enters **phone** for "A:" and **eight** for "B:"

User enters **pie** for "A:" and **2** for "B:"

User enters **potato** for "A:" and **7** for "B:"

User enters **OK** for "A:" and **0** for "B:"

3. Short Answer - Concurrency Terminology [20pts]

Fill in the blanks with terms from the word bank that **best** fit the statements.

Word Bank

authentication	circuit-level concurrency	concurrency tree	deadlock
difficulty of design	distributed computing	encryption	fault tolerance
MapReduce	multiprocessing	multitasking	pipelining

A) To tackle really big tasks that require a lot of computation, we use _____ to spread work concurrently across multiple computers.

B) We might have trouble when parallel programming if two concurrent processes get into _____ by trying to access the same resources at the same time.

C) One standard approach for parallelizing work, _____, splits up data across multiple processes, then combines the results together to compute the final answer.

D) If a computer doesn't have multiple CPUs, it might use _____ to make it look like high-level programs are running concurrently even when they aren't.

4. Short Answer - Encryption [21pts]

Prof. F sends Prof. K a message encrypted using RSA. The following seven steps explain how this process works, but they are out of order and the names have been removed.

Order the steps by writing numbers in the spaces to the left (1 for the first step, 2 for the second, etc), and enter the correct initial in each blank space after Prof. (i.e. Prof. K).

___ Prof. _____ uses Prof. _____'s public key to encrypt the message.

___ An adversary using a man-in-the-middle attack accesses the encrypted message, but cannot decrypt it as they don't have the private key.

___ Prof. _____ looks up Prof. _____'s public key.

___ Prof. _____ receives the encrypted message.

___ Prof. _____ generates a public and private key and makes the public key available to everyone.

___ Prof. _____ uses their private key to decrypt the message.

___ Prof. _____ sends the encrypted message over the internet.