

CS 480 Final Examination

Monday, 23 November 2020

Examination Rules:

No references other than your own knowledge may be used in this exam.

Once the examination has begun, no communication of any kind between students is permitted.

The Instructor will indicate examination times in the BBLearn system

You **MUST** use the paging specifications provided in the exam. If you answer a question on the wrong page, it is not likely to be graded

By executing this examination, I assert that I have read all of the above instructions and the course syllabus, including those specifically related to Academic Integrity. I assert that I fully understand these, and that I will abide by all the rules, requirements, and responsibilities found above and in the syllabus.

1. What are the three parts of a solution to the critical section problem, and briefly explain each.
2. Briefly explain the Readers-Writers problem; describe some real-world condition that would represent this problem.

3. Consider the following snapshot of a system. There are no outstanding unsatisfied requests for resources.

Available

R1	R2	R3
1	3	2

Process	Current Allocation			Maximum Demand		
	R1	R2	R3	R1	R2	R3
P1	1	1	2	3	8	3
P2	2	1	2	2	4	4
P3	1	1	2	2	6	5

- i. What reference data must be calculated to conduct this resource analysis?

- ii. Draw a table like the one shown to find the needed reference data. Note that more cells are provided than required; use the table cells as needed to organize the data.

- iii. Is this system currently in a safe or unsafe state? Show and/or explain how the resources might be distributed to arrive at either a safe or an unsafe state. In other words, show the order of the processes going through the system, and the resource quantities before and after each process is run. If one or more processes cannot run, show the number of resources needed by the process(es) and the available resources at that time.

PAGE 3: 4. Draw a resource allocation diagram (RAD) that shows only the currently acquired resources for the initial condition in question 3 with the constraint that there are no available resources outside what the Processes have already acquired (i.e., the “Available” table is empty). Note that you must draw each arrow exactly as it should be for a given resource; you may not use numbered lines.

5. Explain how the SCAN hard drive scheduling algorithm is better than the SSTF scheduling system
6. Briefly describe what VFS and NFS are, and explain how they might be used in a given computing system

7. Consider the following questions related to data access.

- a. Provide an example where polling might be superior to interrupting, and briefly explain why
- b. Provide an example where interrupting might be superior to polling, and briefly explain why

8. Identify the four security measure levels of protecting a system, and briefly describe them.

a.

b.

c.

d.

PAGE 7: 9. With consideration for a Medieval castle, answer the questions below.

- a. Identify and briefly describe a secure by default strategy castle builders might use.
- b. Identify and briefly describe a defense in depth strategy that castles are likely to use.

10. Explain the principle of least privilege, and provide an example that is not related to computers.
11. Explain the difference between protection and security with regard to an automobile

Ethics/Legal Considerations (ABET)

Scenario: Your company has figured out a way to make human breathing ventilators more reliable at a much lower cost. Your team must develop the software for this device so that it protects the patient at all cost, and handles any failure conditions in such a way as to minimize harm to the patient. Your team is under significant time pressure to complete the software development so the product can be released to the public and support medical facilities that are in need of it.

12. Considering the given circumstances, give an example of an unethical action that you or members of your team could conduct in the course of developing the software. Relate the action to one of the kinds of security violations identified in the book (breach of: confidentiality, integrity, availability; theft of service, etc.). In your answer, be very clear about why this is an unethical action as opposed to an illegal action.