CSE 536 Spring 2024 Final

Your name: ____

You have an hour and 50 minutes (a regular class period) to complete this exam. Mark on this sheet of paper with a pen or pencil, and then turn it in at the front of the room to the TA or I. This test is closed book (note that there is no textbook for the course) and closed note except that you can have one 8.5" by 11" sheet of notes (written on front and back if you like). You may not use any electronic device (not even a calculator) and you may not communicate in any way with any individuals other than the instructor of the course and the TA during the exam. Any violation of these policies will result in a 0 on the exam and will be treated as an act of academic dishonesty as per the syllabus. Every question is worth 10 points. For multiple choice questions, circle the best answer. For short answer questions, write at least one word and at most one sentence in the blank space provided.

1. Under which one of the following circumstances might a process find itself in the "pipe wait" state, waiting for I/O before it can be scheduled on the CPU again?

   A. When it reads from a pipe

   B. When it tries to access protected memory and then doesn't handle the SIGSEGV signal

   C. When the machine is turned off

   D. When the process is hogging the CPU

2. What is a named pipe?

   A. A pipe that is given a name in the virtual file system, *e.g.*, using mkfifo

   B. A process that has a different name than its parent process

   C. The inode of a file that has been deleted

   D. The dentry of a directory that has been removed

3. Which of these is something I would expect to see in an inode and not somewhere else (like a dentry or other kernel data structure)?

A. The name of the file

B. The last time the file was modified

C. A file descriptor table

D. None of the above

4. Suppose a process opens a file, and then reads from it. When are the permissions in the file's inode checked to make sure the process is allowed to read from the file?

A. The process can't possibly know the file's name without read permissions for it

B. When it is read

C. When it is opened

D. Never, because UNIX has no file protection mechanisms

5. Which of these paradigms for building distributed systems is famously not good for use cases where multicast or broadcast is required?

A. Message passing

B. Remote Procedure Calls, *a.k.a.*, RPC

C. The Actor model

D. None of the above

6. Suppose I'm building a distributed system based on asynchronous I/O and the epoll() system call for Linux. I'm trying to make a decision about edge-triggered vs. level-triggered event handling. Which of these might be a valid reason to choose edge-triggered over level-triggered?

A. Complexity, I don't want my code to be complicated so I choose edge-triggered

B. To avoid the "thundering herd" problem, where an event wakes up many threads

C. Level-triggered epoll() is impossible to use along with UNIX signals in any way

D. Level-triggered epoll() can't scale for many file descriptors as well as poll() can

7. Which of these is an advantage of RPC over message passing?

A. RPC is based on procedures, which is a natural abstraction for programmers

B. RPC doesn't require you to write stubs, invoke procedures by name, *etc.*

C. RPC is better for changing network topologies, like cellular towers as a car moves

D. RPC is great for supercomputers, and is what makes MPI work

8. In the game for Homework 1, Werewolves, there's a special user that moderates the game. What is that user's username on the system?

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9. What programming language is the game that we used for Homework 1, Werewolves, programmed in?

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10. For homework 2, both server.py and client.py included a file in the local folder as library that was used for communication in the Werewolves game. Editing this file would have been the natural place to implement MPI, RPC, *etc.* for either the client or server, probably both. What is the name of that file?

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