Important: This is an open book test. You can use any books, notes, or paper, but not exchange anything with other students. You are not allowed to use any electronic/communication devices, including a calculator. *Do not log into the computer during the test.* Any calculations and rough work can be done on the back side of the test pages. You will lose five points for not writing your name.

1. [5 pt] Why do we need a priority interrupt mechanism in CPU? Why can't we simply have a chronological interrupt mechanism as that will be simpler to implement?

2. [5 pt] What is an *activation record* of a procedure? How does it help in efficient use of memory?

3. [5 pt] What is *controlled access* to a file? How does it differ from full access to a file?

4. [5 pt] An I/O-bound program is one that, if run alone, would spend more time waiting for I/O than using the processor. A processor-bound program is the opposite. Suppose a short-term scheduling algorithm favors those programs that have used little processor time in the recent past. Explain why this algorithm favors I/O-bound programs and yet does not permanently deny processor time to processor-based programs.

5. [5 pt] What is the difference between an interrupt and an exception/trap. Give an example of each for illustration.

6. [6 pt] In addition to regular states like run, ready, and wait, Unix has a state known as zombie state? How does it affect the performance of the system? How do you get rid of a zombie process?

7. [9 pt] Show how the bakery algorithm conforms to each tenet of the protocol for critical section problem.