Department of Computer Science and Engineering
National Sun Yat-sen University
First Semester of 2025 PhD Qualifying Exam

Subject： Operating Systems

1. Processes and Threads (20%):

(1) Explain five process states and draw the state transition diagram of a process. (10%)

(2) What are zombie and orphan processes? (4%)

(3) What is Amdahl's law? (2%)

(4) Explain two types of parallelism for threads. (4%)

2. Synchronization and Deadlock (30%):

(1) Explain three requirements for any solution to the critical-section problem. (6%)

(2) What is a spinlock? What is its major advantage? (4%)

(3) Give four steps for the usage of a counting semaphore. (8%)

(4) Explain the first readers-writers problem and the second readers-writers problem. (6%)

(5) In general, what are the three ways to handle a deadlock problem? (6%)

3. Memory Management (20%):

(1) Explain five steps of dynamic loading for routines. (10%)

(2) Explain three common strategies to handle the dynamic storage-allocation problem. (6%)

(3) Explain two types of common protection bits used in a page table. (4%)

4. Mass Storage, I/O, and Files (30%):

(1) Compared to hard disk drives (HDDs), what are three advantages of nonvolatile memory (NVM) devices? (6%)

(2) Explain five steps of a typical sector-sparing transaction. (10%)

(3) Explain how memory-mapped I/O works. (4%)

(4) What is the difference between mandatory and advisory file locking? (4%)

(5) Explain the linked allocation method for files. (6%)