Department of Computer Science and Engineering
National Sun Yat-sen University
Second Semester of 2024 PhD Qualifying Exam

Subject： Operating Systems

1. Processes (20%):

(1) Explain the two inter-process communication models. (4%)

(2) Explain the three synchronization mechanisms for threads to access a shared data item in UNIX systems. (6%)

(3) Explain the four necessary conditions to cause a deadlock. (8%)

(4) What is the major problem of priority scheduling? How to solve it? (2%)

2. Memory (20%):

(1) What is the difference between external and internal fragmentation? (4%)

(2) Explain the first-fit, best-fit, and worst-fit strategies for memory allocation. (6%)

(3) What are the three methods to translate addresses in a real-time system? (6%)

(4) Why can't we use the pool of free frames to allocate kernel pages? (4%)

3. I/O & Files (20%):

(1) Suppose that the range of a disk's cylinders is [1, 200] and the disk head stops at cylinder 55. Let the disk queue contain the requests of blocks on cylinders {99, 187, 40, 124, 17, 131, 65, 70}. Please show how the disk head moves in the SSTF, SCAN, C-SCAN, and C-LOOK disk scheduling schemes. (8%)

(2) What are the five popular schemes to define a logical structure of directories? (5%)

(3) What is the purpose of i-nodes? (2%)

(4) How to accomplish a DMA (direct memory access) transfer? (5%)

4. Security & Protection (20%):

(1) What is the major difference between a virus and a worm? (4%)

(2) What are the six design principles for security? (6%)

(3) What are the three objectives of language-based protection? (6%)

(4) Please give the four benefits of using language-based protection. (4%)

5. Special Systems (20%):

(1) Explain the three latencies concerned by a real-time system. (6%)

(2) How does a preemptive kernel work? (4%)

(3) What is the difference between stateful and stateless services? (4%)

(4) Explain the three QoS levels for multimedia systems. (6%)