Ph.D. Qualifying Exam: Operating Systems
Department of Computer Science and Engineering,
National Sun Yat-sen University

1. [Process & Synchronization: 20%]

(1) What is context switch? What will the kernel do for it? (4%)
(2) What are the four situations to terminate a process? (4%)
(3) What are the four conditions to cause a deadlock? (4%)
(4) Explain two common approaches for deadlock recovery. (4%)
(5) What are mutual exclusion and atomicity? (4%)

2. [Memory Management: 20%]

(1) Please explain external and internal fragmentation in memory allocation. (4%)
(2) What is a page fault? How does the kernel know it? (4%)
(3) Explain thrashing from viewpoints of a process and the working-set model. (4%)
(4) Why can't we use the pool of free frames to allocate kernel pages? (4%)
(5) What is the difference between static and dynamic linking to libraries? (4%)

3. [File, Disk, and I/O: 20%]

(1) What is the difference between sequential and direct access for a file? (4%)
(2) Suppose that the range of a disk's cylinders is [1, 250] and the disk head currently stops at cylinder 60. Let the disk queue contain the requests of blocks on cylinders {99, 187, 38, 124, 18, 131, 65, 72}. Show how the disk head moves in the SSTF, SCAN, C-SCAN, and C-LOOK disk scheduling schemes. (8%)
(3) What is the difference between status and control registers? (4%)
(4) Explain how the memory-mapped I/O works in a serial port. (4%)

4. [Distributed Systems: 20%]

(1) When do we need computation migration? Give two popular solutions. (6%)
(2) What is demand replication? (2%)
(3) What are the three guidelines in the happened-before relation? (6%)
(4) Please explain the two cache-update policies. (4%)
(5) What is a component unit? (2%)

5. [Protection & Security: 20%]

(1) How do the back-pointer and indirection solutions revoke access rights? (4%)
(2) Please give four benefits of using language-based protection. (4%)
(3) What are trap doors and logic bombs? (4%)
(4) When will domain switching occur as each process and procedure is a domain? (4%)
(5) Please give two OS solutions to the stack & buffer overflow problem. (4%)