

Ph.D. Qualifying Exam: Operating Systems
Department of Computer Science and Engineering,
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1. [Processes and Synchronization: 20%]

- (1) What are the two interprocess communication models? How do they work? (4%)
- (2) Define turnaround time, waiting time, and response time in terms of CPU scheduling. (6%)
- (3) What is serializability? How to guarantee this property? (4%)
- (4) Explain the three synchronization mechanisms for threads to access a shared data item in UNIX systems. (6%)

2. [Memory Management: 20%]

- (1) Explain how dynamic linking of shared libraries works. (6%)
- (2) From the viewpoint of the working-set model, what is thrashing? (2%)
- (3) What is the memory-mapped I/O? (2%)
- (4) Why does the swap space provide faster I/O for a disk? (4%)
- (5) Let average memory-access time and page-fault handling time be 240ns and 80 μ s, respectively. Suppose that the effective access time needs to be shorter than 280ns. Then, what is the maximum page-fault rate allowed? (6%)

3. [Storage and I/O Management: 20%]

- (1) Define the seek time, rotational latency, and random-access time for disks. (6%)
- (2) To reduce the length of access-control list, what are the three common classifications of users in connection with each file? Please explain each classification. (6%)
- (3) How to accomplish a DMA (direct memory access) transfer? (6%)
- (4) What is spooling? (2%)

4. [Protection & Security: 20%]

- (1) What are the least privilege principle and the need-to-know principle? (4%)
- (2) Please give three manners to realize protection domains and explain when domain switching will occur. (6%)
- (3) How can tunneling viruses and armored viruses avoid the detection by an antivirus scanner? (4%)
- (4) Please explain the two common kinds of symmetric encryption. (4%)
- (5) What is a zombie system? (2%)

<There are still questions behind.>

5. [Distributed Systems and Special Systems: 20%]

- (1) When will we need computation migration? What are the two common solutions? (6%)
- (2) What is the difference between stateful and stateless services? (4%)
- (3) How to realize a preemptive kernel? (2%)
- (4) The token-passing method can guarantee the property of mutual exclusion. Will it encounter deadlock? Why or why not? (2%)
- (5) What is the priority inversion problem? (2%)
- (6) Explain the four parameters used to describe QoS for multimedia applications. (4%)