

Operating Systems

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CSIE 3310, Spring 2020 Score: /120

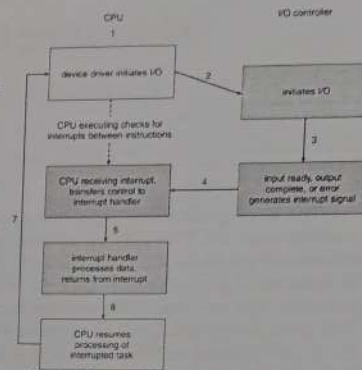
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Final, June 17th, 9:10 – 12:10

This is an open-book and open-own-note exam. Please do answer with your own succinct words IN THE ORDER of question number. Provide your own question definition if you find it is not clear enough. The hints might be misleading. Points will be deducted if your answer is difficult to read or your question definition is not necessary. You can write in Chinese and keep this paper. Your raw scores, including final exam and project 2, will be posted in the same score file as midterm. Your final grade can be found in NTUCOOL around July 2nd, and please ignore other scores there. Have a nice summer vacation.

1. [20%] For the banker's algorithm, there are some implicit assumptions, such as the resources will function in limited little time and can function again quickly the same well after returned. Can you design a better banker's algorithm, or prove it is not feasible, that the user can be granted some of the resources requested as soon as possible to minimize the response time of requests? (Similar to "Round-Robin".) Describe the difference between the new algorithm and the original one if feasible, or the infeasibility. [10%] Prove your correctness of algorithm, or the infeasibility. [10%] Hint: release the safety requirement.
2. [10%] Why do we need different sizes of memory pages? [5%] If we support different page sizes at the same time in an OS, what software functions or hardware designs need to be changed? [5%]
3. [20%] Memory management and (disk) storage management use similar technologies.
 - a. List 3 common ones. [1,2,2%]
 - b. Describe 3 technologies which are better used in storage management but not in memory management, with the most significant reason in a one-line sentence. [3*5%] excluding wear leveling.

4. [10%] The figure in the right describes the Interrupt-Driven I/O Cycles. Please describe the software functions of the Interrupt Service Routine, Device Driver, and Application modules of one I/O device you choose, and how and where, in the figure, the software modules of the I/O device interoperate using the synchronous [5%] and asynchronous [5%] I/O methods respectively, one answer for each method. Hint: computer mouse, flash drive, or timer, ...



5. [30%] Suppose we would like to use the working set model to monitor the locality for files in a disk cache for the NTUCOOL video and text files, so that the remote files (in NTU Computer Center) can be cached locally (in departments or dorms) for better performance.
- What need to be changed in the original working set model? [10%]
 - What different optimizations for big video files versus small text files? [10%]
 - If you were to redesign the NTUCOOL file servers, would you use NAS, Cloud Storage, or SAN? Why? [10%]
6. [30%] Based on project 2, please answer the following questions:
- Since it is a client-server program, how do we guarantee the correct behavior no matter how the set-up order is executed on client and server sides? [5%]
 - Describe your project to be used for the following extension in c. [5%] 怎麼用
 - Suppose your project is to support for sending session-semantic-based Peer-to-Peer (one-to-one messaging without a centralized server) messaging files so that, after each session, each peer has up-to-date message files he/she was messaging with other peers, to be used for next session. What further work needs to be done in your project? [10%] Hint: define the message synchronization in a session and message consistency. Timing to take a snapshot. Stateful or stateless. Many one-to-one messaging at a time. 怎麼優化
 - Following c., describe further optimizations if it supports group messaging with more than two peers and any one can choose to be anonymous. The session owner can see all messages and block messages from any peer to be seen by some peers. [10%] Hint: Peers join and leave anytime in a session.