

This exam is **closed book**. You can have **two pages** of notes. UH expels cheaters.

1. The UNIX method of creating a process through a `fork()`/`exec()` pair is notoriously inefficient. Why? (5 points) Describe two solutions to this problem. (2×5 points)
2. Consider a virtual memory system with 64-bit addresses and a clustered page table with a clustering factor of 2. Assuming that each address occupies 8 bytes, what would be the length of a page table entry assuming that we are implementing:
 - a) *Complete subblocking* (5 points)? _____ **bytes**
 - b) *Partial subblocking* (5 points)? _____ **bytes**
3. What is the difference between a *superpage* and a *partial subblock*? (5 points)
4. You are to write a program to let students submit their assignments on Bayou by copying them into a subdirectory of the TA account. Your solution should guarantee the confidentiality of the programs before and after they are submitted. It cannot use electronic mail or a client/server pair. Which UNIX security mechanism should you use? (5 points) What would be the ownership and access rights of your program? (5 points)
5. Munin is said to have an *eager release* policy. Describe this policy (5 points) and explain how it differs from a *lazy release* policy. (5 points)
6. Compare and contrast the page replacement policies of VMS and Mach. (10 points for an answer with two correct diagrams). Which one is the best suited for UNIX and why? (5 points)
7. What is *false sharing* in a distributed shared memory system? (5 points) What problem does it cause? (5 points) Which feature of Munin addresses that issue? (5 points)
8. In UNIX, what is a *special file*? (5 points) What is the major advantage of having them? (5 points)
9. How does Mach implement threads? (10 points)