

科目：作業系統 A

日期：108 年 7 月 31 日 第 1 頁 共 1 頁

請 "✓" 明 ✓不可看書 可看書

* 請將答案依題號順序寫入答案卷

答題時字跡需工整，否則不予計分。Write your answers legibly; otherwise you will get zero score.

Write down your answers in English or Chinese. Using English does not automatically imply a higher score.

1. [10 pts] Fuchsia is a microkernel-based operating system designed by Google. Most of its system components, such as file systems, run in user space rather than in kernel space. The microkernel approach is known for its poor performance under intensive I/O operations. Explain how this I/O performance bottleneck is caused, and suggest a possible solution.
2. [10 pts] How zombie processes are created in UNIX operating systems? What will happen if a user created too many zombie processes in a system (if permitted)?
3. [10 pts] A process duplicates itself by calling the fork() system call. A brute-force implementation of fork() is to copy the entire memory space of the calling process, but the duplicating procedure is extremely slow if the memory space of the process is large. Suggest an enhancement to speed up the implementation of fork().
4. [10 pts] Interrupt disabling is not a valid solution to the critical section problem for multiprocessor (multi-CPU) machines. Explain why and suggest a valid solution.
5. [10 pts] How does thrashing happen in a demand-paging-based virtual memory system? How to avoid thrashing?

◎請用深黑色鋼筆或原子筆出題

命題老師簽名：

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1. [10pts] List one *advantage* and one *disadvantage* of formatting file system with large logical block size. You have to give the justifications as well.
2. [10pts] We know that CPU may cache memory access. Should we allow memory-mapped device I/O to be cached by CPU as well? Please give your reasons.
3. [10pts] Given the following UNIX directory listing, let's assume that the user *hank* does not have root access to the system, and there is no software vulnerability. Can user *hank* access the directory */root*? If yes, how? If no, please provide your justifications.

```
hank@idaho:/$ ls -l --full-time /
total 100
drwxr-xr-x  2 root root  4096 2019-07-05 06:32:58.881259536 +0800 bin
drwxr-xr-x  3 root root  4096 2019-07-05 06:32:55.781320550 +0800 boot
drwxrwxr-x  2 root root  4096 2018-12-12 12:59:46.723178362 +0800 cdrom
drwxr-xr-x 20 root root  4500 2019-05-22 23:17:15.939113020 +0800 dev
drwxr-xr-x 144 root root 12288 2019-07-06 06:43:07.834910337 +0800 etc
drwxr-xr-x  4 root root  4096 2019-02-15 23:48:36.914120851 +0800 home
drwxr-xr-x 23 root root  4096 2019-05-12 21:43:53.582550999 +0800 lib
drwxr-xr-x  2 root root  4096 2019-05-12 21:43:52.066571965 +0800 lib64
dr-xr-xr-x 254 root root    0 2019-05-09 15:15:25.036000000 +0800 proc
drwx-----  3 root root  4096 2019-01-28 17:50:11.948495047 +0800 root
```

4. [10pts] A firewall can be used to block network ports. Give one attack scenario in which blocking network ports can make a system more secure. Also, give another attack scenario in which blocking network ports would not make the system more secure.
5. [10pts] Explain how the hypervisor software prevents a guest operating system from modifying the memory content of another guest operating system?