

# 國立交通大學試題紙

九十七學年度第一次  
博士班資格考

科目：作業系統 (A)

日期：98 年 2 月 6 日 第 1 頁 共 2 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.

1. [10%] In terms of executing user programs, please explain why or why not the following techniques are positive to the improving of CPU utilization: a) direct memory access b) interrupt-driven I/O c) midterm scheduling d) long-term scheduling e) spin locks.
2. [5%] Discuss the *drawbacks* of using a) the microkernel architecture and b) virtual machines. Is a Playstation emulator based on a microkernel or a virtual machine?
3. [5%] Consider the transition among process states. Give an example to each of the following situations: a) running→waiting, b) waiting→running, c) waiting→ready, d) ready→running, e) running→terminated.
4. [5%] Suppose that we have 9 CPU-bound processes and 3 I/O-bound processes. If there are  $K$  CPUs ( $K \leq 9$ ), and the many-to-many threading model is used. How many kernel threads are needed to fully utilize the CPUs?
5. [5%] FCFS (First-Come First Serve) CPU scheduling algorithm can usually result in poor I/O utilization. Explain why.
6. [5%] Spinlocks are particularly useful in multiprocessor systems. Explain why.
7. [5%] If a system is not deadlocked when all processes issue their largest resource requirements at the same time, then the system can never be deadlocked. Explain why.
8. [5%] Explain the segmented paging scheme used in Intel IA-32 processors (e.g. 80386).
9. [5%] Design a page-reference pattern for which LRU page-replacement algorithm degrades into FIFO.

科目：作業系統 (B)

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10. [10%] Some systems automatically open a file when it is referenced for the first time, and close the file when the job terminates. Discuss the advantages and disadvantages of this scheme as compared to the more traditional one, where the user has to open and close the file explicitly.
11. [5%] The beginning of a free space bit map looks like this after the disk partition is first formatted: 1000 0000 0000 0000 (the first block is used by the root directory). The system always searches for free blocks starting at the lowest numbered block, so after writing file A, which uses 6 blocks, the bit map looks like this: 1111 1110 0000 0000. Show the bit map after the following four additional actions:
  - (a) File B is written, using 5 blocks
  - (b) File A is deleted
  - (c) File C is written, using 8 blocks
  - (d) File B is deleted.
12. [5%] Why must the bit map for file allocation be kept on mass storage, rather than in main memory?
13. [10%] Consider a file system on a disk that has both logical and physical block sizes of 512 bytes. Assume that the information about each file is already in memory. For each of the three allocation strategies (contiguous, linked, and indexed), answer these questions:
  - (a) How is the logical-to-physical address mapping accomplished in this system? (For the indexed allocation, assume that a file is always less than 512 blocks long.)
  - (b) If we are currently at logical block 10 (the last block accessed was block 10) and want to access logical block 4, how many physical blocks must be read from the disk?
14. [10%] What approaches a processor can give commands and data to an I/O controller to accomplish an I/O transfer?
15. [10%]
  - (a) Please briefly describe the operations of SCAN scheduling and LOOK scheduling.
  - (b) Why does SSTF scheduling tend to favor middle cylinders over the innermost and outermost cylinders?