

國立交通大學試題紙

九十六學年度第一次
博士班資格考

科目：作業系統

日期：97 年 1 月 25 日 第 1 頁 共 3 頁

請“✓”明 ✓不可看書 可看書

* 請將答案依題號順序寫入答冊

1. [10 points] What are the differences between the deadlock prevention approach and the deadlock avoidance approach? Give an example for each approach.
2. [10 points] The readers and writers problem presented in the textbook is a classical synchronization problem.

The structure of a writer process proposed in the textbook is as follows:

```
wait(wrt);  
...  
writing is performed  
...  
signal(wrt);
```

The structure of a reader process proposed in the textbook is as follows:

```
wait(mutex);  
readcount++;  
if (readcount == 1)  
    wait(wrt);  
signal(mutex);  
...  
reading is performed  
...  
wait(mutex);  
readcount--;  
if (readcount == 0)  
    signal(wrt);  
signal(mutex);
```

◎請用深黑色鋼筆或原子筆出題

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Given the above programs, answer the following questions: (1) is it possible that a writer process starves to death when a lot of reader processes keep coming?

(2) Use the above programs to explain why you think your answer in (1) is correct. [Note: both the answers in (1) and (2) must be correct to get the full credits of 10 points. Otherwise, no credit will be given.]

3. [10 points] What are the differences between the context of a process and that of a thread? What are the advantages of using threads on a single-CPU machine?
4. [10 points] Draw a process state diagram to illustrate how a process may change its state from its creation to its end.
5. [10 points] What are the differences between the (1) message passing and (2) the shared memory communication mechanisms? What are their advantages and disadvantages?
- Part A
- Part B 6. [2 points] Explain why each TLB entry should be associated with an address-space identifier (i.e., a process ID).
7. [5 points] Will LRU or optimal page-replacement algorithms suffer from Belady's anomalies? If no, prove it. Otherwise, give an example.
8. [3 points] Discuss the pros and cons of using soft links and hard links.
9. [5 points] How a journaling file system such as ext3 or NTFS recovers from a power failure?
10. [5 points] Consider a system with an EEPROM. The EEPROM is mapped to the kernel address space. It is read by means of ordinary memory access. To write data, special write procedures are needed. Reads are fast, while writes are very slow. For the EEPROM, should the OS use buffering, caching, spooling, or a combination of them? Explain your answer.
11. [5 points] Consider a 6000 rpm disk, which is of one single head, 11 tracks, and 110 sectors in total. Let the seek time is linearly proportional to the number of tracks traveled, and to move the head across one track takes 1ms. Suppose that the current head position is at track 0, sector 0. How long does it take to seek to track 10, sector 5? (note that tracks and sectors are numbered from 0)
12. [5 points] Suppose that you are to design an automobile control system, which is timing sensitive. Between a CSMA/CD interconnection architecture and a token-based one, which will you take? Explain why.

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13. [5 points] We are to implement a distributed file system over a wireless sensor network. Sensor nodes are prone to crash. Should the file servers be stateful or stateless? Should the write-back or the write-through client caching policy be taken? Explain why.
14. [5 points] In the distributed timestamp generating scheme, the format of a timestamp is [local clock][site id]. Why should the site id be in the least-significant part of a timestamp?
15. [5 points] Why the scheme of UNIX's /etc/passwd is adequately secure in the last decade? Why modern UNIX systems use shadowing on /etc/passwd?
16. [5 points] How to crack a system by overflowing the stack? How the attack can be protected if the processor refuses to execute code in the stack?

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