

國立臺北科技大學九十八學年度碩士班招生考試

系所組別：2310 資訊工程系碩士班甲組

第一節 作業系統 試題

第一頁 共二頁

注意事項：

1. 本試題共十三題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

一、Below is an implementation of the Semaphore operations with some problems. Please identify the problems and propose a solution. (8%)

```
1.  Wait(S) {
2.     while ( TestAndSet (&lock )); // TestAndSet is an atomic operation
3.     value--;
4.     if (value < 0) {
5.         move this process to a waiting queue
6.         block this process by yielding the CPU
7.     }
8.     lock = FALSE;
9. }

10. Signal(S) {
11.     while ( TestAndSet (&lock )); // TestAndSet is an atomic operation
12.     value++;
13.     if (value <= 0) {
14.         remove a process from the waiting queue
15.         wake up the process
16.     }
17.     lock = FALSE;
18. }
```

二、At what condition spin-locks (or busy-waiting) are more suitable for implementing a critical section than block-synchronizations? (A block-synchronization puts a process into a waiting queue while the process is waiting to enter the critical section.) (5%)

三、Deadlocks can be prevented by releasing all resources currently being held by a process which requests another resource but cannot be granted immediately. Why? (5%)

四、Consider the deadlock detection algorithm. Assume five processes ($P_0 \sim P_4$) are currently running on the system, with three types of resources A (7 instances), B (4 instances), and C (6 instances). Below is a snapshot of the system status. Determine whether there exists a deadlock or not. Explain the reason. (8%)

	Allocation			Request		
	A	B	C	A	B	C
P_0	0	1	1	1	0	0
P_1	2	0	0	2	0	2
P_2	3	0	3	0	1	3
P_3	2	1	1	3	0	1
P_4	0	2	0	0	2	0

五、For disk scheduling, assume the disk contains 200 cylinders numbered from 0 to 199. For a request queue which contains the following cylinder numbers in order: 98, 183, 37, 122, 14, 124, 65, and 67. If the head pointer is at cylinder 53, moving toward cylinder 199, how many disk head movement will be involved to serve all the requests if the elevator algorithm is used? (8%)

六、Discuss the differences between system calls and regular function calls. (4%) What is the *ioctl* system call in UNIX/Linux used for? (4%)

七、Consider the following set of processes, with the length of the CPU-burst time given in milliseconds:

Process	Burst Time
P_1	8
P_2	3
P_3	2
P_4	1
P_5	5

The processes are assumed to arrive in the order P_1, P_2, P_3, P_4, P_5 , all at time 0. Answer the questions using the following scheduling algorithms: shortest job first (SJF), and round-robin (RR) (time quantum = 2) scheduling.

1. What is the turnaround time of each process for each of the algorithms? (4%)
2. What is the waiting time of each process for each of the algorithms? (4%)

注意：背面尚有試題

八、Answer the following questions regarding processes and threads.

1. What are the differences between process and thread? Explain their advantages and disadvantages. (4%)
2. Provide one programming example in which multithreading does not provide better performance than a single-threaded solution. (4%)

九、Compare the main memory organization schemes of pure segmentation and pure paging with respect to the following issues:

1. External fragmentation. (4%)
2. Ability to share code across processes. (4%)

十、Assume we have a demand-paged memory. The page table is held in registers. It takes 8 milliseconds to service a page fault if an empty page is available or the replaced page is not modified, and 20 milliseconds if the replaced page is modified. Memory access time is 100 nanoseconds. Assume that the page to be replaced is modified 70 percent of the time. What is the maximum acceptable page-fault rate for an effective access time of no more than 200 nanoseconds? (8%)

十一、How can the working-set model solve the problem of thrashing? Explain your answers in details. (4%)

十二、Answer the following questions regarding distributed systems.

1. What is the difference between computation migration and process migration? Which is easier to implement, and why? (4%)
2. What are the benefits of a distributed file system (DFS) when compared to a file system in a centralized system? (4%)
3. Assume the wound-wait scheme is used in a distributed system to prevent deadlocks. Suppose that three processes P_1 , P_2 , and P_3 exist in the system and have timestamps 15, 10, and 5, respectively. What will happen if P_3 requests a resource held by P_2 ? (6%)

十三、Answer the following questions regarding real-time systems.

1. What is the most important characteristic of a real-time system? What are the differences between hard and soft real-time systems? (4%)
2. Consider two processes P_1 and P_2 where period $p_1 = 50$, processing time $t_1 = 25$ and period $p_2 = 75$, processing time $t_2 = 30$. Can these two processes be scheduled using rate-monotonic scheduling? Illustrate your answer using a Gantt chart. (4%)