

# 國立臺北科技大學九十七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

填 准 考 證 號 碼

--	--	--	--	--	--	--	--	--	--

第一頁 共二頁

### 注意事項：

1. 本試題共九題，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、Describe the differences among the following scheduling algorithms: shortest job first, round robin, and priority. List example situations when each algorithm would be preferred over the others. (12%)
- 二、Consider the following snapshots of a system with five processes  $P_0$  through  $P_4$  and three resource types A, B, and C,

	<u>Allocation</u>	<u>Max</u>	<u>Available</u>
	A B C	A B C	A B C
$P_0$	0 1 0	7 5 3	3 3 2
$P_1$	2 0 0	3 2 2	
$P_2$	3 0 2	9 0 2	
$P_3$	2 1 1	2 2 2	
$P_4$	0 0 2	4 3 3	

Please answer the following questions using the *banker's algorithm*. (a) What is the content of the matrix *Need*? (b) Is the system in a safe state? (c) If a request from Process  $P_1$  arrives for (1,0,2), can the request be granted immediately? Explain your answers in details. (9%)

- 三、Consider the **Dining-Philosopher Problem** where five philosophers spend their lives thinking and eating. They share a circular table surrounded by five chairs, each belonging to one philosopher. In the center of the table is a bowl of rice, and the table is laid with five single chopsticks. When a philosopher thinks, she does not interact with her colleagues. From time to time, a philosopher gets hungry and tries to pick up the two chopsticks that are closest to her. A philosopher may pick up only one chopstick at a time. When a hungry philosopher has both her chopsticks at the same time, she eats without releasing her chopsticks. When she is finished eating, she puts down both of her chopsticks and starts thinking again.

Write a deadlock-free solution to the dining philosopher problem using semaphores. (Note that you don't need to consider the situation of starvation.) (8%)

- 四、Suppose that a disk drive has 5000 cylinders, numbered 0 to 4999. The drive is currently serving a request at cylinder 143, and the previous request was at cylinder 125. The queue of pending requests, in FIFO order, is  
86, 1470, 913, 1774, 948, 1509, 1022, 1750, 130  
Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests, for each of the following disk-scheduling algorithms? List the movements of disk head in details. (15%)  
(a) FCFS  
(b) SSTF  
(c) SCAN  
(d) LOOK  
(e) C-SCAN  
(f) C-LOOK
- 五、How does man-in-the-middle attack work? How does distributed denial-of-service attack work? (6%)

- 六、Answer the following questions regarding multithreading.

1. Briefly describe the problems for the user level thread implementation in the many-to-one multithreading model. (5%)
2. Determine whether or not a race condition may occur when the following function is invoked by multiple threads in a process concurrently, and describe the reason in detail. (5%)

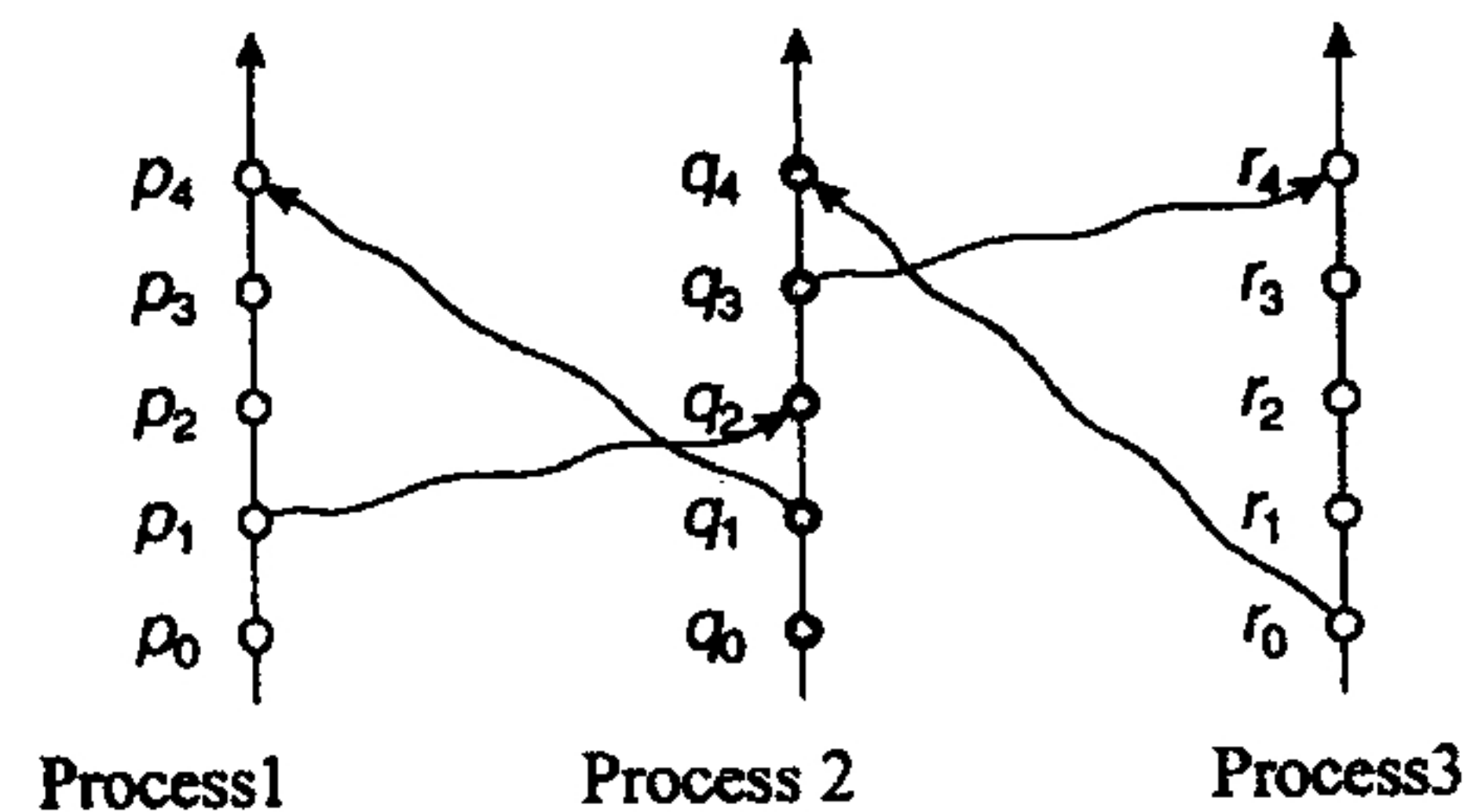
```
void function(int n) {  
    int i, x;  
    x=0;  
    for (i=0; i<n; i++) x+=i;  
    return x;  
}
```

七、Answer the following questions regarding memory management.

1. Consider a system with 32-bit logical address space and with the page size of 4KB. Assume a two-level paging algorithm is used in this system, in which a logical address is divided into three fields: a 10-bit outer page number, a 10-bit inner page number, and a 12-bit page offset. For both the outer page table and the inner page table, each entry consists of 4 bytes. For a process which uses 40 MB of memory, how much memory space (in KB) will be used at least by this process to store the page tables? (10%)
2. Some TLB (Translation Look-aside Buffer) implementations store ASIDs (address-space identifiers) in each TLB entry. An ASID can uniquely identify a process. If ASIDs is not supported, when a context switch occurs, what should be done to the TLB by the operating system to ensure that the next executing process runs correctly? (5%)

八、Answer the following questions regarding distributed systems.

1. On a distributed file system, caching is often used to improve the performance of remote file accesses. Discuss the problems which could be caused when a large block size is used. (8%)
2. The figure below shows a space-time diagram for three concurrent processes. According to the definition of happened-before relation, which of the event pairs  $A:(p_0, r_1)$ ,  $B:(q_0, r_3)$ ,  $C:(q_2, p_4)$ ,  $D:(p_2, r_4)$ , and  $E:(q_1, q_4)$  are concurrent events? Note: answer this question with the letters such as A, B, C. (5%)



九、Given a real-time task set which includes three processes, in which process P1 has a period of 50 and a CPU burst of 25, process P2 has a period of 100 and a CPU burst of 30, and process P3 has a period of 40 and a CPU burst of 10. All these processes arrive at time 0. Assume the Rate Monotonic Scheduling is used in the system. Answer the following questions.

1. List these processes according to the order of their priorities, e.g.  $P1 > P2 > P3$ . (4%)
2. Determine whether or not this task set can be scheduled without missing the deadlines. If yes, prove it. If not, at what time a deadline will be missed? Which process will miss the deadline? (8%)