

國立臺灣科技大學  
八十七學年度碩士班招生考試試題

所 別：管理技術研究所  
學程別：資訊管理學程

組別：甲組、丙組

科目：計算機概論

1. Consider the case that a circularly linked list is used to implement a queue and a pointer is used to point to a node in the list. Which node will be pointed? Why? (3%)
2. What data structure do we use in implementing an iterative depth first search? (3%)
3. Show the final max-heap and 2-3 tree after successively inserting the keys 2, 7, 8, 1, 3, 6, 4, 5, 9, 10 into an initially empty max-heap and 2-3 tree. (10%)
4. Complete the following C function which swaps the left and right children of every node in a binary tree, where the root is pointed by 'r', and the left child and right child are pointed by "left" and "right" respectively. (9%)

```
Tree *swap-tree(Tree *r)
{
    if( r != NULL )
    {
        _____ (1) _____;
        _____ (2) _____;
    }
    _____ (3) _____;
}
```

5. In C, the following expression will sometimes produce a divide-by-zero run-time error. True or False? Why? (5%)

If ((x==y) || (x/(x-y)>0)) printf("Ha!\n");

6. Suppose you have to multiply two large square matrices A and B using a virtual memory system. How would you lay the matrices out so as to minimize your program's working set size, assuming that your program can generate the elements of A and B equally conveniently in any order? (5%)
7. Give an example to show to implement information hiding in C (not C++). (7%)
8. In programming, we often heard the following two opposing opinions.  
 (1) "Memory management is so important that we cannot trust the programmers to do it."  
 (2) "Memory management is so important that we cannot trust the system to do it."  
 Explain and give one programming language as an example for each opinion. (8%)

9. 有兩個 process P1 和 P2 以 Semaphore S1、S2 及相關之 P、V operator 進行協調。其程式如下：

PRODUCER PROCESS P1

PRODUCE :

.

· (produce item)

.

P(S1)

.

· (put item in buffer)

.

V(S2)

GO TO PRODUCE

CONSUMER PROCESS P2

CONSUME :

P(S2)

· (remove item

· from buffer)

.

V(S1)

.

· (consume item)

.

GO TO CONSUME

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以下為這兩個 process 的執行情形，試為空白之 S1，S2 填入適當的值 (5%)。

| Event | Actions | Semaphore | Values |
|-------|---------|-----------|--------|
| 0     | ...     | 2         | 0      |
| 1     | P(S2)   | _____     | _____  |
| 2     | P(S1)   | _____     | _____  |
| 3     | V(S2)   | _____     | _____  |
| 4     | P(S1)   | _____     | _____  |
| 5     | V(S1)   | _____     | _____  |
| 6     | V(S2)   | _____     | _____  |
| 7     | P(S1)   | _____     | _____  |
| 8     | V(S2)   | _____     | _____  |
| 9     | P(S1)   | _____     | _____  |
| 10    | P(S2)   | _____     | _____  |
| 11    | V(S1)   | _____     | _____  |

並請解釋在 Event 1，3，9，11 的時間點時系統有什麼重要事情發生？(4%)

10. 在一個 demand paging 的作業系統中，假設系統中主記憶體容量為三個 frame 且開始時 frame 中沒有載入任何 page。今假設有一應用程式以如下的 page 順序參考(reference)記憶體：

7,0,1,2,0,3,0,4,2,3,0

請分別計算以 FIFO，LRU 及 Optimal 的 page replacement algorithms 做記憶體的管理所產生的 page fault 的數目。(8%)

11. 在 Deadlock Avoidance 方法中有所謂的 banker's Algorithm，今假設在某一時間系統的狀態如下：

|    | Allocation |   |   | Max |   |   | Available |   |   |
|----|------------|---|---|-----|---|---|-----------|---|---|
|    | A          | B | C | A   | B | C | A         | B | C |
| P0 | 0          | 1 | 0 | 7   | 5 | 3 | 3         | 3 | 2 |
| P1 | 2          | 0 | 0 | 3   | 2 | 2 |           |   |   |
| P2 | 3          | 0 | 2 | 9   | 0 | 2 |           |   |   |
| P3 | 2          | 1 | 1 | 2   | 2 | 2 |           |   |   |
| P4 | 0          | 0 | 2 | 4   | 3 | 3 |           |   |   |

請回答下列各問題：

- 系統中 A，B，C 三種資源全部各有幾個？(2%)
- 此系統目前是處於安全狀態或非安全狀態？(2%)
- 若 P0 提出(0,2,0)的要求(request)，是否可被允許而不使系統處於不安全狀態？(2%)
- 若 P1 提出要求(2,0,2)，是否可被允許而不使系統處於不安全狀態？(2%)

12. 試述 HTTP 通訊協定連結的四步驟。(8%)  
以及 HTTP 在網路購物或線上交易的適用性？(7%)

13. 試述傳統主從(client-server)架構在網際網路應用的適用性？(5%)  
以及可能的改善之道。(5%)