

# 國立中山大學 114 學年度 碩士班考試入學招生考試試題

科目名稱：作業系統與資料結構【資工系碩士班甲組】

## — 作答注意事項 —

考試時間：100 分鐘

- 考試開始鈴響前不得翻閱試題，並不得書寫、劃記、作答。請先檢查答案卷（卡）之應考證號碼、桌角號碼、應試科目是否正確，如有不同立即請監試人員處理。
- 答案卷限用藍、黑色筆(含鉛筆)書寫、繪圖或標示，可攜帶橡皮擦、無色透明無文字墊板、尺規、修正液（帶）、手錶(未附計算器者)。每人每節限使用一份答案卷，請衡酌作答。
- 答案卡請以 2B 鉛筆劃記，不可使用修正液（帶）塗改，未使用 2B 鉛筆、劃記太輕或污損致光學閱讀機無法辨識答案者，後果由考生自負。
- 答案卷（卡）應保持清潔完整，不得折疊、破壞或塗改應考證號碼及條碼，亦不得書寫考生姓名、應考證號碼或與答案無關之任何文字或符號。
- 可否使用計算機請依試題資訊內標註為準，如「可以」使用，廠牌、功能不拘，唯不得攜帶書籍、紙張（應考證不得做計算紙書寫）、具有通訊、記憶、傳輸或收發等功能之相關電子產品或其他有礙試場安寧、考試公平之各類器材入場。
- 試題及答案卷（卡）請務必繳回，未繳回者該科成績以零分計算。
- 試題採雙面列印，考生應注意試題頁數確實作答。
- 違規者依本校招生考試試場規則及違規處理辦法處理。

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科目名稱：作業系統與資料結構【資工系碩士班甲組】

題號：434003

※本科目依簡章規定「不可以」使用計算機(問答申論題)

共 2 頁第 1 頁

INSTRUCTIONS: If any question is unclear or you believe some assumptions need to be made, state your assumptions clearly at the beginning of your answer.

1. What is printed by each of the following C program?

(a) (6%)

```
int a=2, b=13, c;  
for (c=1; b>0; b = b>>1) {  
    if (b%2 == 1) c = c*a;  
    a = a*a;  
}  
printf("%d \n", c);
```

(b) (9%)

```
int a[64]={0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15};  
int c=1;  
for (int i=1; i<=3; i++) {  
    for(int j=0; j<=15; j++)  
        a[j] = a[j]+a[j+c];  
    c *= 2;  
}  
printf("%d %d %d \n", a[0], a[5], a[14]);
```

2. The input elements for radix sort are 642, 374, 73, 29, 284, 252. Assume the radix base is 10.

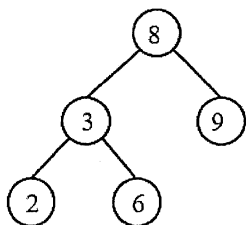
(a) (5%) What is the sequence after the first pass finishes?

(b) (5%) What is the sequence after the second pass finishes?

3. The following figure is an AVL tree.

(a) (5%) Draw the AVL tree after a new element 1 is inserted.

(b) (5%) Draw the AVL tree after a new element 4 is inserted (1 is not inserted).



4. A simple rule for the valid parenthesis format in a string consisting of left and right parentheses is that, for each pair of left parenthesis and right parenthesis, the left should appear first, followed by the right, possibly interrupted by zero or more pairs of left and right parentheses. For example,  $()()$ ,  $(( ))$ , and  $(( ))()$  are valid. But,  $)()$ ,  $(( ))()$ , and  $(( ))(($  are invalid. Let  $p(n)$ ,  $n \geq 0$ , denote the number of valid parenthesis strings for  $n$  pairs of left and right parentheses. It is assumed that  $p(0)=1$ . Additionally,  $p(1)=1$ ;  $p(2)=2$ , representing  $()()$  and  $(( ))$ .

(a) (5%) What is the value of  $p(3)$ ?

(b) (10%) Please give the recurrence relation for calculating  $p(n)$ , for  $n \geq 3$ .

5. (a) (6%) In addition to the name, what are the other six common attributes of a file? Please briefly explain these attributes.

(b) (4%) Please explain how the interrupt chaining method works.

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共 2 頁第 2 頁

6. (a) (6%) There are three common types of hardware support to address the critical-section problem. Please briefly explain them.  
(b) (4%) Please explain two fundamental IPC (inter-process communication) models.
7. (10%) Please explain the five steps of TLB (translation look-aside buffer) operation.
8. (20%) Fill-in questions (2 points each)
  - (a) When device A has a cable plugging into device B, and device B has a cable that plugs into device C, and device C plugs into a port on the computer, this arrangement is called a \_\_\_\_ chain.
  - (b) Conceptually, the memory layout of a process includes text, data, \_\_\_\_, and stack sections.
  - (c) A \_\_\_\_ condition may occur when several processes access the same data concurrently. Hence, the outcome of execution depends on a particular order in which the access takes place.
  - (d) A deadlock situation can arise if four conditions hold at the same time: mutual exclusion, \_\_\_\_, no preemption, and circular wait.
  - (e) The \_\_\_\_ code is non-self-modifying code; it never changes during execution.
  - (f) Inverted page tables require that an \_\_\_\_ identifier be stored in each entry of page table.
  - (g) Random-access time of an HDD device consists of seek time and \_\_\_\_.
  - (h) The \_\_\_\_ time is the interval from the submission time of a process to its completion time (i.e., how long it takes to run the process).
  - (i) Pthreads is a \_\_\_\_ standard for threads.
  - (j) Swap space can be created in a \_\_\_\_ partition. No file system or directory structure is placed in this space.