

國立中央大學100學年度碩士班考試入學試題卷

所別：資訊管理學系碩士班 丙組(一般生)

科目：資料結構

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本科考試禁用計算器

\*請在試卷答案卷(卡)內作答

1. (25%)
  - a) For the Fibonacci series  $F(n)=\{f(i), i=0,1,\dots,n\}$ , where  $f(i)$  is the  $i$ -th Fibonacci number, develop an iterative program in C language, using array concept. (10%)
  - b) Suppose the Fibonacci series  $F(n)$  is stored sequentially into a two dimension array  $A[0..p-1][0..q-1]$ , where each element is occupied by two bytes. The addresses of  $A[4][2]$  and  $A[2][3]$  are 2980 and 2988, respectively.
    - (1) Find the addresses of  $A[0][0]$  and  $A[3][8]$ . (8%)
    - (2) What is the element of  $A[3][8]$  in terms of Fibonacci number? (7%)
2. (25%) Please describe the structure binary trees and the operations on binary trees (such as search and insert operations). Please give some examples to illustrate your answer.
3. (25%) Invent a data structure mapping a stack  $s$  and a queue  $q$  into a single array  $M[n]$ .
  - a) Write algorithms to add and delete elements from these two data objects. (10%)
  - b) What portion of your algorithm need to be changed if your mission is to create another new data structure mapping two stacks  $s$  into a single array  $M[n]$ . Please put labels in front of your algorithms in (1) to highlight the portions to be changed. Please do not re-write the whole algorithm again, just highlight the changed portion with explanation. (5%)
  - c) Briefly describe your idea if you need to invent the third data structure mapping four stacks. (5%)
  - d) Highlight the common advantage and disadvantage for your three data structures in (1), (2), and (3). (5%)
4. (10%) Construct an AVL tree by inserting X, Y, Z, R, Q, U, S, V, T, and W, successively. You should note the balance factor of each node and show all necessary rotations.

參考圖

注意：背面有試題

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5. (10%)
- Construct a 2-3 tree for the list N,E,T,W,O,R,K,S (use the alphabetical order of the letters and insert them successively) (5%)
  - Assuming that the probabilities of searching for each of the keys (i.e., the letters) are the same, find the largest number and the average number of key comparisons for successful searches in this tree. (5%)
6. (5%) Huffman code is one of the famous methods for data compression. As decoding, how many bits should we stop reading and transform them into a character? Explain your answer in detail.

參考用

注意：背面有試題