Data Structures

Midterm Exam, Fall 2010

(因為考完考卷都回收了，所以這份試題是憑印象打的，不過大部分的題目都可以在 2005 跟 2008 的考古題裡面找到，總之看過考古題，書看熟應該都還 ok!)

(有一小題忘記題目了，不過如果一些基本定義看熟應該都寫的出來)

1. Explain the following terms and terms comparisons:
   (a) Tree traversal
   (b) The degree of a tree node
   (c) The degree of a tree
   (d) Overflow
   (e) Complete binary tree
   (f) Row major order
   (g) FIFO list vs. LIFO list
   (h) Algorithm vs. program
   (i) Performance analysis vs. Performance measurement
   (j) …….

(由於這次考的範圍好像比前幾屆少，到階序走訪而已，所以只考了三題是非)

2. Answer “True” or ”False”
   (a) An empty binary tree is invalid while a tree may have zero nodes.
   (b) The order of children is irrelevant in a binary tree.
   (c) The order of operands in in fix representation is the same as that in postfix representation.

(證明題跟 2008 都考一樣的)

3. Prove or disprove the following statements:
   (a) $\sum_{i=0}^{n} i^3 = \theta(n^4)$
   (b) $100n^2 + 200 = O(n)$
   (c) $\mathrm{n!} = \mathrm{O}(n^n)$
   (d) $n^{1.001} + n \log n = \theta(n^{1.001})$

(這題是 2005 跟 2008 沒有出現過的題目，只記得一些關鍵字...system stack 是屬於第三章的部分，在講 stack 的一開始就有提到了，看熟即可)

4. system stack
   a) AR field (好像是要寫出 AR stack 的欄位之類的)
   b) AR lifetime (when created , deleted, etc) (描述一下程式呼叫 AR 的過程)

(這題也是 05 跟 08 沒有出現的題目。在問第四章等價關係的問題)

5. (a) What is an equivalence determination problem?

   (b) pseudo code (要寫出如何判斷哪些元素是一群的等價類別 pseudo code)

   (c) time complexity

(第二章後面的多維陣列表示)

6. Assume that it takes two units of memory location to store an integer and row major order is adopted. Consider the following array declaration:

   int A[5][6][10]

   (a) If A[0][0][0] is stored at address 2000, calculate the memory address of A[2][3][7].

   (b) If A[0][0][0] is stored at address 2000, indicate which array element is at the location 2080.

   (c) If A[3][0][0] is stored at address 2000, calculate the memory address of A[1][5][5].

(第三章的運算式計算)

7. (a) During the process of transforming a parenthesized infix expression to a postfix one, why do we need two types of precedence, an i-stack precedence and an incoming precedence?

   (b) Write the postfix form of the following expressions:

   (i) A – B * D + E / F + A * D + C

   (ii) (A - B) * D + E /(F + A * D) + C

(第四章稀疏矩陣的表示)

8. How can we apply a linked list representation to sparse matrices? It is not necessary to follow the design introduced in the textbook.

(第五章的部分，這題 05 跟 08 的考古題都有出，可是我還是不會寫 QQ)

9. Given an inorder sequence ABEDCJIGFH and a postorder sequence ABCDEFGHIJ, can you derive a unique binary tree? If yes, draw the binary tree; or you have to give two distinct binary trees which can generate above sequences.

(第二小題中間的敘述有點忘了，反正是要說明如何用 array 表示樹)

10. (a) Explain how to implement a circular queue by using an array.

    (b) Explain how to implement a binary tree representation of an array. ……Explain pros and cons.