

國立中央大學97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 科目：資料結構 共 2 頁 第 / 頁

*請在試卷答案卷(卡)內作答

參考用

(1). (10 points) Write the postfix and prefix expression for the following infix expressions

(a) $p/q-x+y*z-p*q$ (5 points)

(b) $p*(q+r)/s-t$ (5 points)

(2) (5 points) Suppose the preorder and inorder traversals of a binary tree are ABCDEF and DCBEAFG respectively. What is the postorder traversal?

(A) DCEBGFA

(B) CDBEFGA

(C) DCEBFGA

(D) CDEBGFA

(E) none of the above.

(5 points)

(3) (15 points) Let $B(n)$ be the number of distinct binary trees constructed from n nodes.

For example, $B(0)=1, B(1)=1, B(2)=2, B(3)=5$.

(a) What is the value for $B(4)$? (5 points)

(b) Please write a recursive formula to define $B(n)$ based on a combination of $B(i)$ where $0 \leq i < n$. (10 points)

(4) (20 points) Assume that the maximum size of a queue is known as $MaxSize$ in advance, and the elements in the queue is represented as J_1, J_2, \dots, J_n . A queue can be implemented using an array.

(a) There exists an algorithm where the deletion and adding of an element with this queue is always of constant time complexity for the array representation. Please write appropriate pseudo-code for these operations: *add*, *delete*, *isFull*, *isEmpty*. Please draw at least one diagram to help understand your array representation where all the important variables in your program should appear. (10 points)

(b) Then, tell us the time complexity for *delete*, *add*, *isFull*, *isEmpty* of your array implementation of queue in (1). (The better performance of your algorithm is, the higher your score will be. You need to put your answer for these operations in a table with each row representing the answer for an operation.). (10 points)

注意：背面有試題

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5. Write the status of the list $F=\{6, 2, 7, 1, 10, 3, 9, 4, 8, 5\}$ at the end of each phase of Quick sort. (10 points)
6. Construct an AVL tree by inserting H, I, J, B, A, E, C, F, D, and G, successively. You should note the balance factor of each node and show all necessary rotations. (10 points)
7. An extended binary tree has N internal nodes. The external path length is E and the internal path length is I . Prove or disprove the equation: $E=I+2N$. (10 points)
8. According to the graph G in Fig.1,
 - (a) Find the transitive closure matrix A^+ and the reflexive transitive closure matrix A^* of G . (6 points)
 - (b) Explain the meaning of A^+ . (2 points)
 - (c) Explain the meaning of A^* . (2 points)

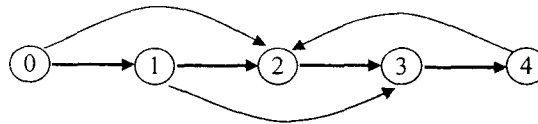


Fig. 1. Digraph G

9. For each of the following requirement, please give a proper representation of graph $G=(V, E)$ in Fig 2.
 - (a) Find all vertices that are adjacent to a specified vertex V_i in time proportional to the number of vertices reported. (5 points)
 - (b) Determine whether two specified vertices V_i and V_j are adjacent in constant time. (5 points)

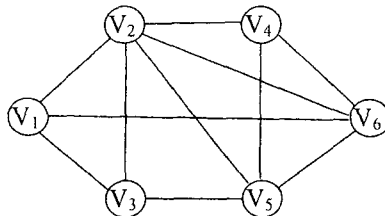


Fig. 2. Graph G

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