

國立臺灣科技大學

九十一學年度博士班招生考試試題

系所組別：資訊管理系甲組、資訊管理系在職教師甲組

科目：資料結構

總分 100分

1. Use Left-Child-Right-Sibling structure to represent a tree. State an iterative algorithm which can traverse the nodes in the tree in the depth-first manner. (15%)
2. An unsorted sequence 179, 208, 306, 93, 859, 984, 55, 9, 271, 33 is to be sorted in increasing order. (15%)
 - (1) Draw the contents of the first two passes including the sorted data in heap sort.
 - (2) Write the contents of the first two passes in quick sort, where the left part is processed before the right part..
 - (3) Write the contents of the first two passes in radix sort.
3. Compare greedy method and dynamic programming method. Give an example respectively to explain their main spirits. (20%)
4. (10%) Compare the advantages and disadvantages of the following data structures:
 - (a). stack and queue (5%)
 - (b). singly linked list and doubly linked list (5%)
5. (10%) Given the postfix form of the expression: $ab/c-de^*+ac^-$, find its prefix form.
6. (15%) Give the implementation (using C or C-like language) of adding an element to a circular queue and deleting an element from a circular queue. It is assumed that "front" and "rear" are two pointer variables point to the queue, "element" is the data type for the element in the circular queue, and the constant MAX_Q_SIZE is the maximum number of elements permitting in the circular queue. The functions' calling sequences are:


```
void addq(int front, int *rear, element item)
element deleteq(int *front, int rear)
```
7. (15%) Given an $n \times n$ matrix (for n is odd) $M[i, j]$ shown as below. The $(n+1)/2$ -th row and column contain nonzero elements *. Use row-major approach to map these nonzero elements in $M[i, j]$ (for $i, j = 1, 2, \dots, n$) to a linear array $A[k]$ (for $k = 1, 2, \dots, 2n-1$).
Hint: You should determine the relationship of i, j and k .

$$M = \begin{bmatrix} & & * & & \\ & & * & & \\ * & * & * & * & * \\ & & * & & \\ & & * & & \end{bmatrix}$$

