(91) 學年度 國立成功大學碩士班招生考試 電機乙組 系所 資料結構 試題. 共 1 頁 第 1 頁

1. (15%) [1-A] Describe the ADT (Abstract Data Type) of queue data structure. (3%)
[1-B] Describe the ADT of binary tree data structure. (4%)
[1-C] Show an implementation of your ADT given in [1-A] using your ADT given in [1-B]. (8%)

2. (15%) Given a data set of N records as described below:

Field Name	Description	Attribute	Format
NAME	Name	String of Chinese characters	4 Chinese characters
ID_NO	ID Number	10-byte string	A999999999
DOB	Date of Birth	8-byte data field	MMDDYYYY
TEL_NO	Telephone No.	10-byte string	9999999999
ADDR	Address	String of Chinese characters	32 Chinese characters

(Note on format: A=Alphabet, 9=Digit, MM=Month, DD=Day, YYYY=Year)

To sort the N records in non-decreasing order with the conditions given below, answer each question and briefly explain your reason:
[2-A] If N=100, the key is YYYY and the records with the same key value must keep the same ordering before and after sorting. Which sorting algorithm will you use?
[2-B] Which sorting algorithm will you use if N=1000 and the key is TEL_NO?
[2-C] Which sorting algorithm will you use if N=100000 and the key is ID_NO?

3. (5%) Let A be the root node of a binary tree T. Suppose T has 13 nodes and the left subtree of A is a complete binary tree of 5 nodes. How many different structures can T assume?

4. (15%) Explain the following terms: (3 points each)
[4-A] *Open addressing* [4-B] *Dynamic hashing*
[4-C] *Spanning tree of Graph G* [4-D] *Breadth-First Search of Graph G*
[4-E] *Balance factor*

5. (5%) Transfer an infix expression to a prefix expression.
7 * 2 / (5 – 2) – 3 * (2 ^ 8^ 4 + 5) / 6

6. (5%) Describe advantage(s) and disadvantage(s) of circular queues.

7. (10%) There are ten identical objects and one of them is slightly heavier than the others. Use a scale a minimum number of times to identify the heavier object. Represent the solution to this problem by a tree.

8. (15%) Devise an algorithm to determine whether a given binary tree is a heap.

9. (15%) Suppose A is a one-dimensional array of size N and we want to keep K stacks in this array. The size of the ith stack is M_i and the pointer to the ith stack is P_i. Organize a storage scheme and the associated PUSH and POP operations.