國立臺灣科技大學
九十四學年度碩士班招生考試試題

系所組別：電子工程系碩士班甲組
科　　目：資料結構

總分100分，所有答案必須寫於答案卷上.

1. (15%)
Assume there is a set of data elements. Please compare the worst-case time of the following operations, if the same set of data elements are stored in sorted sequential lists, sorted singly linked lists, and AVL trees, respectively.
3 % (1) search for a specific element x ;
3 % (2) search for k^{th} item;
3 % (3) insert x ;
3 % (4) delete k^{th} item;
3% (5) output all data elements in order.

2. (15%)
Prove that any algorithm that sorts only by comparisons must have a worst-case computing time of $\Omega(n\log n)$.

3. (20%)

台灣大樂透的中獎號碼是由 1 至 49 的數字中隨機產生六個號碼及一個特別號，但公佈的得獎號碼則是依號碼數值大小排列，並將特別號放在最後。請回答下列問題：

(1) 請設計一個演算法，其輸入為隨機產生的六個號碼，其輸出為由小到大依序排列的中獎號碼(10%)；

(2) 請一併設計你的演算法中用到的資料結構(10%)。

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4 (15%)

Consider the following network with the indicated link cost; use Dijkstra's shortest –path algorithm to compute the shortest path from A to all network nodes (B, C, D, E, F). Please execute step by step and the final answer in the form

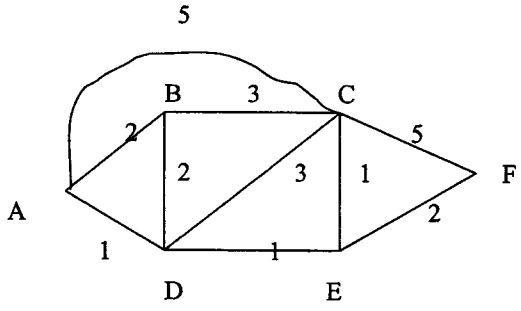
D [1] = d (A, B) = _____

D [2] = d (A, C) = _____

D [3] = d (A, D) = _____

D [4] = d (A, E) = _____

D [5]= d (A, F) = _____



5. (20 %)

(1) (5 %) Suggest a data structure to convert infix expression (such as 2 + 3 * 4) to postfix expression (such as 2 3 4 * +)

(2) (10%) Please describe the algorithm to convert infix expression to post expression using data structure in (1)

(3) (5%) Suggest a data structure to performance job scheduling in the computer system. The computer system does not use priorities, then the jobs are process in order they enter system.

6. (15%) Suppose that we are selling the service of a machine. Each user needs the same amount of time on the machine but people are willing to pay different amount for service. Assume that the machine is not kept idle unless no user is available. We want to maximize the returns from this machine.

(1) (7%) Please design a data structure to main all persons waiting for use the machine. Whenever, the machine becomes available, the user paying the most is selected.

(2) (8%) Please design an algorithm to reorganize your data structure in 6(1) after the user paying the most is selected and deleted.

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