

國立臺灣科技大學

九十二學年度碩士班招生考試試題

系所組別：資訊管理系碩士班甲組

科目：資料結構

題目共 6 題，總分 100 分

1. Use $(x \text{ MOD } 11)$ to be the hashing function and show the final hash table with linear probing (where every bucket has only one slot) and chaining after successively inserting keys 16, 38, 30, 41, 67, 74, 57, 17, 35, 21 into an initially empty hash table. (15%)

2. We have a set of 6 jobs to be executed, each of which takes unit time. At any instant $t = 1, 2, \dots, 6$, we can execute exactly one job, and earns a profit g_i if and only if it is executed no later than time d_i for $1 \leq i \leq 6$. Their profits and deadlines are as follows:

i	1	2	3	4	5	6
g_i	8	3	20	10	5	15
d_i	1	3	3	4	1	1

Schedule the jobs such that the maximum profit can be obtained.

- (1) Show the sequence of the tasks to be checked and whether they are rejected in your scheduling method. Moreover, show the contents of the time slot array where the i th element in the array records the task allocated to the i th time slot. For example, (10%)

time slot array	1	2	3	4
1. task 4			4	
2.				
i. task j is rejected				

- (2) How to use the disjoint set structure in your method to speed up the scheduling. (5%)

3. Let " i " denote insertion operation and " d " denote deletion operation.

- (1) Draw the final min heap under the condition that we perform the following operations $i7, i6, i4, i5, d, i1, i9, d, i3, i8, d, i10, i2, d$ on an initially empty min heap. (10%)
- (2) Draw the final binary search tree under the condition that we perform the following operations $i5, i2, i8, i4, i1, i9, i3, d5, i6, i7, d8$ on an initially empty binary search tree, where the deleted nodes are replaced by the nodes in their left subtrees. (10%)



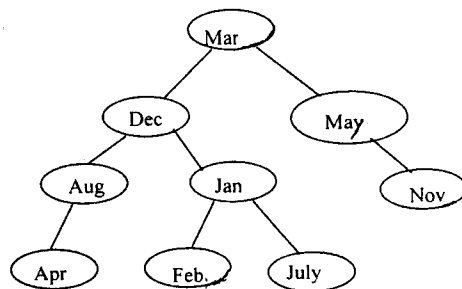
國立臺灣科技大學

九十二學年度碩士班招生考試試題

系所組別：資訊管理系碩士班甲組

科 目：資料結構

4. [Heap Sort] 有一個陣列 A[] 其元素依序如下：
26, 5, 77, 1, 61, 11, 59, 15, 48, 16
- (1) 畫出其所對應的二元樹。(5%)
 - (2) 將(1)的二元樹調整為一個 Max Heap。(5%)
 - (3) 以(2)的 Heap 展示 Heap Sort 的過程，只要能說明其方法即可，不必畫出全部過程。(5%)
 - (4) 簡單說明為何 Heap Sort 的時間複雜度為 $n \log n$? (5%)
5. [AVL Tree]
- (1) 定義何謂 AVL 平衡樹(Height Balanced Tree)? (5%)
 - (2) 有一 AVL 平衡樹如下，在其中插入一個節點其內容為"June"，請畫出平衡後的結果。(10%)



6. [Graph] 有一個圖形(graph)，其相鄰串列(Adjacency List)表示法如所示。
- (1) 畫出其圖形。(5%)
 - (2) 寫出由節點 1 開始，分別作深先搜尋(Depth-First Search)及廣先(Breadth-First Search)搜尋(Depth-First Search)所拜訪節點的順序。(5%)
 - (3) 列出一個符合該圖形的 Topological Sort 的節點順序。(5%)

