

國立臺北科技大學 112 學年度碩士班招生考試

系所組別：2151 電機工程系碩士班戊組

第一節 資料結構 試題 (選考)

第 1 頁 共 1 頁

注意事項：

1. 本試題共 8 題，每題配分列於各小題題目後，共 100 分。
2. 不必抄題，作答時請將試題題號及答案依照順序寫在答案卷上。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1. Order the following functions by their growth rate from slowest to fastest:

$$O(n), O(n^2), O(n \log n), O(\log n), O(n!), O\left(n^{\frac{1}{\log n}}\right). \quad (6\%)$$

2. Convert the following conversion to postfix:

(a) Infix: $a/b \times (c + d - e) - (f - g)$ (6%)

(b) Prefix: $\times/a - \times cb + de - fg$ (6%)

3. Sort the following data in ascending order by using three methods:

700, 123, 487, 1101, 657, 53, 188, 25.

Show your steps.

(a) Bubble Sort (5%)

(b) Quick Sort (5%)

(c) Radix Sort (5%)

[Note: Please choose the first key as pivot in quick sort.]

4. Assume $\text{Data}[1..100, 1..100]$ is a two-dimensional integer array whose start address is $00A0_{(16)}$. Please explain the possible addresses of $\text{Data}[3, 5]$.

(integer: 4 bytes) (10%)

5. Demonstrate the insertion of the keys into a hash table:

12, 5, 88, 128, 17, 10, 33, 45, 27, 14, 64, 129.

[Note: Each bucket contains only 1 slot.]

(a) Let the table have 13 buckets, and let the hash function be

$$h(k) = k \bmod 13$$

and collision resolved by linear probing. (6%)

(b) Describe the difference between collision and overflow. (6%)

6. Given the following 10 numbers:

5, 3, 8, 2, 6, 7, 1, 9, 10, 4

(a) Construct a binary search tree for these numbers. Draw the resulting tree. (5%)

(b) Show the postorder sequence of the obtained tree in (a). (5%)

(c) Delete 8 from the obtained tree in (a) and show all possible resulting trees. (5%)

(d) Construct a MIN-heap for these numbers using Top-Down Strategy. Draw the resulting heap. (5%)

(e) Please Delete 1 from the obtained heap in (d) and show the resulting heap. (5%)

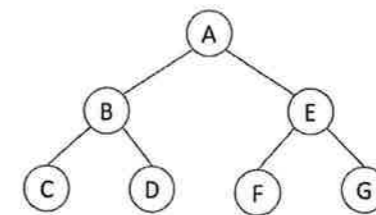
7. About graph:

$$A(G) = \begin{matrix} & v_1 & v_2 & v_3 & v_4 & v_5 & v_6 & v_7 \\ \begin{matrix} v_1 \\ v_2 \\ v_3 \\ v_4 \\ v_5 \\ v_6 \\ v_7 \end{matrix} & \begin{bmatrix} 0 & 5 & 0 & 0 & 0 & 0 & 9 \\ 5 & 1 & 3 & 7 & 0 & 0 & 0 \\ 0 & 3 & 1 & 0 & 0 & 0 & 0 \\ 0 & 7 & 0 & 0 & 1 & 0 & 2 \\ 0 & 0 & 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 9 & 0 & 0 & 2 & 0 & 0 & 0 \end{bmatrix} \end{matrix}$$

(a) $A(G)$ is the adjacency matrix of G . Give the adjacency multi-lists graph representation of the graph. (5%)

(b) Find minimum spanning tree of the graph via Kruskal's algorithm (start from v_4). (5%)

8. Consider the tree below, show the output for each of functions:



<p>(a) Given the following:</p> <pre> void t1(TreeNode x) { if (x!=null) { printf("%c", x->key); t1(x->right); t1(x->left); printf("%c", x->key); } } </pre> <p style="text-align: right;">(5%)</p>	<p>(b) Given the following:</p> <pre> void t2(TreeNode x) { if (x!=null) { t1(x->left); t1(x->right); printf("%c", x->key); t1(x->left); } } </pre> <p style="text-align: right;">(5%)</p>
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