

國立成功大學
111學年度碩士班招生考試試題

編 號： 229

系 所： 會計學系

科 目： 資料結構

日 期： 0220

節 次： 第 3 節

備 註： 不可使用計算機

※ 考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

一、選擇題(40 分，每題 4 分)

1. There are several data structures that we can use to implement dynamic sets. In a _____, the elements deleted from the set is the one most recently inserted.
A. Queue B. Stack C. Tree D. Heap
2. Hash tables support the dictionary operations, including *insert*, *delete*, and *search*. On average, hashing require _____ time to perform a *search* operation.
A. $\Theta(1)$ B. $O(1)$ C. $O(n)$ D. $O(n)$
3. If we need to wire a house with a minimum of cable, which of the following can be used to solve this problem?
A. AVL tree B. 2-3 tree C. Minimum spanning tree D. R-tree
4. Quicksort is a divide-and-conquer recursive algorithm. Its average running time is _____.
A. $O(N)$ B. $O(N^2)$ C. $O(1)$ D. $O(N \log N)$
5. Which of the following implementations does not belong to *greed* algorithm?
A. Dijkstra's algorithm B. priority queue C. Huffman codes D. Linked list
6. Given a queue implemented with an array $Q[1..12]$. Suppose that the queue has 5 elements, 15, 6, 9, 8, 4, located in $Q[7]$, $Q[8]$, $Q[9]$, $Q[10]$, and $Q[11]$, respectively. Which is the new head of the queue Q after one performs the following operations $ENQUEUE(Q,17)$, $ENQUEUE(Q, 3)$, $ENQUEUE(Q,5)$, and $DEQUEUE(Q)$?
A. 5, B. 6 C. 12 D. 3
7. What are the minimum number of elements in a heap of height h ?
A. $2^{h+1} - 1$ B. 2^h C. 2^{h+1} D. $2^h - 1$
8. _____ can eliminate fragmentation altogether if it moves all the allocated objects to contiguous storage.
A. Automatic garbage collection B. deference C. dereference D. dangling pointer
9. A red-black tree with n internal nodes has height at most _____.
A. $n \log(n)$ B. $2 \log(n+1)$ C. $\log(n)$ D. None of the above
10. _____ is a dummy object that is widely used in linked list in order to simplify boundary conditions.
A. Sentinel B. NIL C. Head D. Tail

二、簡答題 (60 分)

1. Please write down the steps for the operation of Max-Heap-insert ($A, 10$) into the heap $A = \langle 15, 13, 9, 5, 12, 8, 7, 4, 0, 6, 2, 1 \rangle$. (10%)

2. Consider Fig. 1, answer the following questions: (15%)
 - A: What's the result of "Pre-order traversal"?
 - B: What's the result of "post-order traversal"?
 - C: What's the result of "depth-first order traversal"?

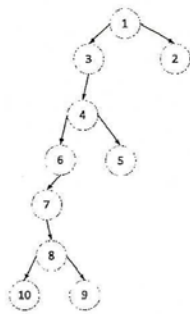


Fig. 1

3. Given input $\{89, 18, 49, 58, 69\}$, and a hash function $h(x) = X \pmod{10}$, show the hash result for each of the following: (20%)
 - A: Separate chaining hash table.
 - B: Open addressing hash table using linear probing.
 - C: Open addressing hash table using quadratic probing.
 - D: Open addressing hash table with second hash function $h_2(x) = 7 - (X \pmod{7})$.

4. Suppose we have a file that contains only the characters *a*, *e*, *i*, *s*, *t*, plus *blank spaces* and *newlines*. Suppose further, that the file has ten *a*'s, fifteen *e*'s, twelve *i*'s, three *s*'s, four *t*'s, thirteen *blanks*, and one *newline*, as Table 1 shown. Please compute the Huffman code of each character and draw the Huffman tree. (15%)

Table 1

Character	Frequency
a	10
e	15
i	12
s	3
t	4
space	13
newline	1