

# 大同大學 100 學年度轉學入學考試試題

考試科目：資料結構

所別：資訊工程學系

第 1/2 頁

註：本次考試 不可以參考自己的書籍及筆記； 不可以使用字典； 不可以使用計算器。

1. (12 points) A sequential (or linear) search algorithm can locate the position of an item in a unsorted array  $A$  with size of  $N$  according to an input key  $k$ .
  - (a) (10 points) Write a C function that can perform sequential search.
  - (b) (2 points) What is the maximum number of comparisons made in the worst case by the C function?
2. (22 points) A binary search algorithm can locate the position of an item in a sorted array  $A$  with size of  $N$  according to an input key  $k$ .
  - (a) (10 points) Write an iterative C function that can perform binary search.
  - (b) (10 points) Write a recursive C function that can perform binary search.
  - (c) (2 points) What is the maximum number of recursive calls made in the worst case by the recursive function?
3. (6 points) Both sequential search and binary search can be used to find an entry in an array of items.
  - (a) (3 points) What is the advantage the sequential search has over the binary search?
  - (b) (3 points) What is the advantage the binary search has over the sequential search?
4. (10 points) Fill in the blanks in the following C function advance\_n so that it will move an *item* forward  $n$  positions in a linear linked *list*.

```
struct node { int info; struct node *next; };  
typedef struct node *NODEPTR;
```

```
void advance_n ( NODEPTR *list, int n, int item )  
{  
    NODEPTR p = *list, q, node;  
    while ( p->info != item ) {  
        q = p;  
        p = _____;  
    }  
    q->next = _____;  
    q = p;  
    for ( int i = 0; i < n; i++ )  
        p = _____;  
    q->next = _____;  
    p->next = _____;  
}
```

5. (10 points) Draw the 11-item hash table resulting from hashing the keys  
{ 12, 44, 13, 88, 23, 94, 11, 39, 20, 16, 5 }  
using the hash function

$$h(k) = k \bmod 11$$

and assuming collisions are handled by

- (a) (5 points) chaining,
- (b) (5 points) linear probing.

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第 2/2 頁

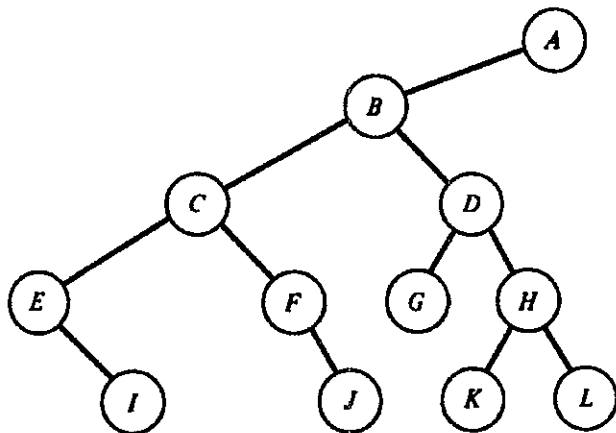
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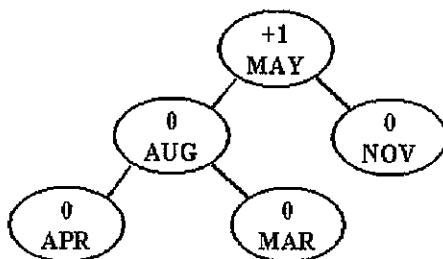
6.(15 points) Use the prefix expression, postfix expression and binary expression tree to represent the following expression.

$$\underline{A = B + C / D * (E - F)}$$

7. (15 points) List the preorder, inorder, and postorder traversal results of the following tree.



8. (10 points) An AVL tree is a balanced binary search tree that is height balanced: for each node  $x$ , the heights of the two subtrees of  $x$  differ by at most 1. After a node is inserted, the trees may need to be rebalanced to maintain height balanced. Given an AVL tree below, draw the tree after inserting node JAN and the tree after rebalancing. Note. Each node should contain the balance number.



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