

國立彰化師範大學112學年度碩士班招生考試試題

系所：數學系(選考丁)、

科目：資料結構

統計資訊研究所(選考丁)

☆☆請在答案紙上作答☆☆

共4頁，第1頁

一、(50%)請寫出下列程式碼的執行結果(共5題，每題10分)：

(1)

```
#include <stdio.h>
void swap(int *, int *);
void showResult(int, int);
int main() {
    int num1 = 5, num2 = 10;
    showResult(num1, num2);
    swap( & num1, & num2);
    showResult(num1, num2);
    return 0;
}
void swap(int * n1, int * n2) {
    int temp;
    temp = * n1;
    * n1 = * n2;
    * n2 = temp;
}
void showResult(int num1, int num2) {
    printf("%d, %d\n", num1, num2);
}
```

(2)

```
#include <stdio.h>
void insertionSort(int [], int);
void showArray(int [], int);
int main() {
    int data[] = {3, 5, 2, 4, 1};
    int size = sizeof(data) / sizeof(data[0]);
    insertionSort(data, size);
}
void insertionSort(int array[], int size) {
    for (int step = 1; step < size; step++) {
        int key = array[step];
        int j = step - 1;
        while (key < array[j] && j >= 0) {
            array[j + 1] = array[j];
        }
    }
}
```

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共4頁，第2頁

```
        --j;
    }
    array[j + 1] = key;
    showArray(array, size);
}
}

void showArray(int array[], int size) {
    for (int i = 0; i < size; i++) {
        printf("%d ", array[i]);
    }
    printf("\n");
}
```

(3)

```
#include <stdio.h>
#include <stdlib.h>
#include <time.h>
#define N 5
typedef struct node {
    int data;
    struct node * llink;
    struct node * rlink;
} TNODE;
void build_tree(TNODE ** , int);
void showArray(TNODE * );
int main() {
    int a[] = {3, 5, 2, 4, 1};
    int r, i;
    TNODE * h = NULL;
    for (i = 0; i < N; i++) {
        build_tree( & h, a[i]);
    }
    showArray(h);
    return 0;
}

void build_tree(TNODE ** h, int data) {
    TNODE * p;
    if ((* h) == NULL) {
```

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共4頁，第3頁

```
    p = malloc(sizeof(TNODE));
    p -> data = data;
    p -> llink = NULL;
    p -> rlink = NULL;
    * h = p;
} else {
    if (data <= ( * h) -> data) {
        build_tree( & (( * h) -> llink), data);
    } else {
        build_tree( & (( * h) -> rlink), data);
    };
};
}
void showArray(TNODE * p) {
    if (p != NULL) {
        showArray(p -> llink);
        showArray(p -> rlink);
        printf("%4d", p -> data);
    }
}
```

```
(4)
#include <stdio.h>
int showResult(int);
int main() {
    int n = 5;
    printf("%d\n", showResult(n));
    return 0;
}
int showResult(int n) {
    if (n != 0)
        return n + showResult(n - 1);
    else
        return n;
}
```

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共4頁，第4頁

(5)

```
#include <stdio.h>
int main() {
    int a = 12345, b = 0, r;
    while (a != 0) {
        r = a % 10;
        b = b * 10 + r;
        a /= 10;
    }
    printf("%d\n", b);
    return 0;
}
```

二、(10%) Please order the following time complexity from the best to the worst, suppose n is sufficiently large.

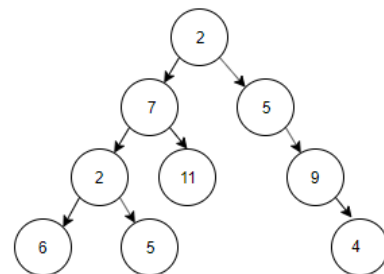
$O(1)$; $O(n \log n)$; $O(n^3)$; $O(2^n)$; $O(n!)$

三、(10%) Which data structure is suitable to represent a sparse polynomials such as $A(X) = 2X^{1000} + 1$? You must write the programming codes (in C, C++, or java) of your data structure and briefly explain it. You can also use some illustrations to help me understanding your answers.

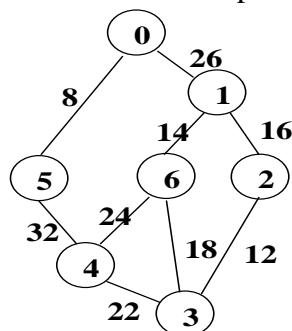
四、Please write the traversal result of the right binary tree.

(a) pre-order; (5%)

(b) breadth-first search. (5%)



五、(10%) Find the minimum-cost spanning tree of the following graph by using Kruskal's algorithm. (PS. You have to write the immediate step or briefly describe your answers)



Given the right graph, please write its

(a) adjacency matrix (5%);

(b) adjacency lists (5%).

