

國立彰化師範大學114學年度碩士班招生考試試題

系所： 數學系(選考丁)、
統計資訊研究所(選考丁)

科目： 資料結構

☆☆請在答案紙上作答☆☆

共5頁，第1頁

一、(50%) Write the output of the execution of the following programs:

(1)

```
#include <stdio.h>
void gcd(int, int);
int main() {
    int a = 101, b = 84;
    gcd(a, b);
    return 0;
}
void gcd(int a, int b) {
    int q = ((a < b) ? a : b);
    int p = ((a > b) ? a : b);
    if (p % q == 0) {
        printf("%d\n", q);
        return;
    } else {
        printf("%d %d\n", p, q);
        return gcd(q, p % q);
    }
}
```

(2)

```
#include <stdio.h>
void printArray(int [], int);
void arraySort(int [], int);
int main() {
    int data[] = {2, 5, 1, 4, 3};
    int size = sizeof(data) / sizeof(data[0]);
    arraySort(data, size);

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

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共5頁，第2頁

```
}  
void arraySort(int array[], int size) {  
    for (int step = 1; step < size; step++) {  
        int key = array[step];  
        int j = step - 1;  
        while (j >= 0 && key < array[j]) {  
            array[j + 1] = array[j];  
            --j;  
        }  
        array[j + 1] = key;  
        printArray(array, size);  
    }  
}
```

(3)

```
#include <stdio.h>  
int main() {  
    int n = 1;  
    while (n <= 10) {  
        if (n % 2 == 0) {  
            n++;  
            continue;  
        }  
        printf("%2d ", n);  
        n++;  
    }  
    return 0;  
}
```

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共5頁，第3頁

(4)

```
#include <stdio.h>

int main() {
    int low = 20, high = 40, i, flag;
    while (low < high) {
        flag = 0;
        for (i = 2; i <= low / 2; ++i) {
            if (low % i == 0) {
                flag = 1;
                break;
            }
        }
        if (flag == 0)
            printf("%d ", low);
        ++low;
    }
    return 0;
}
```

(5)

```
#include<stdio.h>

int main() {
    int a, b, c;
    int arr[5] = {1, 3, 5, 7, 9};
    a = ++arr[1];
    b = arr[1]++;
    c = arr[a++];
    printf("%d %d %d", a, b, c);
    return 0;
}
```

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共5頁，第4頁

二、A task network diagram and the Critical Path Method (CPM) are commonly employed to schedule software development projects. Suppose a particular software project is expected to begin on January 1, 2025, with no holidays or interruptions. Day 1 is counted as the start of work. The table below provides relevant task information for executing this project (e.g., task durations, and precedence relationships).

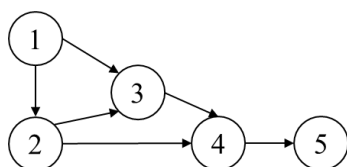
Please answer the following:

- (1) Construct the task network diagram for this project. (5%)
- (2) Specify the critical path for this project. (5%)

Task	Duration	Required Preceding Tasks
A	9	None
B	5	None
C	7	A
D	2	A
E	5	C,D
F	7	B
G	2	E, F

三、Given the Directed graph, please write its:

- (1) adjacency matrix (5%)
- (2) adjacency lists (5%)



四、Given the expression: $a + (z + f) / y$, please answer the following:

- (1) Construct the corresponding binary expression tree according to standard operator precedence. (4%)
- (2) List the Preorder traversal of the resulting binary tree. (3%)
- (3) List the Breadth-first search (BFS) traversal of the resulting binary tree. (3%)

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共5頁，第5頁

五、Consider a directed graph represented by the matrix shown below, where each entry of the matrix indicates the length (weight) of the corresponding edge. Based on this matrix, determine the shortest path and distances of the shortest path from vertex A to each of the vertices B, C, D, and E, respectively. (10%)

A	B	C	D	E
0	5	3	10	1
∞	0	∞	∞	∞
∞	2	0	5	∞
∞	2	∞	0	∞
∞	∞	∞	1	0

六、The calculation formula for the Binomial Coefficient is given as follows:

$$\binom{n}{m} = \frac{n!}{m!(n-m)!} = \binom{n-1}{m} + \binom{n-1}{m-1}$$
$$Bino(n, m) = \begin{cases} 1, & \text{if } m = 0 \text{ or } m = n \\ Bino(n-1, m) + Bino(n-1, m-1); & \text{otherwise} \end{cases}$$

- (1) Find the value of Bino(5, 3) (5%)
- (2) When computing Bino(5, 3), how many times in total is the function Bino called? (5%)