

DEPARTMENT OF COMPUTER ENGINEERING
CMPE101: Foundation of Computer Engineering
EXPERIMENT 3

Introduction to C Programming: Sequential code structure

Objectives:

- 1) Understand how to edit, compile and execute C computer codes.
- 2) Understand C programming: sequential code structure.

Note: Before writing a computer code, you should do the following steps: 1) **understand** and **analyze** the problem, 2) develop an **algorithm** and/or **flowchart** and 3) convert the **algorithm** and/or the **flowchart** into a C **code**.

Task I: Tracing section

A/ The following code displays the number of bytes used to store different data types. **Edit, compile, and execute the C-code.**

Record the results. sizeof(datatype) returns the size of a datatype.

```
#include <stdio.h>
int main(void) {
    printf("the size of char is %d bytes\n", sizeof(char));
    printf("the size of short is %d bytes\n", sizeof(short));
    printf("the size of int is %d bytes\n", sizeof(int));
    printf("the size of long is %d bytes\n", sizeof(long));
    printf("the size of float is %d bytes\n", sizeof(float));
    printf("the size of double is %d bytes\n", sizeof(double));
    printf("the size of long double is %d bytes\n", sizeof(long double));
    return 0;}

```

B/ Edit the following code segments in a form of C-program and investigate the output.

```
1) int    x, y, z;
float    a;
x = 9 * 0.5;
a = 9 * 0.5;
y = 15 % 15;
z = 15 % 2;
printf("x=%d, a=%f, y=%d, z=%d\n", x, a, y, z)

```

```
2) #define    PI 3.14159
int    x, y, z;
float    a, b;
x = 5;
y = 10;
z = x + (4 * y * y * y) + PI;
a = x + (4 * y * y * y) + PI;
b = (x / y) + a;
printf("x=%d, y=%d, z=%d\na=%7.2f, b=%f\n", x, y, z, a, b);

```

```

3) int x = 20, y;
y = x++;
printf("x=%d, y=%d\n", x, y);

4) int x = 20, y;
y = ++x;
printf("x=%d, y=%d\n", x, y);

5) int x, y, z;
x = 5;
y = 10;
z = x++ * y - 2;
z += ++x;
printf("x=%d, y=%d, z=%d\n", x, y, z);

6) float x = 1.0, y;
int z = 2;
y = x + z;

7) int w, z, q;
float x = 4.0, y;
y = sqrt(x);
w = y;
z = x - w;
q = sqrt(3);
printf("y=%f, w=%d, z=%d, q=%d", y, w, z, q);

8) int a=9, b=4;
float c, d;
c = a/b;
d = (float)a / (float)b;
printf("c=%.2f, d=%.2f", c, d);

9) int i = 5;
float j = 314.15;
char cr = '$';
printf("%5i", i);
printf("%6.1f", j);
printf("%f", j);
printf("%.1e", j);
printf("%10.2e", j);
printf("%c", cr);

10) int x, a = 5;
x = a++;
printf("x=%d\n a=%d\n", x, a);

11) int x, a = 5;

```

```
x = ++a;
printf("x=%d\n a=%d\n", x, a);
```

```
12) int x, a = 5, b = 10;
x = a++ + b++;
printf("x=%d\n a=%d\n b=%d\n", x, a, b);
```

```
13) int x, a = 5, b = 10;
x = ++a + ++b;
printf("x=%d, \n a=%d\n b=%d\n", x, a, b);
```

```
14) int x, a = 5, b = 10;
x = a++ + --b;
printf("x=%d, \n a=%d\n b=%d\n", x, a, b);
```

```
15) int a = 3, b = 5;
a += b;
printf("a=%d\n b=%d\n", a, b);
```

```
16) int a = 3, b = 5;
a += b++;
printf("a=%d\n b=%d\n", a, b);
```

```
17) int a = 3, b = 5;
a *= b - (b / 2);
printf("a=%d\n b=%d\n", a, b);
```

```
18) int a=3, b=5, c=4;
a += b -= --c * 2;
printf("a=%d, \n b=%d \n c=%d\n", a, b, c);
```

```
19) float x = 4;
x += 2 / 3;
printf("x=%lf\n", x);
```

```
20) float x = 4;
x += 2.0 / 3;
printf("x=%f\n", x);
```

```
21) float x = 4;
x += (float)2 / 3;
printf("x=%f\n", x);
```

```
22) int a = 5, b = 8;
a = b;
b = a;
printf("a=%d\n b=%d\n", a, b);
```

```
23) int a = 5, b = 8, temp;
```

```
temp = a;
a = b;
b = temp;
printf("a=%d\n b=%d\n", a, b);
```

24) what is the result of

35 / 8 % 3

35 / (8 % 3)

3 + 2 * (12 - 4 * 11 % 6 * 4 / 3)

25) Write the following mathematical expression in computer form using C programming language:

$$F = \frac{A+B\sqrt{X}}{C+D.Y^4}$$

Task II: Programming tasks

1) Consider the following code that computes and prints the area of a circle with the radius r . The area of the circle is computed by:

$$area = \pi r^2$$

```
#include<stdio,h>
#include<math.h>
#define PI 22.0/7.0
int main(){

double radius,area;

printf("Enter the radius of a circle: ");
scanf("%lf",&radius);
area=pi*pow(radius,2);
printf("The area of the circle=%lf",area);

return 0;}
```

a) Edit, compile and execute this code. Use the following input values for the radius r : 4

b) Modify the given code to read the radius of a sphere and then compute and print the sphere volume. Note: The volume of a sphere of radius r is computed as:

$$volume = \frac{4}{3} \pi r^3$$

A sample run of the program must be as follows:

```
*** PROGRAM TO CALCULATE THE VOLUME OF A SPHERE ***
```

```
Enter the radius of the sphere: 2.0
```

```
The volume of the sphere is 33.5.
```

2) To calculate the total points of a student in CMPE110 course according to his midterm, lab, and final grades, the following weights are used:

Midterm 40%,
Final 50%,
Lab 10%.

Write a C code that reads the student's midterm, final and lab grades and then computes and prints on the computer monitor his total points.

A sample run of the program must be as follows:

```
*** Program to calculate the total points in CMPE110 course ***
```

```
Enter your grades in final, midterm, and quiz? 70 85 80  
Your total point is 77.0
```

3) Consider the problem of converting an amount of money in US dollars to Turkish Liras (TL). Assuming that the exchange rate is given by: 1 US dollar equals 1.8 TL, write down a C code that will read the amount of dollars and convert it to Turkish lira.

A sample run of the program must be as follows:

```
*** Program to convert money in $ to TL ***
```

```
Exchange Rate 1$= 1.8 TL
```

```
Enter the amount in US dollars: 100  
The equivalent amount in Turkish Liras is : 180.0
```

4/ Write a program that reads the radius of the circle inscribed inside the square and based on that it will print the values of red and yellow areas respectively. Print the values with 2 digits after decimal point. Define the value of π (3.1416) as a constant. A sample run of your program gives the following:

```
Enter the value of the radius: 1.578  
The yellow area is 2.14  
The red area is 7.82
```

