Lab 1 – Basic C Programming and Control Flow

Lab session – One hour is allocated for this lab session. There are 4 questions. The first two questions are lab questions. The last two questions are practice questions for you to try if you have extra time in the lab.

Note: You do not need to submit your code for this lab.

Lab Questions

1. Write a C program that prints the ID and grade of each student in a class. The input contains the student IDs and their marks. The range of the marks is from 0 to 100. The relationships of the marks and grades are given below:

Grade	Mark
A	100-75
B	74-65
C	64-55
D	54-45
F	44-0

Use the sentinel value –1 for student ID to indicate the end of user input.

Write the program using the switch statement.

A sample program template is given below.

```c
#include <stdio.h>
int main()
{
    /* Write your code here */

    return 0;
}
```

The code using the if-else if-else statement is given below for your reference:

```c
#include <stdio.h>
int main()
{
    int studentNumber = 0, mark;

    printf("Enter Student ID: \n");
    scanf("%d", &studentNumber);
    while (studentNumber != -1)
    {
        printf("Enter Mark: ");
        scanf("%d", &mark);
        if (mark >= 75)
            printf("Grade = A\n");
        else if (mark >= 65)
            printf("Grade = B\n");
```

```c
        else if (mark >= 55)
            printf("Grade = C\n");
        else if (mark >= 45)
            printf("Grade = D\n");
        else
            printf("Grade = F\n");
        printf("Enter Student ID: ");
        scanf("%d", &studentNumber);
    }
    return 0;
}
```

Sample input and output sessions are given below:

(1) Test Case 1:
     Enter Student ID:
     11
     Enter Mark:
     56
     Grade = C
     Enter Student ID:
     21
     Enter Mark:
     89
     Grade = A
     Enter Student ID:
     31
     Enter Mark:
     34
     Grade = F
     Enter Student ID:
     -1

(2) Test Case 2:
     Enter Student ID:
     11
     Enter Mark:
     75
     Grade = A
     Enter Student ID:
     21
     Enter Mark:
     65
     Grade = B
     Enter Student ID:
     31
     Enter Mark:
     55
     Grade = C
     Enter Student ID:
     32
     Enter Mark:

45
Grade = D
Enter Student ID:
-1

(3) Test Case 2:
Enter Student ID:
-1

2. Write a C program that reads in several lines of non-negative integer numbers, computes the average for each line and prints out the average. The value −1 in each line of user input is used to indicate the end of input for that line.

A sample program template is given below.

```c
#include <stdio.h>
int main()
{

    /* Write your code here */

    return 0;
}
```

Sample input and output sessions are given below:

(1) Test Case 1:
Enter number of lines:
1
Enter line 1 (end with -1):
1 2 3 4 -1
Average = 2.50

(2) Test Case 2:
Enter number of lines:
2
Enter line 1 (end with -1):
2 4 6 8 -1
Average = 5.00
Enter line 2 (end with -1):
1 3 5 7 9 -1
Average = 5.00

(3) Test Case 3:
Enter number of lines:
3
Enter line 1 (end with -1):
2 4 6 8 -1
Average = 5.00
Enter line 2 (end with -1):

Average = 5.00
Enter line 3 (end with -1):
Average = 6.00

Practice Questions

3. Write a C program that accepts a positive number *height* between 1 and 10 as its parameter value, and prints a triangular pattern according to *height*. Note that only 1, 2 and 3 are used to generate the patterns. A sample input and output session when the program is called is given below. For example, if height is 3, then the program will print the following pattern:

```
1
22
333
```

If height is 7, then the program will print the following pattern:

```
1
22
333
1111
22222
333333
1111111
```

A sample program template is given below.

```c
#include <stdio.h>
int main()
{
   /* Write your code here */

   return 0;
}
```

Sample input and output sessions are given below:

(1) Test Case 1:
Enter the height:
3
Pattern:
1
22
333

(2) Test Case 2:
Enter the height:
7

Pattern:
```
1
22
333
1111
22222
333333
1111111
```

4. Write a C program that computes the value of e^x according to the following formula:

$$e^x = 1 + \frac{x}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} + \ldots\ldots + \frac{x^{10}}{10!}$$

A sample program template is given below.

```c
#include <stdio.h>
int main()
{

    /* Write your code here */

    return 0;
}
```

Sample input and output sessions are given below:

(1) Test Case 1:
Enter x:
0.9
Result = 2.46

(2) Test Case 2:
Enter x:
0
Result = 1.00

(3) Test Case 3:
Enter x:
-0.9
Result = 0.41