Practical Work No. 3
Conditional structures

Objective :

- Recall the conditional structures
- Present the syntaxes offered by the C language allowing the manipulation of conditional structures.

I. The alternative structure in C

I.1 The if else structure

Syntax

```
if ( expression ){
…… ;        /*instruction block*
}
else{
…… ;        /*instruction block*/
}
```

In the case where no treatment is invoked if the logical expression is false, the conditional structure becomes:

```
if ( expression ){
…… ;        /*instruction block*
}
```

Remarks

- ✓ The {} are not necessary when the blocks have only one statement.
- ✓ The C language has a somewhat exotic pair of operators that can be used as an alternative to if - else and which has the advantage of being able to be integrated into an expression:

The conditional operator (? :)

Syntax:

expr1 ? expr2 : expr3

If expr1 provides a non-zero value, then the value of expr2 is provided as the result, otherwise the value of expr3 is provided as the result.

Example:

```
if (A>B)
    MAX=A;
else
    MAX=B;
```

⟺ **MAX = (A > B) ? A : B;**

I.2 The Switch structure: Multiple election instructions

Syntax:

```
switch(<var>){
        case With_st1: instr_1; break;
        case  With_st2: inst_2; break;
              .................
        case With_stn: instr_n; break;
        default: instr_nn ;
 }
```

- <var> is a variable of type int or char.
- '**default**' (the translation of 'otherwise') is optional.
- With_sti is a case reference that represents one of the allowed values of the variable <var> (if <var> is of integer type then case references must be integer values).
- instr_i can be simple or compound.
- Empty statements are also allowed to indicate that no processing is to be performed in this case.
- The switch statement takes the value of <var> and compares it to each of the case labels. Once it finds a matching one, the following statements are executed either until a break statement is encountered or until the end of the body of the switch statement.
- It is important to remember to use the break statement whenever a given case is completed, otherwise the following statements would be executed (until the next break).

Examples:

Assuming that choice is a character variable, a typical switch statement is:

```
switch(choice) {
        case'R': printf("Red"); break;
        case'B':printf("Blue"); break;
        case'y': printf("Yellow"); break;
}
```

Assuming that day is an integer variable, a typical switch statement is:

```
switch(day) {
        case 0: case 1: case 2: case 3: case 4:printf("At work!"); break;
        case5: printf ("Today is Saturday"); break;
        case6: printf ("Rest");
}
```

In this switch statement, the values 0 to 4 all lead to the execution of the same printf statement, then the break statement exits from switch. But if day is 5, the printf statement is executed followed by the printf("Rest") statement; if day is 6, only the last printf statement is executed.

II. Work requested

Exercise 1:

Write a program that reads three integer values (A, B, and C) from the keyboard and displays the largest of the three values, using:

a) if – else and a MAX helper variable

b) if - else if - ... – else without help variable

c) conditional operators and a helper variable MAX

d) conditional operators without helper variable

Exercise 2:

Write a C program that reads the sides of a triangle from the keyboard and then displays the nature of the triangle (rectangle, isosceles, equilateral or any)

Exercise 3:

Write a program that reads two integer values (A and B) from the keyboard and displays the sign of the product of A and B without doing the multiplication operation.

Exercise 4:

Write a program that reads two integer values (A and B) from the keyboard and displays the sign of the sum of A and B without doing the addition operation.

Exercise 5:

Write a C program that reads a date in the form of *day number*, *month number*, and *year*. Then, display the date with the name of the month.

Exercise 6:

Write a C algorithm that allows the user to enter a rainbow color number and displays the corresponding color:

1: red, 2: orange, 3: yellow, 4: green, 5: blue, 6: indigo, and 7: violet.

Exercise 7:

We want to computerize the invoicing of an ordered quantity of an item. We will provide the ordered quantity Q and the unit price PU as data. The VAT rate will always be 18%. A discount is established based on the amount including all taxes according to the following table:

Amount including tax (MTTC) in dinars	Discount
MTTC < 1000	10% of MTTC
1000 <= MTTC < 5000	15% of MTTC
5000 <= MTTC < 10000	20% of MTTC
MTTC >=10000	30% of MTTC

Write a C program that takes the ordered quantity and unit price and displays the invoice According to the following model:

Example:

Give the quantity ordered: 20

Give the unit price: 715

Amount excluding tax: 14,300,000 Dinars

VAT amount: 2574,000 Dinars

Amount including tax: 16,874,000 Dinars

Discount: 5062,000 Dinars

Net to pay: 11,811,800 Dinars

Exercise 8:

Write a C program that calculates the real solutions of a quadratic equation $ax^2+bx+c = 0$ by discussing the formula:

$$x_{1,2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Use a helper variable D for the value of the discriminant b^2-4ac and decide with the help of D whether the equation has one, two, or no real solutions.

Also consider cases where the user enters null values :

- for only a;
- for a and b;
- for a, b, and c.

Display the results and necessary messages on the screen.