CL1002 – Programming Fundamentals Lab

Lab # 08

Conditional Structures

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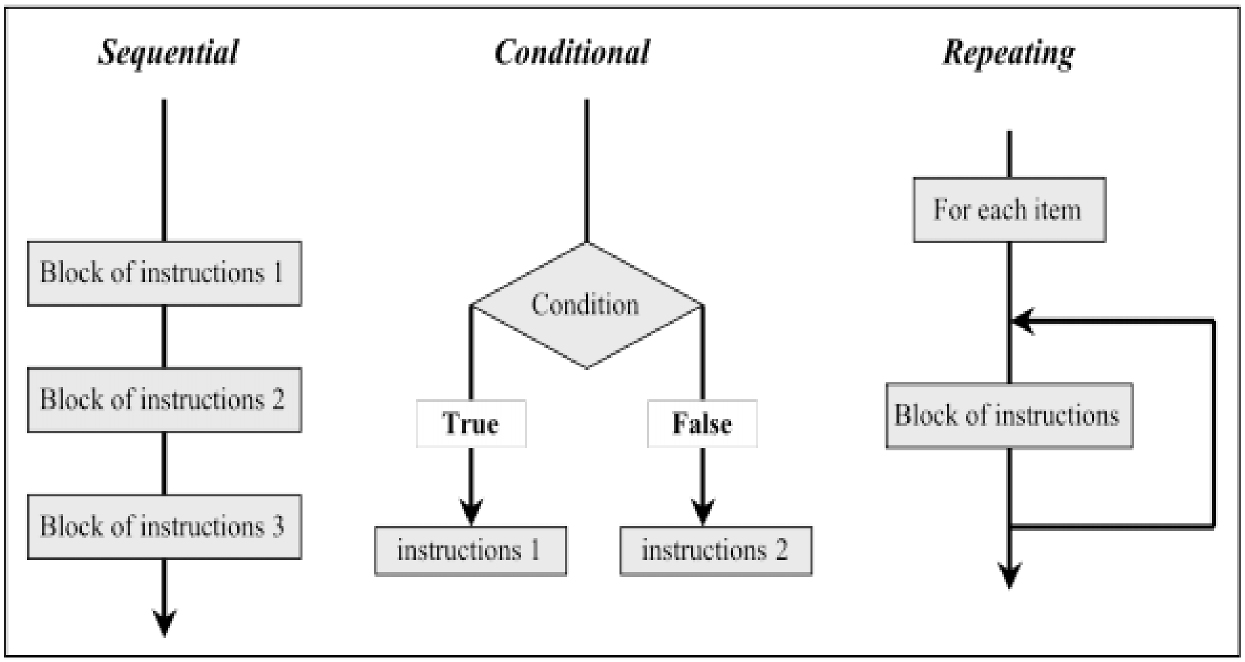
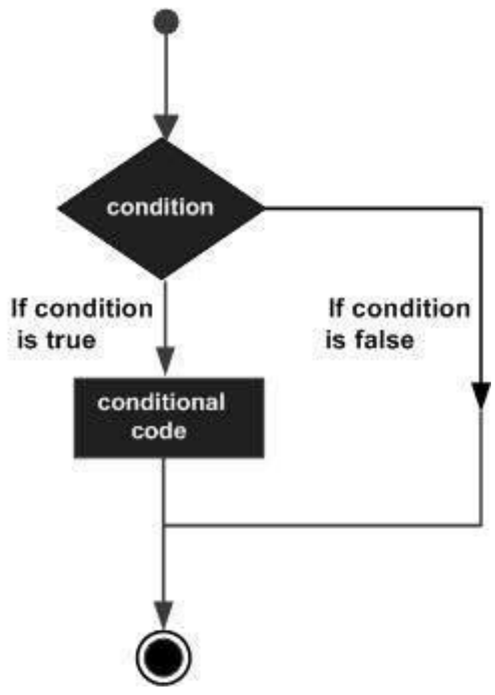
Control Structures

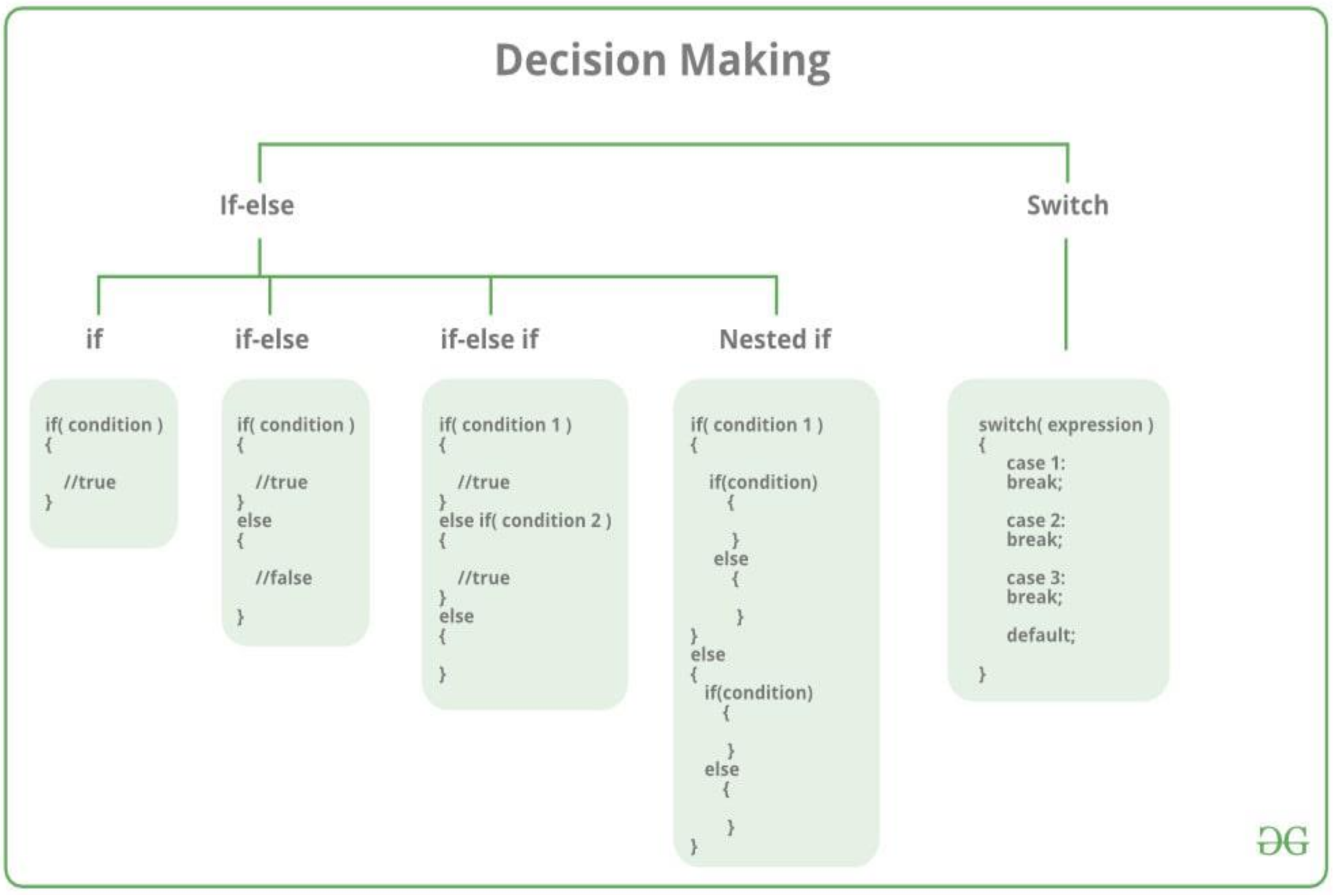
Algorithms require two important control structures: iteration(repeating) and selection(conditional). Both are supported by C in various forms. The programmer can choose the statement that is most useful for the given circumstance.



Selection Statements / Decision Making

They come to situations in real life when we need to make some decisions and based on these decisions, we decide what we should do next. Similar situations arise in programming also where we need to make some decisions and based on these decisions, we will execute the next block of code.
For example, in C if x occurs then execute y else execute z. There can also be multiple conditions like in C if x occurs then execute p, else if condition y occurs execute q, else execute r. This condition of C else-if is one of the many ways of importing multiple conditions.
Decision making is the most important aspect of almost all the programming languages. As the name implies, decision making allows us to run a particular block of code for a particular decision. Here, the decisions are made on the validity of the conditions. Condition checking is the backbone of decision making.
Following is the general form of a typical decision-making structure found in most of the programming languages.





```
if( condition )
{
    //true
}
```

```
if( condition )
{
    //true
}
else
{
    //false
}
```

```
if( condition 1 )
{
    //true
}
else if( condition 2 )
{
    //true
}
else
{

}
```

```
if( condition 1 )
{
   if(condition)
     {

     }
    else
     {

     }
}
else
{
  if(condition)
    {

    }
  else
    {

    }
}
```

```
switch( expression )
{
     case 1:
     break;

     case 2:
     break;

     case 3:
     break;

     default;
}
```

C if else Statement

The if-else statement in C is used to perform the operations based on some specific condition. The operations specified in if block is executed if and only if the given condition is true.

There are the following variants of if statement in C language.

- If statement
- If-else statement
- If else-if ladder
- Nested if

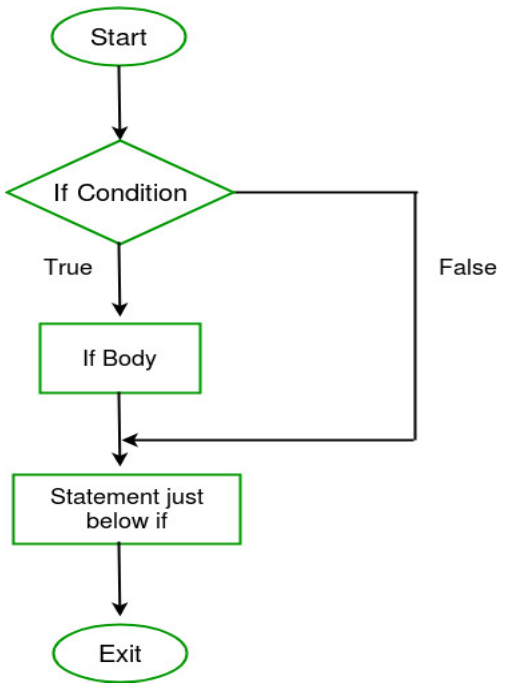
1. If Statement in C/C++ (One-Way Decision)

if statement is the simplest decision-making statement. It is used to decide whether a certain statement or block of statements will be executed or not i.e., if a certain condition is true then a block of statement is executed otherwise not.

Syntax:

```
if(condition)
{
  // Statements to execute if
  // condition is true
}
```

Flowchart of if statement in C



Example 1

```
// C program to illustrate If statement
#include <stdio.h>
 int main()
{
   int i = -10;
    if (i > 0) {
       printf("i is positive ");
   }
    printf("I am Not in if");
}
```

Output

```
I am Not in if
```

As the condition present in the if statement is false. So, the block below the if statement is not executed.

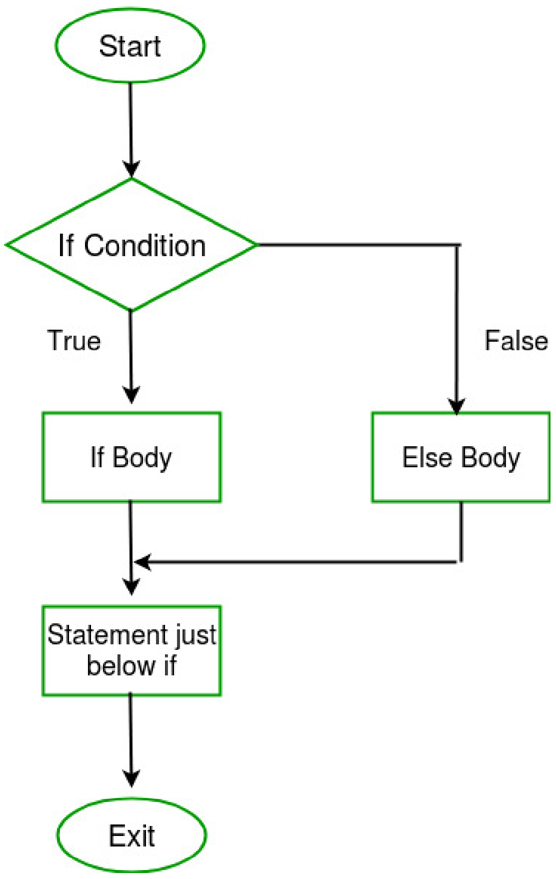
2. if-else in C/C++ (Two-Way Decision)

The if statement alone tells us that if a condition is true, it will execute a block of statements and if the condition is false it won't. But what if we want to do something else if the condition is false. Here comes the C else statement. We can use the else statement with the if statement to execute a block of code when the condition is false.

Syntax:

```
if (condition)
{
   // Executes this block if
   // condition is true
}
else
{
   // Executes this block if
   // condition is false
}
```

Flowchart:



Example 2

```
// C program to illustrate If statement
#include <stdio.h>

int main()
{
   int i = 20;

   if (i >= 0) {

       printf("i is positive or zero");
   }
   else {

       printf("i is negative");
```

```
    }
    return 0;
}
```

Output

```
i is positive or zero
```

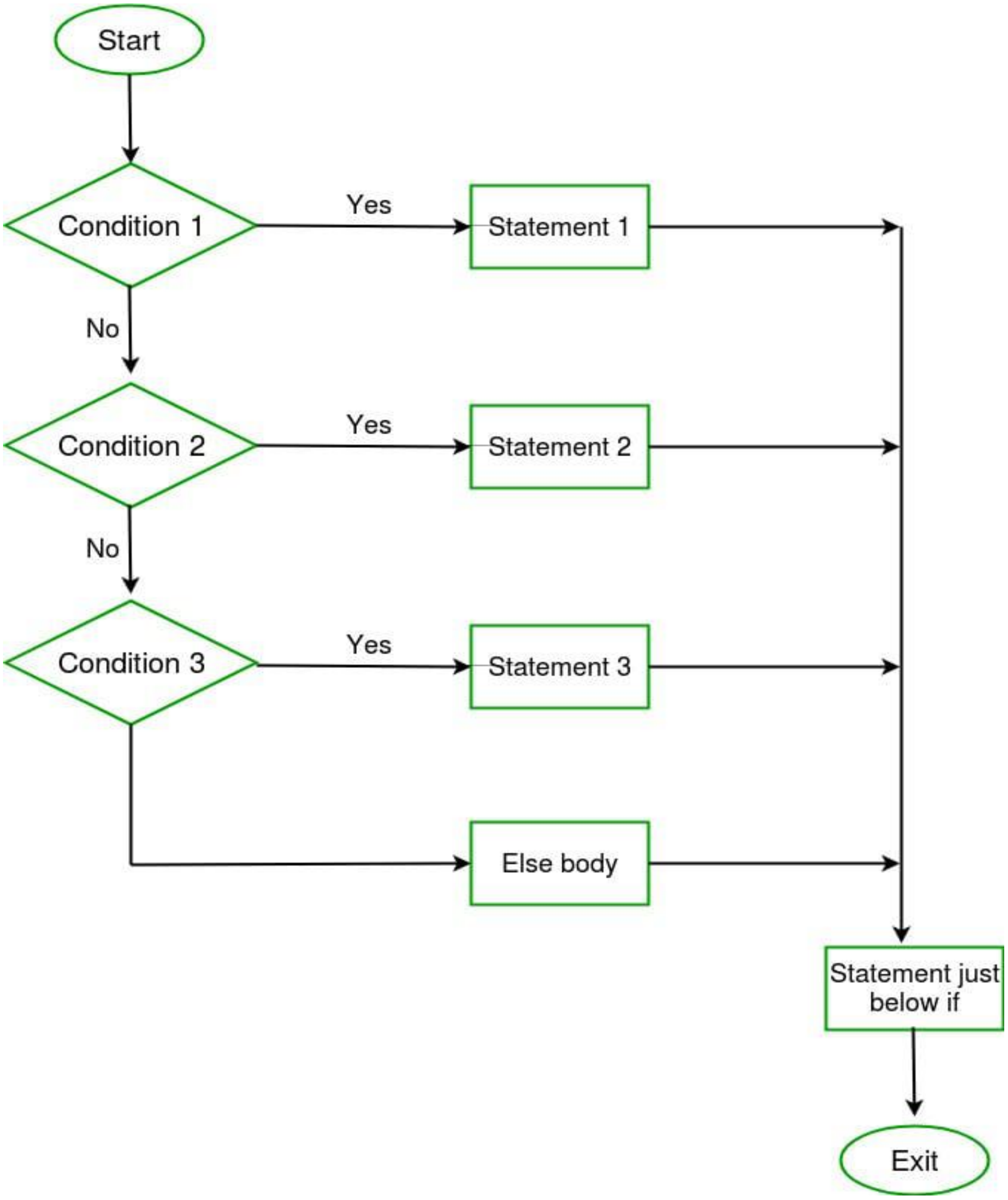
The block of code following the else statement is executed as the condition present in the if statement is false.

3. if-else-if ladder in C/C++ (Multi Way Decisions)

Here, a user can decide among multiple options. The C if statements are executed from the top down. As soon as one of the conditions controlling the if is true, the statement associated with that if is executed, and the rest of the C else-if ladder is bypassed. If none of the conditions is true, then the final else statement will be executed.

Syntax:

```
if (condition)

   statement;

else if (condition)

   statement;

.

.

else

   statement;
```


Start
Condition 1
Yes
Statement 1
No
Condition 2
Yes
Statement 2
No
Condition 3
Yes
Statement 3
Else body
Statement just below if
Exit

Example 3:

```
// C program to illustrate If elseif statement
#include <stdio.h>
int main()
{
   int i = -10;
   if (i > 10){
       printf("i is Positive");
   }
   else if (i == 0){
       printf("i is zero");}
   else{
       printf("i is negative");}
}
```

Output

```
i is negative
```

C Logical Operators

An expression containing logical operator returns either 0 or 1 depending upon whether expression results true or false. Logical operators are commonly used in decision making in C programming.

Operator	Meaning	Example
&&	Logical AND. True only if all operands are true	If c = 5 and d = 2 then, expression `((c==5) && (d>5))` equals to 0.
||	Logical OR. True only if either one operand is true	If c = 5 and d = 2 then, expression `((c==5) || (d>5))` equals to 1.
!	Logical NOT. True only if the operand is 0	If c = 5 then, expression `!(c==5)` equals to 0.

Example 4

```c
// program that grant access to children aged between 8 - 12
#include <stdio.h>
int main()
{
   int age = 18;

   if(age>=8 && age<=12){
       printf("You are allowed Welcome!\n");
   }
   else{
       printf("Sorry! You are not allowed. Bye !\n");

   }
   return 0;
}
```

Output

```
Sorry! You are not allowed. Bye !
```

Example 5

```c
#include <stdio.h>
int main()
{
   int a = 5,b=-3;

   if(a>0 || b>0){
       printf("Either of the number is greater than 0\n");
   }
   else{
       printf("No number is greater than 0\n");

   }

   return 0;
}
```

Output

```
Either of the number is greater than 0
```

Switch Statement

In C programming, the switch statement is a control flow statement that allows you to perform different actions based on the value of a variable or an expression. It is often used as an alternative to a series of if-else statements when you need to make decisions based on a single value. The basic syntax of a switch statement is as follows:

```
switch (expression) {
    case value1:
        // Code to execute if expression equals value1
        break;
    case value2:
        // Code to execute if expression equals value2
        break;
    // More case statements as needed
    default:
        // Code to execute if none of the case values match expression
}
```

If the value of the expression matches one of the case labels, the corresponding block of code is executed. After the code for a case is executed, you should use the **break** statement to exit the switch block; otherwise, the program will continue executing the code for subsequent case labels.

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

    printf("Enter a number between 1 and 3: ");
    scanf("%d", &choice);

    switch (choice) {
        case 1:
            printf("You entered 1.\n");
            break;
        case 2:
            printf("You entered 2.\n");
            break;
        case 3:
            printf("You entered 3.\n");
            break;
        default:
            printf("Invalid choice.\n");
    }

    return 0;
}
```

References:

https://www.geeksforgeeks.org/decision-making-c-cpp/

https://www.javatpoint.com/c-if-else