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CHAPTER – 6

CONTROL STRUCTURES

1. **Define Control Structure or Control Statement**
   - ⌦ A program statement that causes a jump of control from one part of the program to another is called **control structure** or **control statement.**
   - ⌦ Control statements are compound statements used to alter the control flow of the process or program depending on the state of the process.

2. **What is the use of Control Structure?**
   - ⌦ Programs consist of statements which are executed in sequence, to alter the flow we use control statements.

3. **What are the types of Control Structure?**
   - ⌦ There are **3** types of Control Structures or Statements. They are
   - ⌦ **Sequential** – Statements are executed one after another.
   - ⌦ **Alternative or Branching** – Skip a statement or set of statements and execute another segment based on condition.
   - ⌦ **Iteration or Looping** – Executes a set of statement for multiple times.

4. **Define Sequential Statement**
   - ⌦ A **Sequential statement** is composed of a sequence of statements which are executed one after another.
   - ⌦ A code to print your name, address and phone number is an example of sequential statement.
   - ⌦ **Eg:**

```
print ("Hello! This is Shyam")
print ("22, Alagappan Street, Kumbakonam, 9677066334")
```

5. **What is Branching Statement or Alternative Statement?**
   - ⌦ In our day-to-day life we need to take various decisions and choose an alternate path to achieve our goal.
   - ⌦ May be we would have taken an alternate route to reach our destination when we find the usual road by which we travel is blocked.
   - ⌦ The Statements are executed based on the condition.

- This type of decision making is what we are to learn through **Alternative or Branching Statement.**

6. What are the types of Alternative or Branching Statements?

- There are **3** types of Alternative or Branching Statements namely,
- **Simple if** – Simplest of all decision making statements.
- **If – Else** – To check the true block as well as the false block.
- **If…elif Statement** – Construct a chain of **if** statement

7. Define Simple If Statement and Write the Syntax?

- **Simple** if is the simplest of all decision making statements. Condition should be in the form of relational or logical expression.
- **Syntax:**

```
if <condition>:
    statements-block1
```

- **Eg:**

```
x=int (input("Enter your age :"))
    if x>=18:
            print ("You are eligible for voting")
```

8. Define If – Else Statement and Write the Syntax?

- **If else** statement provides control to check the true block as well as the false block.
- **If else** statement provides two possibilities and the condition determines which block is to be executed.
- **Syntax:**

```
if <condition>:
    statements-block 1
else:
    statements-block 2
```

- **Eg:**

```
a = int(input("Enter any number :"))
if a%2==0:
    print (a, " is an even number")
else:
        print (a, " is an odd number")
```

9. What is the alternate method to write the syntax for if-else?

⌦ **Syntax:**

```
variable = variable1 if condition else variable 2
```

⌦ **Eg:**

```
a = int (input("Enter any number :"))
x="even" if a%2==0 else "odd"
print (a, " is ",x)
```

⌦ **Output:**

```
Enter any number : 3
3 is odd
```

10. Define Nested If..elif…else Statement

⌦ When we need to construct a chain of **if** statement(s) then **'elif'** clause can be used instead of **'else'.**

⌦ **Syntax:**

```
if <condition-1>:
    statements-block 1
elif <condition-2>:
    statements-block 2
else:
    statements-block n
```

⌦ In the syntax of **if..elif..else** mentioned above, condition-1 is tested if it is true then statements-block1 is executed, otherwise the control checks condition-2, if it is true statements-block2 is executed and even if it fails statements-block n mentioned in **else** part is executed.

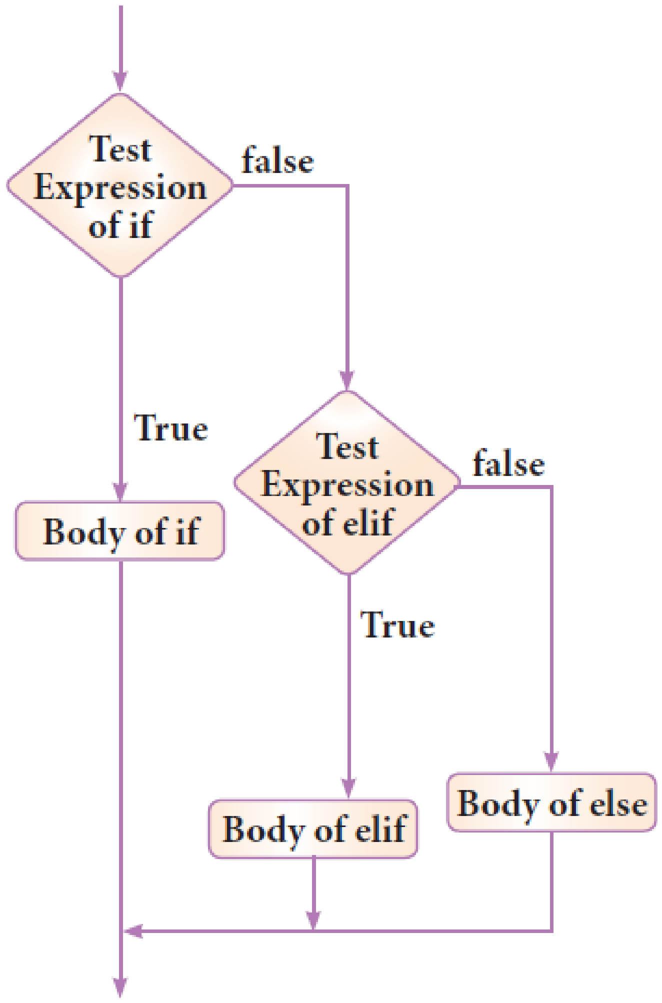
11. Write the Syntax and Draw the Flowchart for Nested If..elif…else Statement?

⌦ **SYNTAX:**

```
if <condition-1>:
    statements-block 1
elif <condition-2>:
    statements-block 2
else:
```

statements-block n

⌧ **FLOWCHART:**



12. What is Iteration Statements or Looping Statements?

⌧ Iteration or loop are used in situation when the user need to execute a block of code several of times or till the condition is satisfied.

⌧ A **loop** statement allows executing a statement or group of statements multiple times.

⌧ There are 2 types of Looping namely,

- ☯ While Loop, &
- ☯ For Loop.

13. Define While Loop with Syntax?

⌧ **Syntax:**

```
while <condition>:
      statements block 1
[else:
```

statements block2]

- In the **while** loop, the condition is any valid Boolean expression returning True or False.
- The **else** part of while is optional part of **while**.
- The **statements block1** is kept executed till the condition is True. If the **else** part is written, it is executed when the condition is tested False.
- **While** loop belongs to entry check loop type that is it is not executed even once if the condition is tested False in the beginning.

14. Define For Loop with Syntax?

- **For** loop is the most comfortable loop.
- It is also an entry check loop.
- The condition is checked in the beginning and the body of the loop (statements-block 1) is executed if it is only True otherwise the loop is not executed.
- **Syntax:**

  for counter_variable in sequence:

  statements-block 1

  [else: # optional block

  statements-block 2]
- In Python, for loop uses the range( ) function in the sequence to specify the initial, final, and increment values.
- range( ) generates a list of values starting from start till stop one.

15. Write the Syntax for range() with example?

- **Syntax**:

  range (start,stop,[step])

  Where,

  start – refers to the initial value

  stop – refers to the final value

  step – refers to increment value, this is optional part.
- **Eg:**

  range (1,30,1) – will start the range of values from 1 and end at 29

  range (2,30,2) – will start the range of values from 2 and end at 28

16. What is the use of Indentation in Python compare to other languages?

- ⌦ In Python, indentation is important in loop and other control statements.
- ⌦ Indentation only creates blocks and sub-blocks like how we create blocks within a set of { } in languages like C, C++ etc.
- ⌦ In most other programming languages, **indentation** is used only to help make the code look pretty.
- ⌦ But in **Python**, it is required to indicate to which block of code the statement belongs to.

17. Define Nested Loop

- ⌦ A loop placed within another loop is called as nested loop structure.
- ⌦ One can place a **while** within another **while; for** within another **for; for** within **while** and **while** within **for** to construct such nested loops.

18. What is Jump Statement? What are the Jump Statements in Python?

- ⌦ The jump statement in Python is used to unconditionally transfer the control from one part of the program to another.
- ⌦ There are three keywords to achieve jump statements in Python:
  - ☯ **Break,**
  - ☯ **Continue, &**
  - ☯ **Pass.**

19. Define Break Statement

- ⌦ The **break** statement terminates the loop containing it.
- ⌦ Control of the program flows to the statement immediately after the body of the loop.
- ⌦ A **while** or **for** loop will iterate till the condition is tested false.
- ⌦ One can even transfer the control out of the loop (terminate) with help of **break** statement.
- ⌦ When the break statement is executed, the control flow of the program comes out of the loop and starts executing the segment of code after the loop structure.
- ⌦ If break statement is inside a nested loop (loop inside another loop), break will terminate the innermost loop.
- ⌦ **Syntax:**

```
break
```

20. What is Continue Statement? Draw the Flowchart?

- ⌦ Continue statement unlike the break statement is used to skip the remaining part of a loop and start with next iteration.
- ⌦ **Syntax:**

    continue

21. Define Pass Statement

- ⌦ **Pass** statement in Python programming is a null statement.
- ⌦ Pass statement when executed by the interpreter it is completely ignored.
- ⌦ Nothing happens when pass is executed, it results in no operation.
- ⌦ Pass statement can be used in **'if'** clause as well as within loop construct, when you do not want any statements or commands within that block to be executed.
- ⌦ **Syntax:**

    pass

CHAPTER – 7

PYTHON FUNCTIONS

1. **What are Functions?**
    - Functions are named blocks of code that are designed to do specific job.
    - When you want to perform a particular task that you have defined in a function, you call the name of the function responsible for it.

2. **What are the different types of Functions?**
    - **User-defined functions** – Defined by the Users
    - **Built-in functions** – In built within Python
    - **Lambda functions** – Anonymous Un – Named Function
    - **Recursion functions** – Functions that calls itself

3. **What are the Advantages of Function?**
    - It avoids repetition and makes high degree of code reusing.
    - It provides better modularity for your application.

4. **Write the Syntax for User – Defined Function?**
    - **Syntax***:*

```
def <function_name ([parameter1, parameter2…] )> :
    <Block of Statements>
    return <expression / None>
```

    - **Eg:**

```
def hello():
    print (“hello - Python”)
    return
hello()
```

5. **What are the things that need to be noted when defining Functions?**
    - Function blocks begin with the keyword **“def”** followed by function name and parenthesis ().
    - Any input parameters or arguments should be placed within these parentheses when you define a function.
    - The code block always comes after a colon (:) and is indented.

6. **What is the Use of Return Statement?**
   - The statement **“return [expression]”** exits a function, optionally passing back an expression to the caller.
   - A **“return”** with no arguments is the same as return None.

7. **Define Block**
   - A block is one or more lines of code, grouped together so that they are treated as one big sequence of statements while execution.
   - Statements in a block are written with indentation. Usually, a block begins when a line is indented (by four spaces) and all the statements of the block should be at same indent level.

8. **What is meant by Nested Block?**
   - A block within a block is called nested block.
   - When the first block statement is indented by a single tab space, the second block of statement is indented by double tab spaces.

9. **What are the Advantages of User – Defined Function?**
   - Functions help us to divide a program into modules. This makes the code easier to manage.
   - It implements code reuse. Every time you need to execute a sequence of statements, all you need to do is to call the function.
   - Functions, allows us to change functionality easily, and different programmers can work on different functions.

10. **How to Pass Parameters in Function?**
    - The parameters that you place in the parenthesis will be used by the function itself.
    - You can pass all sorts of data to the functions.
    - **Syntax:**

```
def funname(parameters separated by comma):
assume w = 3 and h = 5
def area(w,h):
        return w * h
print (area (3,5))
```

    - The value of 3 and 5 are passed to **w** and **h** respectively, the function will return 15 as output.

11. **Define Parameters and Arguments**
    - Parameters are the variables used in the function definition.
    - Arguments are the values we pass to the function parameters

12. **What are the types of Function Arguments?**
    - Arguments are used to call a function and there are primarily 4 types of functions that one can use:
        - Required arguments,
        - Keyword arguments,
        - Default arguments and
        - Variable-length arguments.

13. **What is Required Arguments?**
    - **"Required Arguments"** are the arguments passed to a function in correct positional order.
    - The number of arguments in the function call should match exactly with the function definition.
    - At least one parameter to prevent syntax errors to get the required output.
    - **Eg:**

```
def printstring(str):
        print ("Required arguments ")
        print(str)
        return
printstring("Welcome")
```

    - **Output:**

```
Required arguments
Welcome
```

14. **What is Keyword Arguments?**
    - Keyword arguments will invoke the function after the parameters are recognized by their parameter names.
    - The value of the keyword argument is matched with the parameter name and so, one can also put arguments in improper order (not in order).
    - **Eg:**

```
def printdata (name):
        print ("Keyword arguments")
        print (“Name :”,name)
        return
printdata(name = “Gshan”)
```

- **Output:**

```
Keyword arguments
Name :Gshan
```

15. What is Default Arguments?

- Default argument is an argument that takes a default value if no value is provided in the function call.
- The following example uses default arguments, that prints default salary when no argument is passed.
- **Eg:**

```
def printinfo( name, salary = 3500):
        print (“Name: “, name)
        print (“Salary: “, salary)
        return
printinfo(“Mani”)
```

- **Output:**

```
Name: Mani
Salary: 3500
```

16. What is Variable Length Arguments?

- In some situations you might need to pass more arguments than have already been specified. Going back to the function to redefine it can be a tedious process.
- Variable-Length arguments can be used instead.
- These are not specified in the function’s definition and an asterisk (*) is used to define such arguments.
- **Eg:**

```
def printnos (*nos):
for n in nos:
        print(n)
        return
print ('Printing two values')
```

```
printnos (1,2)
```

❖ **Output:**

```
Printing two values
1
2
```

17. Write the Syntax for Variable Length Arguments?

❖ **Syntax:**

```
def function_name(*args):
        function_body
        return_statement
```

❖ **Eg:**

```
def printnos (*nos):
for n in nos:
        print(n)
        return
print ('Printing three values')
printnos (10,20,30)
```

❖ **Output:**

```
Printing two values
10
20
30
```

18. What are the methods to pass the arguments in Variable Length Arguments?

❖ There are 2 methods to pass the arguments in Variable Length Arguments.

- ☯ Non keyword variable arguments
- ☯ Keyword variable arguments

❖ Non-keyword variable arguments are called **tuples**.

19. What is Anonymous Function or Lambda Function?

❖ Anonymous function is a function that is defined **without a name.**

❖ Normal functions are defined using the **def** keyword, Anonymous functions are defined using the **lambda** keyword.

- ❖ Anonymous functions are also called as **lambda** functions.

20. What is the use of Lambda or Anonymous Function?

- ❖ Lambda function is mostly used for creating small and one-time anonymous function.
- ❖ Lambda functions are mainly used in combination with the functions like filter(), map() and reduce().

21. What are the uses of Lambda Function?

- ❖ Lambda function can take any number of arguments and must return one value in the form of an expression.
- ❖ Lambda function can only access global variables and variables in its parameter list.

22. Write the Syntax with Example for Anonymous Function?

- ❖ **Syntax:**

```
lambda [argument(s)] :expression
```

- ❖ **Eg:**

```
sum = lambda arg1, arg2: arg1 + arg2
print ('The Sum is :', sum(30,40))
```

- ❖ **Output:**

```
The Sum is : 70
```

23. Define Return Statement

- ❖ The return statement causes your function to exit and returns a value to its caller. The point of functions in general is to take inputs and return something.
- ❖ The return statement is used when a function is ready to return a value to its caller.
- ❖ So, only one return statement is executed at run time even though the function contains multiple return statements.
- ❖ Any numbers of 'return' statements are allowed in a function definition but only one of them is executed at run time.

24. Write the Syntax for Return Statement?

- ❖ **Syntax:**

```
return [expression list ]
```

- This statement can contain expression which gets evaluated and the value is returned. If there is no expression in the statement or the return statement itself is not present inside a function, then the function will return the none object.
- **Eg:**

```
def usr_abs (n):
    if n>=0:
            return n
    else:
            return –n
x=int (input("Enter a number :")
print (usr_abs (x))
```

- **Output:**

```
Enter a Number : 25
25
```

25. Define Scope of a Variable and its types?

- Scope of variable refers to the part of the program, where it is accessible, i.e., area where you can refer (use) it.
- We can say that scope holds the current set of variables and their values.
- There are two types of scopes - **local scope** and **global scope**.

26. Define Local Scope

- A variable declared inside the function's body or in the local scope is known as local variable.
- When a variable is created inside the function/block, the variable becomes local to it.
- A local variable only exists while the function is executing.
- The formal arguments are also local to function.
- **Eg:**

```
def loc():
    y=0 # local scope
    print(y)
loc()
```

- **Output:**

```
0
```

27. Define Global Scope

- A variable, with global scope can be used anywhere in the program. It can be created by defining a variable outside the scope of any function/block.
- When we define a variable outside a function, it's global by default.
- You don't have to use global keyword.
- **Eg:**

```
c = 1
def add():
    print(c)
add()
```

- **Output:**

```
1
```

28. What are the Rules for the Local Variable?

- A variable with local scope can be accessed only within the function/block that it is created in.
- When a variable is created inside the function/block, the variable becomes local to it.
- A local variable only exists while the function is executing.
- The formal arguments are also local to function.

29. What are the Rules for Global Keyword?

- When we define a variable outside a function, it's global by default. You don't have to use global keyword.
- We use global keyword to read and write a global variable inside a function.
- Use of global keyword outside a function has no effect

30. Define abs() function with syntax and example

- Returns an absolute value of a number. The argument may be an integer or a floating point number.
- **Syntax:**

```
abs(x)
```

- **Eg:**

```
x= -23.2
print('x=',abs(x))
```

- **Output:**

```
x=23
```

31. Define ord() function with syntax and example

- It returns the ASCII value for the given Unicode Character. This function is inverse of chr() function
- **Syntax:**
  ```
  ord(c)
  ```
- **Eg:**
  ```
  c='a'
  print('c=',ord(c))
  ```
- **Output:**
  ```
  c=97
  ```

32. Define chr() function with syntax and example

- Returns the Unicode character for the given ASCII value. This function is inverse of ord() function.
- **Syntax:**
  ```
  chr(i)
  ```
- **Eg:**
  ```
  c=65
  print(chr(c))
  ```
- **Output:**
  ```
  A
  ```

33. Define bin() function with syntax and example

- Returns a binary string prefixed with "0b" for the given integer number.
- **Syntax:**
  ```
  bin(i)
  ```
- **Eg:**
  ```
  i=15
  print(bin(i))
  ```
- **Output:**
  ```
  0b1111
  ```

34. Define type() function with syntax and example

- Returns the type of object for the given single object. **Note:** This function used with single object parameter.
- **Syntax:**

  type(object)
- **Eg:**

```
x=15.2
print(type(x))
```
- **Output:**

```
<class 'float'>
```

35. Define id() function with syntax and example

- id( ) Return the "identity" of an object. i.e. the address of the object in memory. The address of x and y may differ in your system.
- **Syntax:**

  id(object)
- **Eg:**

```
x='a'
print(id(x))
```
- **Output:**

```
13480736
```

36. Define min() function with syntax and example

- It is used to return the minimum value in a list.
- **Syntax:**

  min(list)
- **Eg:**

```
A=[1,2,3,4]
print('Minimum is:',min(A))
```
- **Output:**

```
Minimum is:1
```

37. Define max() function with syntax and example

- It is used to return the maximum value in a list.

- **Syntax:**

```
max(list)
```

- **Eg:**

```
A=[1,2,3,4]
print('Maximum is:',max(A))
```

- **Output:**

```
Maximum is:4
```

38. Define sum() function with syntax and example

- It is used to return the sum of the values
- **Syntax:**

```
sum(list)
```

- **Eg:**

```
A=[1,2,3,4]
print('Sum is:',sum(A))
```

- **Output:**

```
Sum is:10
```

39. Define round() function with syntax and example

- It is used to return the nearest integer to its input.
- The first argument is used to specify the value to be rounded.
- The second argument is used to specify the number of decimal digits desired after rounding.
- **Syntax:**

```
round(number,[digits])
```

- **Eg:**

```
x=15.89
print(round(x,0))
print(round(x,1))
```

- **Output:**

```
15.0
15.9
```

40. Define pow() function with syntax and example

- It is used to return the computation of ab i.e. (a**b). a is raised to the power of b.

- **Syntax:**

```
pow(a,b)
```

- **Eg:**

```
x=2
y=4
print(pow(x,y))
```

- **Output:**

```
16
```

41. Define floor() function with syntax and example

- It is used to return the largest integer less than or equal to x.
- **Syntax:**

```
math.floor(x)
```

- **Eg:**

```
x=15.7
print(math.floor(x))
```

- **Output:**

```
15
```

42. Define ceil() function with syntax and example

- It is used to return the smallest integer greater than or equal to x.
- **Syntax:**

```
math.ceil(x)
```

- **Eg:**

```
x=15.7
print(math.ceil(x))
```

- **Output:**

```
16
```

43. Define sqrt() function with syntax and example

- It is used to return the square root of x. x should always be greater than 0.
- **Syntax:**

```
math.sqrt(x)
```

- **Eg:**

```
x=49
print(math.sqrt(x))
```

- ❖ **Output:**

```
7.0
```

44. What is Composition in Functions?

- ❖ The value returned by a function may be used as an argument for another function in a nested manner. This is called **composition**.
- ❖ If we wish to take a numeric value or an expression as a input from the user, we take the input string from the user using the function **input()** and apply **eval()** function to evaluate its value

45. What is Infinite Iteration?

- ❖ A recursive function calls itself.
- ❖ Imagine a process would iterate indefinitely if not stopped by some condition.
- ❖ Such a process is known as **Infinite Iteration.**

46. What is Recursive Function?

- ❖ When a function calls itself is known as recursion.
- ❖ Recursion works like loop but sometimes it makes more sense to use recursion than loop. You can convert any loop to recursion.

47. How the Recursive Function Works?

- ❖ Recursive function is called by some external code.
- ❖ If the base condition is met then the program gives meaningful output and exits.
- ❖ Otherwise, function does some required processing and then calls itself to continue recursion.

48. What is the base condition in Recursive Function?

- ❖ The condition that is applied in any recursive function is known as base condition.
- ❖ A base condition is must in every recursive function otherwise it will continue to execute like an infinite loop.

49. Write a Python Program to calculate the factorial using Recursive Function?

- ❖ **Coding:**

```
def fact(n):
if n == 0:
    return 1
else:
    return n * fact (n-1)
print (fact (0))
print (fact (5))
```

❖ **Output:**

```
1
120
```