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2019-20 Edition

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ISBN : 978-81-8449-799-1

Code No : SG91

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PREFACE

" The woods are lovely, dark and deep. "
But I have promises to keep, and
miles to go before I sleep

- Robert Frost

Respected Principals, Correspondents, Head Masters / Head Mistresses, Teachers,

From the bottom of our heart, we at SURA Publications sincerely thank you for the support and patronage that you have extended to us for more than a decade.

It is in our sincerest effort we take the pride of releasing **SURA's Computer Science Guide** for +2 Standard – Edition 2019. This guide has been authored and edited by qualified teachers having teaching experience for over a decade in their respective subject fields. This Guide has been reviewed by reputed Professors who are currently serving as Head of the Department in esteemed Universities and Colleges.

With due respect to Teachers, I would like to mention that this guide will serve as a teaching companion to qualified teachers. Also, this guide will be an excellent learning companion to students with exhaustive exercises and in-text questions in addition to precise answers for textual questions.

In complete cognizance of the dedicated role of Teachers, I completely believe that our students will learn the subject effectively with this guide and prove their excellence in Board Examinations.

I once again sincerely thank the Teachers, Parents and Students for supporting and valuing our efforts.

God Bless all.

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UNIT-I PROBLEM SOLVING TECHNIQUES

CHAPTER 1

FUNCTION

CHAPTER SNAPSHOT

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EVALUATION

PART - I

CHOOSE THE BEST ANSWER (1 MARK)

1. The small sections of code that are used to perform a particular task is called
(a) Subroutines (b) Files
(c) Pseudo code (d) Modules
[Ans. (a) subroutines]

2. Which of the following is a unit of code that is often defined within a greater code structure?
(a) Subroutines (b) Function
(c) Files (d) Modules
[Ans. (b) Function]

3. Which of the following is a distinct syntactic block?
(a) Subroutines (b) Function
(c) Definition (d) Modules
[Ans. (c) Definition]

4. The variables in a function definition are called as
(a) Subroutines (b) Function
(c) Definition (d) Parameters
[Ans. (d) Parameters]

5. The values which are passed to a function definition are called
(a) Arguments (b) Subroutines
(c) Function (d) Definition
[Ans. (a) Arguments]

6. Which of the following are mandatory to write the type annotations in the function definition?
(a) Curly braces (b) Parentheses
(c) Square brackets (d) indentations
[Ans. (b) Parentheses]

7. Which of the following defines what an object can do?
(a) Operating System (b) Compiler
(c) Interface (d) Interpreter
[Ans. (c) Interface]

8. Which of the following carries out the instructions defined in the interface?
(a) Operating System (b) Compiler
(c) Implementation (d) Interpreter
[Ans. (c) Implementation]

9. The functions which will give exact result when same arguments are passed are called
(a) Impure functions (b) Partial Functions
(c) Dynamic Functions (d) Pure functions
[Ans. (d) Pure functions]

10. The functions which cause side effects to the arguments passed are called
(a) impure function (b) Partial Functions
(c) Dynamic Functions (d) Pure functions
[Ans. (a) impure function]

PART - II

ANSWER THE FOLLOWING QUESTIONS (2 MARKS)

1. What is a subroutine?

Ans. (i) Subroutines are the basic building blocks of computer programs. Subroutines are small sections of code that are used to perform a particular task that can be used repeatedly.
(ii) In Programming languages these subroutines are called as Functions.

2. Define Function with respect to Programming language.

Ans. A function is a unit of code that is often defined within a greater code structure. Specifically, a function contains a set of code that works on many kinds of inputs, like variants, expressions and produces a concrete output.

3. Write the inference you get from X:=(78).

Ans. X:= (78) has an expression in it but (78) is not itself an expression. Rather, it is a function definition. Definitions bind values to names, in this case the value 78 being bound to the name 'X'. Definitions are not expressions, at the same time expressions are also not treated as definitions. Definitions are distinct syntactic blocks. Definitions can have expressions nested inside them, and vice-versa.

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4. Differentiate interface and implementation.

Ans. The difference between interface and implementation is

Interface	Implementation
Interface just defines what an object can do, but won't actually do it	Implementation carries out the instructions defined in the interface

5. Which of the following is a normal function definition and which is recursive function definition.

i) let rec sum x y :
return x + y

ii) let disp :
print 'welcome'

iii) let rec sum num :
if (num!=0) then return num + sum (num-1)
else
return num

Ans. **(i)** Recursive function

(ii) Normal function

(iii) Recursive function

Part - III

Answer the following questions (3 marks)

1. Mention the characteristics of Interface.

Ans. **(i)** The class template specifies the interfaces to enable an object to be created and operated properly.

(ii) An object's attributes and behaviour is controlled by sending functions to the object.

2. Why strlen is called pure function?

Ans. **(i)** strlen is a pure function because the function takes one variable as a parameter, and accesses it to find its length.

(ii) This function reads external memory but does not change it, and the value returned derives from the external memory accessed.

3. What is the side effect of impure function. Give example.

Ans. **(i)** The variables used inside the function may cause side effects though the functions which are not passed with any arguments. In such cases the function is called impure function.

(ii) When a function depends on variables or functions outside of its definition block, you can never be sure that the function will behave the same every time it's called.

(iii) For example the mathematical function random() will give different outputs for the same function call.

Program :

```
let Random number
let a := random()
if a > 10 then
return: a
else
return: 10
```

(iv) Here the function Random is impure as it is not sure what will be the result when we call the function.

4. Differentiate pure and impure function.

Ans.

Interface	Implementation
The return value of the pure functions solely depends on its arguments passed. Hence, if you call the pure functions with the same set of arguments, you will always get the same return values. They do not have any side effects.	The return value of the impure functions does not solely depend on its arguments passed. Hence, if you call the impure functions with the same set of arguments, you might get the different return values. For example, random(), Date().
They do not modify the arguments which are passed to them	They may modify the arguments which are passed to them

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5. What happens if you modify a variable outside the function? Give an example.

Ans. One of the most popular groups of side effects is modifying the variable outside of function.

For example :

```
let y: = 0
(int) inc (int) x
y: = y + x;
return (y)
```

PART - IV

ANSWER THE FOLLOWING QUESTIONS

(5 MARKS)

1. What are called Parameters and write a note on

(i) Parameter without Type

(ii) Parameter with Type

Ans. **Parameters (and arguments) :** Parameters are the variables in a function definition and arguments are the values which are passed to a function definition.

(i) Parameter without Type : Let us see an example of a function, definition :

```
(requires: b>=0 )
(returns: a to the power of b)
let rec pow a b:=
        if b=0 then 1
        else a * pow a (b –1)
```

- In the above function definition variable 'b' is the parameter and the value which is passed to the variable 'b' is the argument. The precondition **(requires)** and postcondition **(returns)** of the function is given.
- Note we have not mentioned any types: **(data types)**. Some language compiler solves this type **(data type)** inference problem algorithmically, but some require the type to be mentioned.
- In the above function definition if expression can return 1 in the then branch, by the **typing** rule the entire if expression has type **int**.
- Since the if expression has type **'int'**, the function's return type also be 'int'. **'b'** is compared to 0 with the equality operator, so **'b'** is also a type of 'int'. Since 'a' is multiplied with another expression using the * operator, **'a'** must be an int.

(ii) Parameter with Type : Now let us write the same function definition with types for some reason:

```
(requires: b> 0 )
(returns: a to the power of b )
    let rec pow (a: int) (b: int) : int :=
            if b=0 then 1
            else a * pow b (a-1)
```

- When we write the type annotations for **'a'** and **'b'** the parentheses are mandatory. Generally we can leave out these annotations, because it's simpler to let the compiler infer them.
- There are times we may want to explicitly write down types. This is useful on times when you get a type error from the compiler that doesn't make sense. Explicitly annotating the types can help with debugging such an error message.

2. Identify in the following program

```
let rec gcd a b :=
if b <> 0 then gcd b (a mod b) else return a
```

i) Name of the function

ii) Identify the statement which tells it is a recursive function

iii) Name of the argument variable

iv) Statement which invoke the function recursively

v) Statement which terminates the recursion

Ans. **(i)** gcd

(ii) let rec gcd

(iii) a, b

(iv) gcd b (a mod b)

(v) return a

3. Explain with example Pure and impure functions.

Ans. **Pure functions :**

(i) Pure functions are functions which will give exact result when the same arguments are passed.

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(ii) For example the mathematical function sin (0) always results 0. This means that every time you call the function with the same arguments, you will always get the same result.

(iii) A function can be a pure function provided it should not have any external variable which will alter the behaviour of that variable.

```
Let us see an example
let square x
        return: x * x
```

(iv) The above function square is a pure function because it will not give different results for same input.

(v) There are various theoretical advantages of having pure functions. One advantage is that if a function is pure, then if it is called several times with the same arguments, the compiler only needs to actually call the function once. Lt's see an example

```
let i: = 0;
  if i <strlen (s) then
  -- Do something which doesn't
                              affect s
++i
```

(vi) If it is compiled, strlen (s) is called each time and strlen needs to iterate over the whole of 's'. If the compiler is smart enough to work out that strlen is a pure function and that 's' is not updated in the loop, then it can remove the redundant extra calls to strlen and make the loop to execute only one time.

(vii) From these what we can understand, strlen is a pure function because the function takes one variable as a parameter, and accesses it to find its length. This function reads external memory but does not change it, and the value returned derives from the external memory accessed.

Impure functions :

(i) The variables used inside the function may cause side effects though the functions which are not passed with any arguments. In such cases the function is called impure function.

(ii) When a function depends on variables or functions outside of its definition block, you can never be sure that the function will behave the same every time it's called. For example the mathematical function random() will give different outputs for the same function call.

```
let Random number
let a := random()
      if a > 10 then
        return: a
else
      return: 10
```

(iii) Here the function Random is impure as it is not sure what will be the result when we call the function.

4. Explain with an example interface and implementation.

Ans. (i) An interface is a set of action that an object can do. For example when you press a light switch, the light goes on, you may not have cared how it splashed the light. In Object Oriented Programming language, an Interface is a description of all functions that a class must have in order to be a new interface.

(ii) In our example, anything that **"ACTS LIKE"** a light, should have function definitions like turn_on () and a turn_off (). The purpose of interfaces is to allow the computer to enforce the properties of the class of **TYPE T** (whatever the interface is) must have functions called X, Y, Z, etc.

(iii) A class declaration combines the external interface (its local state) with an implementation of that interface (the code that carries out the behaviour). An object is an instance created from the class. The interface defines an object's visibility to the outside world.

The difference between interface and implementation is

Interface	Implementation
Interface just defines what an object can do, but won't actually do it	Implementation carries out the instructions defined in the interface

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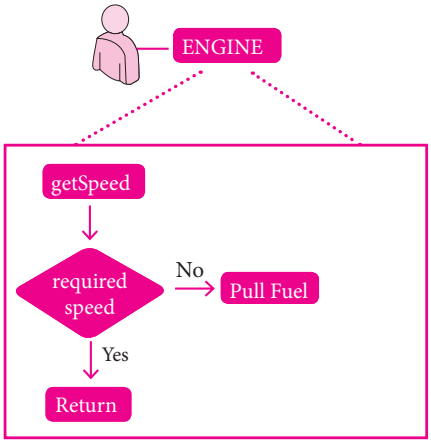
(iv) In object oriented programs classes are the interface and how the object is processed and executed is the implementation.

Characteristics of interface :

(i) The class template specifies the interfaces to enable an object to be created and operated properly.

(ii) An object's attributes and behaviour is controlled by sending functions to the object.

For example, let's take the example of increasing a car's speed.



(iii) The person who drives the car doesn't care about the internal working. To increase the speed of the car he just presses the accelerator to get the desired behaviour. Here the accelerator is the interface between the driver (the calling / invoking object) and the engine (the called object).

(iv) In this case, the function call would be Speed (70): This is the interface. Internally, the engine of the car is doing all the things. It's where fuel, air, pressure, and electricity come together to create the power to move the vehicle.

(v) All of these actions are separated from the driver, who just wants to go faster. Thus we separate interface from implementation.

(vi) Let us see a simple example, consider the following implementation of a function that finds the minimum of its three arguments:

```
let min 3 x y z :=
    if x < y then
            if x < z then x else z
    else
            if y < z then y else z
```

ADDITIONAL QUESTIONS AND ANSWERS

CHOOSE THE CORRECT ANSWER — 1 MARK

1. Which of the following are expressed using statements of a programming language?

(a) Functions (b) Algorithm
(c) Interface (d) Implementation

[Ans. (b) Algorithm]

2. What must the used when a bulk of statements to be repeated for many number of times?

(a) Algorithm (b) Program
(c) Subroutines (d) Parameters

[Ans. (c) Subroutines]

3. Which of the following contains a set a code that works an many kinds of input and produces a concrete output?

(a) Function (b) Algorithm
(c) Arguments (d) Language

[Ans. (a) Function]

4. Which of the following are the values which are passed to a function definition?

(a) Parameters (b) Algorithm
(c) Data types (d) Arguments

[Ans. (d) Arguments]

5. The function definition is introduced by the keyword

(a) def (b) rec
(c) let (d) infer

[Ans. (c) let]

6. The recursive function is defined using the keyword

(a) let (b) let rec
(c) name (d) infer

[Ans. (b) let rec]

7. A function definition which call itself is called

(a) user defined function
(b) built-in function
(c) derived function
(d) recursive function

[Ans. (d) recursive function]

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8. **Which of the following is a description of all functions in object oriented programming language?**
(a) Implementation (b) parameter
(c) Interface (d) Arugument
[Ans. (c) Interface]

9. **Which of the following is an instance created from the class?**
(a) parameter (b) function
(c) subroutines (d) object
[Ans. (d) object]

10. **Which of the following is an example of impure function?**
(a) Strlen() (b) random()
(c) sqrf() (d) pure()
[Ans. (b) random()]

11. **In which type of function the return type is solely depends on its argument passed?**
(a) pure (b) impure
(c) parameterized (d) monochromatize
[Ans. (a) pure]

12. **In which type of function the return type does not solely depends on its argument passed?**
(a) Pure (b) Parameterized
(c) Impure (d) Monochromatize
[Ans. (c) Impure]

Choose and fill in the blanks

1. **Subroutines are called as _____**
(a) Algorithm (b) Interface
(c) Parameters (d) Functions
[Ans. (d) Functions]

2. **_____ are the variables in a function definition.**
(a) Arguments (b) Parameters
(c) Identifiers (d) Operators
[Ans. (b) Parameters]

3. **Explicitly _____ the types can help with debugging.**
(a) defining (b) annotating
(c) informing (d) computing
[Ans. (b) annotating]

4. **All functions are _____ definitions.**
(a) static (b) dynamic
(c) algorithmic (d) static
[Ans. (a) static]

5. **A _____ combines the external interface with an implementation of the interface.**
(a) parameter without type
(b) class declaration
(c) function definition
(d) parameter with type
[Ans. (b) class declaration]

6. **In object oriented programs _____ are the interface**
(a) Implementation (b) parameters
(c) Interface (d) Arguments
[Ans. (c) Interface]

7. **In object oriented programs, how the object is processed and executed is _____.**
(a) Implementation (b) Interface
(c) recursion (d) function
[Ans. (a) Implementation]

8. **Stolen is an example _____function.**
(a) user defined (b) impure
(c) pure (d) recursive
[Ans. (c) pure]

9. **Evaluation of _____ functions does not cause any side effects to its output?**
(a) Impure (b) pure
(c) Recursive (d) built-in
[Ans. (b) pure]

Choose the correct statement

1. **Which of the following is an incorrect statement?**
(i) Algorithms are not expressed using statements of a programming language.
(ii) An interface is a set of action that an object can do
(iii) Implementation does not carries out the instructions defined in the interface.
(iv) Pure functions will give exact result.
(a) i and iii (b) ii and iv
(c) iii and ii (d) i, ii and iv
[Ans. (a) i and iii]

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Very Short Answers 2 MARKS

1. Differentiate parameters and arguments.

Ans. Parameters are the variables in a function definition and arguments are the values which are passed to a function definition.

2. Give an example of function definition parameter without type.

Ans.
```
(requires: b>=0 )
(returns: a to the power of b)
let rec pow a b:=
        if b=0 then 1
        else a * pow a (b-1)
```

3. Give an example of function definition parameter with type.

Ans.
```
(requires: b> 0 )
(returns: a to the power of b )
let rec pow (a: int) (b: int) : int :=
if b=0 then 1
else a * pow b (a-1)
```

4. What is recursive function?

Ans. A function definition which call itself is called recursive function.

5. Give an example of pure function.

Ans.
```
let square x
        return: x * x
let i: = 0;
        if i <strlen (s) then
        -- Do something which doesn't affect s
        ++i
```

6. Give an example of impure function.

Ans.
```
let y: = 0
(int) inc (int) x
y: = y + x;
return (y)
```

7. Construct on algorithm that arranges meetings between these two types so that they change their color to the third type. In the end, all should display the same color.

Ans.
```
let rec monochromatize a b c :=
if a > 0 then
a, b, c := a-1, b-1, c+2
else
a:=0, b:=0, c:= a + b + c
return c
```

Short Answers 3 MARKS

1. Explain the syntax of function definitions.

Ans.

(i) The syntax to define functions is close to the mathematical usage: the definition is introduced by the keyword **let**, followed by the **name** of the function and its arguments; then the formula that computes the image of the argument is written after an = sign. If you want to define a recursive function: use **"let rec" instead of "let"**.

(ii) **Syntax :** The syntax for function definitions:

let rec fn a1 a2 ... an := k

(iii) Here the **'fn'** is a variable indicating an identifier being used as a function name. The names **'a1'** to **'an'** are variables indicating the identifiers used as parameters. The keyword **'rec'** is required if **'fn'** is to be a recursive function; otherwise it may be omitted.

2. Write an algorithm to check whether the entered number is even or odd.

Ans.
```
(requires: x>= 0)
        let rec even x :=
        x=0 || odd (x-1)
        return 'even'
(requires: x>= 0)
        let odd x :=
        x<>0 && even (x-1)
        return 'odd'
```

3. Write a short note an syntax for function types.

Ans. **The syntax for function types :**

$x \rightarrow y$

$x1 \rightarrow x2 \rightarrow y$

$x1 \rightarrow ... \rightarrow xn \rightarrow y$

The **'x'** and **'y'** are variables indicating types. The type $x \rightarrow y$ is the type of a function that gets an input of type 'x' and returns an output of type 'y'. Whereas **$x1 \rightarrow x2 \rightarrow y$** is a type of a function that takes two inputs, the first input is of type **'x1'** and the second input of type **'x2'**, and returns an output of type **'y'**. Likewise **$x1 \rightarrow \ldots \rightarrow xn \rightarrow y$** has type **'x'** as input of n arguments and **'y'** type as output.

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CHAPTER 2

DATA ABSTRACTION

CHAPTER SNAPSHOT

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EVALUATION

PART - I

CHOOSE THE BEST ANSWER (1 MARK)

1. Which of the following functions that build the abstract data type ?
(a) Constructors (b) Destructors
(c) Recursive (d) Nested
[Ans. (a) Constructors]

2. Which of the following functions that retrieve information from the data type?
(a) Constructors (b) Selectors
(c) Recursive (d) Nested
[Ans. (b) Selectors]

3. The data structure which is a mutable ordered sequence of elements is called
(a) Built in (b) List
(c) Tuple (d) Derived data
[Ans. (b) List]

4. A sequence of immutable objects is called
(a) Built in (b) List
(c) Tuple (d) Derived data
[Ans. (c) Tuple]

5. The data type whose representation is known are called
(a) Built in datatype
(b) Derived datatype
(c) Concrete datatype
(d) Abstract datatype
[Ans. (b) Derived datatype]

6. The data type whose representation is unknown are called
(a) Built in datatype
(b) Derived datatype
(c) Concrete datatype
(d) Abstract datatype
[Ans. (c) Concrete datatype]

7. Which of the following is a compound structure?
(a) Pair (b) Triplet
(c) Single (d) Quadrat
[Ans. (a) Pair]

8. Bundling two values together into one can be considered as
(a) Pair
(b) Triplet
(c) Single
(d) Quadrat **[Ans. (a) Pair]**

9. Which of the following allow to name the various parts of a multi-item object?
(a) Tuples
(b) Lists
(c) Classes
(d) Quadrats **[Ans. (c) Classes]**

10. Which of the following is constructed by placing expressions within square brackets?
(a) Tuples (b) Lists
(c) Classes (d) Quadrats
[Ans. (b) Lists]

PART - II

ANSWER THE FOLLOWING QUESTIONS (2 MARKS)

1. What is abstract data type?

Ans. **(i)** Abstract Data type (ADT) is a type (or class) for objects whose behavior is defined by a set of value and a set of operations.

(ii) The definition of ADT only mentions what operations are to be performed but not how these operations will be implemented.

(iii) It does not specify how data will be organized in memory and what algorithms will be used for implementing the operations. It is called "abstract" because it gives an implementation independent view. The process of providing only the essentials and hiding the details is known as abstraction.

2. Differentiate constructors and selectors.

Ans. **(i)** Constructors are functions that build the abstract data type.

(ii) Selectors are functions that retrieve information from the data type.

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3. What is a Pair? Give an example.

Ans. **(i)** Any way of bundling two values together into one can be considered as a Pair. Lists are a common method to do so. Therefore List can be called as Pairs.

(ii) **Example :** List = [10,20,30]

4. What is a List? Give an example.

Ans. **(i)** List is constructed by placing expressions within square brackets separated by commas.

(ii) Such an expression is called a list literal. List can store multiple values. Each value can be of any type and can even be another list.

(iii) The elements of a list can be accessed in two ways. The first way is via our familiar method of multiple assignment, which unpacks a list into its elements and binds each element to a different name.

(iii) **Example :**
```
lst := [10, 20]
x, y := lst
```

5. What is a Tuple? Give an example.

Ans. **(i)** A tuple is a comma-separated sequence of values surrounded with parentheses. Tuple is similar to a list.

(ii) The difference between the two is that you cannot change the elements of a tuple once it is assigned whereas in a list, elements can be changed.

(iii) **Example :** colour= ('red', 'blue', 'Green')

PART - III

ANSWER THE FOLLOWING QUESTIONS (3 MARKS)

1. Differentiate Concrete datatype and Abstract datatype.

Ans. **(i)** Concrete datatypes or structures (CDT's) are direct implementations of a relatively simple concept.

(ii) Abstract Datatypes (ADT's) offer a high level view (and use) of a concept independent of its implementation.

(iii) A concrete data type is a data type whose representation is known and in abstract data type the representation of a data type is unknown

2. Which strategy is used for program designing? Define that Strategy.

Ans. A powerful strategy for designing programs: 'wishful thinking'. Wishful Thinking is the formation of beliefs and making decisions according to what might be pleasing to imagine instead of by appealing to reality.

3. Identify Which of the following are constructors and selectors?

(a) N1=number()
(b) accetnum(n1)
(c) displaynum(n1)
(d) eval(a/b)
(e) x,y= makeslope (m), makeslope(n)
(f) display()

Ans. **(a)** Constructors
(b) Selector
(c) Selector
(d) Constructors
(e) Constructors
(f) Selector

4. What are the different ways to access the elements of a list. Give example.

Ans. **(i)** The elements of a list can be accessed in two ways. The first way is via our familiar method of multiple assignment, which unpacks a list into its elements and binds each element to a different name.

```
lst := [10, 20]
x, y := lst
```

(ii) In the above example x will become10 and y will become 20.

(iii) A second method for accessing the elements in a list is by the element selection operator, also expressed using square brackets. Unlike a list literal, a square-brackets expression directly following another expression does not evaluate to a list value, but instead selects an element from the value of the preceding expression.

```
lst[0]
10
lst[1]
20
```


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5. Identify Which of the following are List, Tuple and class ?

(a) arr [1, 2, 34]
(b) arr (1, 2, 34)
(c) student [rno, name, mark]
(d) day= ('sun', 'mon', 'tue', 'wed')
(e) x= [2, 5, 6.5, [5, 6], 8.2]
(f) employee [eno, ename, esal, eaddress]

Ans. **(a)** List
(b) Tuple
(c) Class
(d) Tuple
(e) List
(f) Class

PART - IV

ANSWER THE FOLLOWING QUESTIONS

(5 MARKS)

1. How will you facilitate data abstraction. Explain it with suitable example.

Ans. To facilitate data abstraction, you will need to create two types of functions: constructors and selectors.

Constructors and Selectors :

(i) Constructors are functions that build the abstract data type. Selectors are functions that retrieve information from the data type.

(ii) For example, say you have an abstract data type called city. This city object will hold the city's name, and its latitude and longitude. To create a city object, you'd use a function like

```
city = makecity (name, lat, lon)
```

(iii) To extract the information of a city object, you would use functions like

```
getname(city)
getlat(city)
getlon(city)
```

(iv) The following pseudo code will compute the distance between two city objects:

```
distance(city1, city2):
        lt1, lg1 := getlat(city1), getlon(city1)
        lt2, lg2 := getlat(city2), getlon(city2)
        return ((lt1 - lt2)**2 +
                        (lg1 -lg2)**2))½
```

(v) In the above code read distance(), getlat() and getlon() as functions and read lt as latitude and lg longitude. Read := as "assigned as" or "becomes"

(vi) lt1, lg1 := getlat(city1), getlon(city1) is read as lt1 becomes the value of getlat(city1) and lg1 becomes the value of getlont(city1).

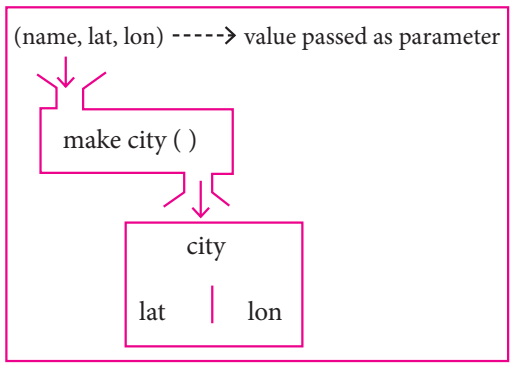
(vii) Notice that you don't need to know how these functions were implemented. You are assuming that someone else has defined them for us.

(viii) It's okay if the end user doesn't know how functions were implemented. However, the functions still have to be defined by someone.

(ix) Let us identify the constructors and selectors in the above code. As you already know that Constructors are functions that build the abstract data type. In the above pseudo code the function which creates the object of the city is the constructor.

```
city = makecity (name, lat, lon)
```

(x) Here makecity (name, lat, lon) is the constructor which creates the object city.



Constructor

Selectors are nothing but the functions that retrieve information from the data type. Therefore in the above code

```
getname(city)
getlat(city)
getlon(city)
```

(xi) are the selectors because these functions extract the information of the city object.

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2. What is a List? Why List can be called as Pairs. Explain with suitable example.

Ans. To enable us to implement the concrete level of our data abstraction, Some languages like Python provides a compound structure called Pair which is made up of list or Tuple. The first way to implement pairs is with the List construct.

List :

(i) List is constructed by placing expressions within square brackets separated by commas. Such an expression is called a list literal. List can store multiple values. Each value can be of any type and can even be another list.

Example for List is [10, 20].

(ii) The elements of a list can be accessed in two ways. The first way is via our familiar method of multiple assignment, which unpacks a list into its elements and binds each element to a different name.

```
lst := [10, 20]
x, y := lst
```

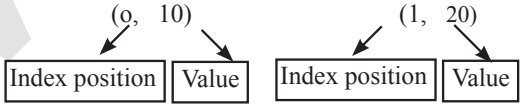
(iii) In the above example x will become10 and y will become 20. A second method for accessing the elements in a list is by the element selection operator, also expressed using square brackets.

(iv) Unlike a list literal, a square-brackets expression directly following another expression does not evaluate to a list value, but instead selects an element from the value of the preceding expression.

```
lst[0]
10
lst[1]
20
```

(v) In both the example mentioned above mathematically we can represent list similar to a set.

lst[(0, 10), (1, 20)] - where



(vi) Any way of bundling two values together into one can be considered as a pair. Lists are a common method to do so. Therefore List can be called as Pairs.

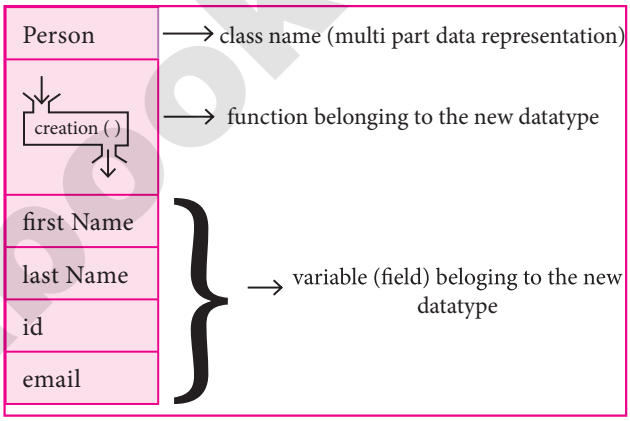
3. How will you access the multi-item? Explain with example.

Ans. **(i)** The structure construct (In OOP languages it's called class construct) is used to represent multi-part objects where each part is named (given a name). Consider the following pseudo code:

class Person:

```
    creation( )
    firstName := " "
    lastName := " "
    id := " "
    email := " "
```

The new data type Person is pictorially represented as



Let main() contains	
p1:=Person()	statement creates the object
firstName := "Padmashri"	setting a field called first Name with value Padmashri
lastName :="Baskar"	setting a field called lastName with value Baskar
id :="994–222–1234"	setting a field called id value 994–222–1234
email="compsci@gamil.com"	setting a filed called email with value compsci@gmail.com
- - output of firstName : Padmashri	

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(ii) The class (structure) construct defines the form for multi-part objects that represent a person. Its definition adds a new data type, in this case a type named Person.

(iii) Once defined, we can create new variables (instances) of the type. In this example Person is referred to as a class or a type, while p1 is referred to as an object or an instance.

(iv) Here class Person as a cookie cutter, and p1 as a particular cookie. Using the cookie cutter you can make many cookies. Same way using class created many objects of that type.

(v) A class defines a data abstraction by grouping related data items. A class is not just data, it has functions defined within it. We say such functions are subordinate to the class because their job is to do things with the data of the class.

ADDITIONAL QUESTIONS AND ANSWERS

CHOOSE THE CORRECT ANSWER 1 MARK

1. Which of the following is a powerful concept that allows programmers to treat codes as objects?

(a) Encapsulation (b) Data Abstraction
(c) Inheritance (d) Polymorphism

[Ans. (b) Data Abstraction]

2. Which of the following provides modularity?

(a) Datatypes (b) Subroutines
(c) Classes (d) Abstraction

[Ans. (b) Objects]

3. ADT expansion is

(a) Abstract Data Template
(b) Absolute Data Type
(c) Abstract Data Type
(d) Application Development Tool

[Ans. (c) Abstract Data Type]

4. Which of the following is a type for objects whose behavior is defined by a set of value and a set of operations?

(a) User-defined datatype
(b) Derived datatype
(c) Built-in datatype
(d) Abstract datatype

[Ans. (d) Abstract datatype]

5. ADT behavior is defined by

(i) Set of Variables (ii) Set of Value
(iii) Set of Functions (iv) Set of Operations
(a) i, ii (b) ii, iii
(c) ii, iv (d) i, iii

[Ans. (c) ii, iv]

6. The process of providing only the essentials and hiding the details is known as

(a) Functions (b) Abstraction
(c) Encapsulation (d) Pairs

[Ans. (b) Abstraction]

7. Which of the following gives an implementation independent view?

(a) Abstract
(b) Concrete
(c) Datatype
(d) Behavior of an object

[Ans. (a) Abstract]

8. How many ways to implement an ADT?

(a) Only one (b) Two
(c) Three (d) Many

[Ans. (d) Many]

9. Which of the following are implemented using & lists?

(a) Singly linked list ADT
(b) Doubly Linked list ADT
(c) Stack ADT
(d) Queue ADT
(e) All of these **[Ans. (e) All of these]**

10. Which of the following replicate how we think about the world?

(a) Queue ADT
(b) Data Hiding
(c) Data Abstraction
(d) Stack ADT **[Ans. (c) Data Abstraction]**

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11. To facilitate data abstraction, How many types of functions are created?
(a) 2 (b) 3
(c) 4 (d) Only one
[Ans. (a) 2]

12. Which of the following function that facilitate the data abstraction?
(a) Constructors
(b) Destructors
(c) Selectors
(d) a and c [Ans. (d) a and c]

13. Which of the following are functions that build the abstract datatype?
(a) Constructors
(b) Destructors
(c) Selectors
(d) All of these [Ans. (a) Constructors]

14. Which of the following extract the information of the object?
(a) Constructors
(b) Functions
(c) Selectors
(d) Destructors [Ans. (c) Selectors]

15. In which data representation, a definition for each function is known.
(a) User defined
(b) Buil-in
(c) Abstract
(d) Concrete [Ans. (d) Concrete]

16. How many parts are there in the program?
(a) 2 (b) 3
(c) 4 (d) Many
[Ans. (a) 2]

17. To implement the concrete level of data abstraction the language python provides a compound structure called
(a) ADT
(b) Concrete data
(c) Pair
(d) User defined function [Ans. (c) Pair]

18. Which of the following is contracted by placing expressions within square brackets separated by commas?
(a) List (b) Tuple
(c) Set (d) Dictionary
[Ans. (a) List]

19. How many values can be stared in the list?
(a) 4 (b) 10
(c) 100 (d) Multiple
[Ans. (d) Multiple]

20. l : = [10, 20] is an example
(a) Tuple (b) Set
(c) List (d) Dictionary
[Ans. (c) List]

21. List can also be called as
(a) Functions (b) Class
(c) Structure (d) Pairs
[Ans. (d) Pairs]

22. How many ways are there to represent pair datatype?
(a) 2 (b) 4 (c) 3 (d) 5
[Ans. (a) 2]

23. Color = ('red', 'green', 'blue') is an example of
(a) Dictionary (b) List
(c) Set (d) Tuple
[Ans. (d) Tuple]

24. Which of the following does not allow us to name the various parts of a multi-item object?
(a) List (b) Tuple
(c) Pair (d) All of these
[Ans. (d) All of these]

25. Which of the following defines a data abstraction by grouping related data items?
(a) List (b) Pair
(c) Class (d) Tuple
[Ans. (c) Class]

26. Which of the following as bundled data and the functions that work on that data?
(a) Object (b) Pair
(c) List (d) Class
[Ans. (d) Class]

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27. CDT expansion is
(a) Collective Data Type
(b) Class Data Type
(c) Concrete Data Type
(d) Central Data Type
[Ans. (b) Class Data Type]

Choose and fill in the blanks

1. Data Abstraction allows programmers to treat code as _____.
(a) Objects (b) Classes
(c) Members (d) Parameters
[Ans. (a) Objects]

2. _____ are the representation for Abstract Data types.
(a) Objects (b) Classes
(c) Functions (d) Lists
[Ans. (b) Classes]

3. Classes are the representation for ____
(a) Abstract datatype
(b) Built-in datatype
(c) Concrete datatype
(d) Essential datatype
[Ans. (a) Abstract datatype]

4. The _____ can be implemented using singly linked list or doubly linked list.
(a) Tuple ADT (b) List ADT
(c) Function ADT (d) List ADT
[Ans. (b) List ADT]

5. The basic idea of ____ is to structure programs so that they operate on abstract dat(a)
(a) Encapsulation
(b) Polymorphism
(c) Data type
(d) Data Abstraction
[Ans. (d) Data Abstraction]

6. A _____ data representation is defined as an independent part of the program.
(a) Abstract (b) Concrete
(c) List (d) Tuple
[Ans. (b) Concrete]

7. _____ are functions that retrieve information from the data type.
(a) Constructors
(b) Selectors
(c) List
(d) Tuples **[Ans. (b) Selectors]**

8. _____ is made up of list or Tuples.
(a) Set (b) Pair
(c) Dictionary
(d) Control Structures **[Ans. (b) Pair]**

9. List is constructed by using ____ and ____.
(a) (), , (b) <>, ;
(c) [], , (d) [], :
[Ans. (c) [], ,]

10. A ____ is a comma separated values surround with parentheses.
(a) List (b) Tuple
(c) Set (d) Dictionary
[Ans. (b) Tuple]

11. Tuple is constructed by using ___ and __
(a) (), (b) [], (c) [],: (d) (),:
[Ans. (a) (),]

12. A ____ is not just data, it has functions defined within it.
(a) Class (b) List
(c) Pair (d) Object
[Ans. (a) Class]

Choose the incorrect statement

1. Which of the following is and incorrect statement?
(i) ADT is defined by set of values and set of operations
(ii) ADT does specify how data will be organized in the memory.
(iii) Constructors are not used to built abstract data type.
(iv) Selectors are functions that retrieve information from the data type.
(a) i, ii (b) ii, iv
(c) ii, iii (d) i, iii, iv
[Ans. (c) ii, iii]

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VERY SHORT ANSWERS 2 MARKS

1. Give an example of implementing an ADT.

Ans. (i) There can be different ways to implement an ADT, for example, the List ADT can be implemented using singly linked list or doubly linked list.

(i) Similarly, stack ADT and Queue ADT can be implemented using lists.

2. Identify which is the constructor and selector from the following statement.

(i) The Functions that retrieve information from the datatype

(ii) The function which creates an object.

Ans. (i) Selector

(ii) Constructor

3. Write the pseudo code for the representation of the rational number.

Ans. The pseudo code for the representation of the rational number

```
x,y:=8,3
rational(n,d)
numer(x)/numer(y)
- - output :
```

4. How the concrete level of data abstraction implemented?

Ans. (i) To implement the concrete level of data abstraction, languages like Python provides a compound structure called Pair which is made up of list or Tuple.

(ii) The first way to implement pairs is with the List construct.

5. Write a note on pair datatype.

Ans. (i) A pair is a compound data type that holds two other pieces of data. The two ways of representing the pair data type.

(ii) The first way is using List construct and the second way to implement pairs is with the tuple construct.

6. Write a pseudocode to depressant rational numbers using list.

Ans.

```
rational(n, d):
    return [n, d]
numer(x):
    return x[0]
denom(x):
    return x[1]
```

7. How a class defines a data abstraction?

Ans. (i) A class defines a data abstraction by grouping related data items. A class is not just data, it has functions defined within it.

(ii) Functions are subordinate to the class because their job is to do things with the data of the class.

8. From the statement P1 : = Preson(), What does P1 and person referred.

Ans. Person is referred to as a class or a type, while p1 is referred to as an object or an instance.

9. How the elements of a list can be accessed?

Ans. (i) The elements of a list can be accessed in two ways.

(ii) The first way is via multiple assignment and the second method is by the element selection operator.

SHORT ANSWERS 3 MARKS

1. Identify the constructor and selector from the following.

(i) City = Make city (name, lat, lon)

(ii) Get name (city)

(iii) Make point (x,y)

(iv) x coord (point)

(v) y coord (point)

Ans. (i) Constructor

(ii) Selector

(iii) Constructor

(iv) Selector

(v) Selector

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2. Write a note on Data Abstraction.

Ans. **(i)** Data abstraction is supported by defining an abstract data type (ADT), which is a collection of constructors and selectors.

(ii) Constructors create an object, bundling together different pieces of information, while selectors extract individual pieces of information from the object.

3. Give an example of an ADT for rational numbers.

Ans. **An ADT for rational numbers :**

- - constructor

- - constructs a rational number with numerator n, denominator d

rational(n, d)

- - selector

numer(x) → returns the numerator of rational number x

denom(y) → returns the denominator of rational number y

Long Answers **5 MARKS**

1. Explain the representation of Abstract datatype using rational numbers.

Ans. **(i)** The basic idea of data abstraction is to structure programs so that they operate on abstract data. That is, our programs should use data in such a way, as to make as few assumptions about the data as possible.

(ii) At the same time, a concrete data representation is defined as an independent part of the program.

(iii) Any program consist of two parts. The two parts of a program are, the part that operates on abstract data and the part that defines a concrete representation, is connected by a small set of functions that implement abstract data in terms of the concrete representation.

(iv) To illustrate this technique, let us consider an example to design a set of functions for manipulating rational numbers.

(v) **Example :** A rational number is a ratio of integers, and rational numbers constitute an important sub-class of real numbers. A rational number such as 8/3 or 19/23 is typically written as :

<numerator>/<denominator>

(vi) where both the <numerator> and <denominator> are placeholders for integer values. Both parts are needed to exactly characterize the value of the rational number. Actually dividing integers produces a float approximation, losing the exact precision of integers.

(vii) However, you can create an exact representation for rational numbers by combining together the numerator and denominator.

(viii) As we know from using functional abstractions, we can start programming productively before you have an implementation of some parts of our program.

(ix) Let us begin by assuming that you already have a way of constructing a rational number from a numerator and a denominator. You also assume that, given a rational number, you have a way of selecting its numerator and its denominator component.

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CHAPTER 3

SCOPING

CHAPTER SNAPSHOT

EVALUATION

PART - I

CHOOSE THE BEST ANSWER (1 MARK)

1. Which of the following refers to the visibility of variables in one part of a program to another part of the same program.
(a) Scope (b) Memory
(c) Address (d) Accessibility
[Ans. (a) Scope]

2. The process of binding a variable name with an object is called
(a) Scope (b) Mapping
(c) late binding (d) early binding
[Ans. (b) Mapping]

3. Which of the following is used in programming languages to map the variable and object?
(a) :: (b) := (c) = (d) ==
[Ans. (c) =]

4. Containers for mapping names of variables to objects is called
(a) Scope (b) Mapping
(c) Binding (d) Namespaces
[Ans. (d) Namespaces]

5. Which scope refers to variables defined in current function?
(a) Local Scope (b) Global scope
(c) Module scope (d) Function Scope
[Ans. (a) Local Scope]

6. The process of subdividing a computer program into separate sub-programs is called
(a) Procedural Programming
(b) Modular programming
(c) Event Driven Programming
(d) Object oriented Programming
[Ans. (b) Modular programming]

7. Which of the following security technique that regulates who can use resources in a computing environment?
(a) Password (b) Authentication
(c) Access control (d) Certification
[Ans. (c) Access control]

8. Which of the following members of a class can be handled only from within the class?
(a) Public members
(b) Protected members
(c) Secured members
(d) Private members
[Ans. (a) Public members]

9. Which members are accessible from outside the class?
(a) Public members
(b) Protected members
(c) Secured members
(d) Private members
[Ans. (a) Public members]

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10. The members that are accessible from within the class and are also available to its sub-classes is called

(a) Public members
(b) Protected members
(c) Secured members
(d) Private members

[Ans. (b) Protected members]

PART - II

ANSWER THE FOLLOWING QUESTIONS (2 MARKS)

1. What is a scope?

Ans. Scope refers to the visibility of variables, parameters and functions in one part of a program to another part of the same program.

2. Why scope should be used for variable. State the reason.

Ans. Scobe should be used for a variable because every part of the program can access the variable.

3. What is Mapping?

Ans. The process of binding a variable name with an object is called mapping.= (equal to sign) is used in programming languages to map the variable and object.

4. What do you mean by Namespaces?

Ans. Namespaces are containers for mapping names of variables to objects.

5. How Python represents the private and protected Access specifiers?

Ans. Python prescribes a convention of prefixing the name of the variable/method with single or double underscore to emulate the behaviour of protected and private access specifiers.

PART - III

ANSWER THE FOLLOWING QUESTIONS (3 MARKS)

1. Define Local scope with an example.

Ans. (i) Local scope refers to variables defined in current function. Always, a function will first look up for a variable name in its local scope.

(ii) Only if it does not find it there, the outer scopes are checked.

(iii) Look at this example :

1. Disp(): 2. a:=7 3. print a 4. Disp()	Entire program Disp( ): a:=7 print a Disp ( )	Output of the Program 7

(iv) On execution of the above code the variable a displays the value 7, because it is defined and available in the local scope.

2. Define Global scope with an example.

Ans. (i) A variable which is declared outside of all the functions in a program is known as Global variable.

(ii) This means, global variable can be accessed inside or outside of all the functions in a program. Consider the following example

1. a:=10 2. Disp(): 3. a:=7 4. print a 5. Disp() 6. print a	Entire program a:=10 Disp( ) a:=7 print a Disp 1( ): print a	Output of the Program 7 10

(iii) On execution of the above code the variable a which is defined inside the function displays the value 7 for the function call Disp() and then it displays 10, because a is defined in global scope.

3. Define Enclosed scope with an example.

Ans. (i) All programming languages permit functions to be nested. A function (method) within another function is called nested function.

(ii) A variable which is declared inside a function which contains another function definition with in it, the inner function can also access the variable of the outer function. This scope is called enclosed scope.

(iii) When a compiler or interpreter search for a variable in a program, it first searches Local, and then searches Enclosing scopes. Consider the following example

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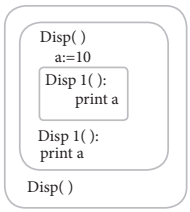
1. Disp(): 2. a:=10 3. Disp1(): 4. print a 5. Disp1() 6. print a 7. Disp()	Entire program 	Output of the Program 10 10

4. Why access control is required?

Ans. **(i)** Access control is a security technique that regulates who or what can view or use resources in a computing environment.

(ii) It is a fundamental concept in security that minimizes risk to the object.

5. Identify the scope of the variables in the following pseudo code and write its output

```
color:= Red
mycolor():
b:=Blue
lue
myfavcolor():
    g:=Green
    printcolor, b, g
    myfavcolor()
    printcolor, b
mycolor()
print color
```

Ans. color : =Red – global scope
b:=Blue – local scope
g:=Green – Enclosed scope

PART - IV

ANSWER THE FOLLOWING QUESTIONS

(5 MARKS)

1. Explain the types of scopes for variable or LEGB rule with example.

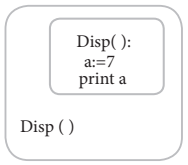
Ans. **Types of Variable Scope :**

There are 4 types of Variable Scope, let's discuss them one by one:

Local Scope :

(i) Local scope refers to variables defined in current function. Always, a function will first look up for a variable name in its local scope. Only if it does not find it there, the outer scopes are checked.

Look at this example

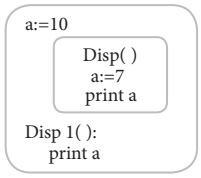
1. Disp(): 2. a:=7 3. print a 4. Disp()	Entire program 	Output of the Program 7

(ii) On execution of the above code the variable a displays the value 7, because it is defined and available in the local scope.

Global Scope:

(i) A variable which is declared outside of all the functions in a program is known as global variable.

(ii) This means, global variable can be accessed inside or outside of all the functions in a program. Consider the following example

1. a:=10 2. Disp(): 3. a:=7 4. print a 5. Disp() 6. print a	Entire program 	Output of the Program 7 10

(iii) On execution of the above code the variable 'a' which is defined inside the function displays the value 7 for the function call Disp() and then it displays 10, because a is defined in global scope.

Enclosed Scope :

(i) All programming languages permit functions to be nested. A function (method) with in another function is called nested function.

(ii) A variable which is declared inside a function which contains another function definition with in it, the inner function can also access the variable of the outer function. This scope is called enclosed scope.

(iii) When a compiler or interpreter search for a variable in a program, it first search Local, and then search Enclosing scopes. Consider the following example

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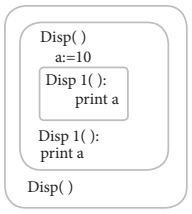
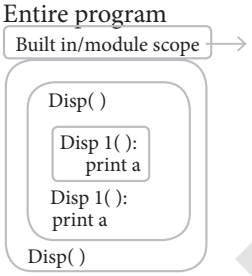
1. Disp(): 2. a:=10 3. Disp1(): 4. print a 5. Disp1() 6. print a 7. Disp()	Entire program  	Output of the Program 10 10

(iv) In the above example Disp1() is defined with in Disp(). The variable 'a' defined in Disp() can be even used by Disp1() because it is also a member of Disp().

Built-in Scope :

(i) Finally, we discuss about the widest scope. The built-in scope has all the names that are pre-loaded into the program scope when we start the compiler or interpreter.

(ii) Any variable or module which is defined in the library functions of a programming language has Built-in or module scope. They are loaded as soon as the library files are imported to the program.

Entire program  	Library files associated with the software

LEGB rule :

(i) Scope also defines the order in which variables have to be mapped to the object in order to obtain the value.

(ii) Let us take a simple example as shown below:

```
1. x:= 'outer x variable'
2. display():
3.     x:= 'inner x variable'
4.     print x
5. display()
```

(iii) When the above statements are executed the statement (4) and (5) display the result as

Output :

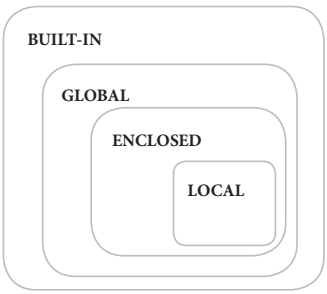
```
outer x variable
inner x variable
```

(i) Above statements give different outputs because the same variable name 'x' resides in different scopes, one inside the function display() and the other in the upper level. The value **'outer x variable'** is printed when x is referenced outside the function definition.

(ii) Whereas when display() gets executed, **'inner x variable'** is printed which is the x value inside the function definition. From the above example, we can guess that there is a rule followed, in order to decide from which scope a variable has to be picked.

(iii) The **LEGB** rule is used to decide the order in which the scopes are to be searched for scope resolution. The scopes are listed below in terms of hierarchy (highest to lowest).

Local(L)	Defined inside function/ class
Enclosed(E)	Defined inside enclosing functions (Nested function concept)
Global(G)	Defined at the uppermost level
Built-in(B)	Reserved names in built-in functions (modules)



2. Write any Five Characteristics of Modules.

Ans. The following are the desirable characteristics of a module.

(i) Modules contain instructions, processing logic, and data.

(ii) Modules can be separately compiled and stored in a library.

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(iii) Modules can be included in a program.
(iv) Module segments can be used by invoking a name and some parameters.
(v) Module segments can be used by other modules.

3. Write any five benefits in using modular programming.

Ans. (i) Less code to be written.
(ii) A single procedure can be developed for reuse, eliminating the need to retype the code many times.
(iii) Programs can be designed more easily because a small team deals with only a small part of the entire code.
(iv) Modular programming allows many programmers to collaborate on the same application.
(v) The code is stored across multiple files.
(vi) Code is short, simple and easy to understand.
(vii) Errors can easily be identified, as they are localized to a subroutine or function.
(viii) The same code can be used in many applications.
(ix) The scoping of variables can easily be controlled.

ADDITIONAL QUESTIONS AND ANSWERS

CHOOSE THE CORRECT ANSWER — 1 MARK

1. The part of a program that can see or use the variables are called
(a) Scope (b) Parameter
(c) Function (d) Indentation
[Ans. (a) Scope]

2. Which of the following refers to the addresses to an object in memory?
(a) Functions (b) Indentation
(c) Variables (d) Operators
[Ans. (b) Indentation]

3. How many variables can be mapped to the same instance?
(a) 2 (b) 3
(c) 4 (d) Multiple
[Ans. (d) Multiple]

4. Which of the following keeps track of all these mappings with namespaces?
(a) Programming languages
(b) Application software
(c) System software
(d) My SQL
[Ans. (a) Programming languages]

5. How the names are mapped with objects in programming language?
(a) name == object (b) name :: object
(c) name := object (d) object := name
[Ans. (c) name := object]

6. The order in which variables have to be mapped to the object in order to obtain the value is called
(a) Rule (b) Syntax
(c) Scope (d) Hierarchy
[Ans. (c) Scope]

7. Which of the following rule is used to decide the order in which the scopes are to be searched for scope resolution?
(a) LEGB (b) LGEB
(c) LBEG (d) LGBE
[Ans. (a) LEGB]

8. Write the below interns of hierarchy (highest to lowest)?
(1) Reversed names in built in functions
(2) Defined inside function
(3) Defined inside enclosing function
(4) Defined at the uppermost level
(a) 3, 2, 1, 4 (b) 1, 4, 2, 3
(c) 2, 3, 1, 4 (d) 2, 3, 4, 1
[Ans. (d) 2, 3, 4, 1]

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9. How many types of variable scope are there?
(a) 2 (b) 4 (c) 3 (d) 6
[Ans. (b) 4]

10. Which of the following is not a variable scope?
(a) Global (b) Enclosed
(c) List (d) Built-in
[Ans. (c) List]

11. Choose the type of scope for a variable 'a' defined in the following program.

```
Disp () :
a : = 7
Print a
Disp ()
```

(a) Global (b) Enclosed
(c) Local (d) Built-in
[Ans. (c) Local]

12. A variable which is declared outside all the functions in a program is known as
(a) Local (b) Enclosed
(c) Extern (d) Global
[Ans. (d) Global]

13. Which of the following variable can be accessed inside or outside of all the functions in a program?
(a) Local (b) Global
(c) Enclosed (d) Built-in
[Ans. (b) Global]

14. What is the output of the statement in the following program?

```
X : = 10
Disp () :
a : = 7
print a
Displ () :
Print a
```

(a) 710 (b) 107
(c) 7 (d) 10
[Ans. (d) 10]

15. Which of the following can ease the job of programming and debugging the program?
(a) Statements (b) Interaction
(c) Modules (d) Scopes
[Ans. (c) Modules]

16. Which of the following programming enables programmers to divide up the work and retry pieces of the program independently?
(a) Modular Programming
(b) Procedural Programming
(c) Object Oriented Programming
(d) Structural Programming
[Ans. (a) Modular Programming]

17. The example of modules are
(a) Procedures (b) Subroutines
(c) Functions (d) All of these
[Ans. (d) All of these]

18. Which of the following contain instructions, processing logic and data?
(a) Scopes (b) Modules
(c) Indentation (d) Access control
[Ans. (b) Modules]

19. The following are the type of variable scopes Find the odd one out
(a) Local
(b) Enclosed
(c) Global
(d) Protected
[Ans. (d) Protected]

20. Which of the following members of a class are denied access from outside the class?
(a) Private (b) Protected
(c) Public (d) Enclosed
[Ans. (a) Private]

21. Which of the following is not a classical object oriented language?
(a) C++ (b) Java
(c) Python (d) C **[Ans. (d) C]**

22. Which of the following keywords are not used to control the access to class members?
(a) Public (b) Protected
(c) Public (d) Global
[Ans. (d) Global]

23. How many access control keywords are there?
(a) 2 (b) 3 (c) 4 (d) 6
[Ans. (b) 3]

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24. **Find the odd man out**
(a) Public (b) Local
(c) Protected (d) Private
[Ans. (b) Local]

25. **The arrangement of private instance variables and public methods ensures the principle of**
(a) Inheritance (b) Polymorphism
(c) Encapsulation (d) Abstraction
[Ans. (c) Encapsulation]

26. **Which of the following members of a class are accessible from within the class and available to its subclass?**
(a) Private (b) Protected
(c) Public (d) All of these
[Ans. (b) Protected]

27. **By default, the Python. class members are**
(a) Private (b) Protected
(c) Global (d) Public
[Ans. (d) Public]

28. **By default, the C++ and Java class members are**
(a) Private
(b) Protected
(c) Public
(d) Local
[Ans. (a) Private]

29. **Programs are composed of one or more independently developed**
(a) Access control
(b) Encapsulation
(c) Modules
(d) Members of a class **[Ans. (c) Modules]**

CHOOSE AND FILL IN THE BLANKS

1. **Scope refers to the visibility of _____**
(a) Variables (b) Parameters
(c) Functions (d) All of these
[Ans. (d) All of these]

2. **Fill up the blank in assign a variable with _____ to an object.**
(a) = (b) ! =
(c) : = (d) = =
[Ans. (c) Multiple]

3. **The duration for which a variable is alive is called its _____.**
(a) End time (b) Life time
(c) Scope time (d) Visible time
[Ans. (b) Life time]

4. **The scope of a _____ is that part of the code where it is visible.**
(a) Keyword (b) Variable
(c) Function (d) Operator
[Ans. (b) Variable]

5. **A Function always first look up for a variable name in its _____ scope.**
(a) Local (b) Enclosed
(c) Global (d) Built-in
[Ans. (a) Local]

6. **The inner function can access the variable of the outer function. This is called _____ scope.**
(a) Local (b) Function
(c) Enclosed (d) Global
[Ans. (c) Enclosed]

7. **_____ can be separately compiled and stored in a library.**
(a) Characteristics (b) Syntax
(c) Modules (d) none of these
[Ans. (c) Modules]

8. **In Object Oriented Programming Language security is implanted through _____**
(a) Access modifiers (b) Access modules
(c) Access variables (d) Keywords
[Ans. (a) Access modifiers]

9. **_____ is a selective restriction of access to data in a program?**
(a) Control variable
(b) System authentication
(c) Access control (d) Modules
[Ans. (c) Access control]

10. **_____ members of the class are accessible from outside the class.**
(a) Private (b) Protected
(c) Public (d) All of these
[Ans. (c) Public]

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Choose the correct statement

1. Choose the correct statement from the following.

(i) A Program cannot be divided into modules that work together to get the output.
(ii) Modules can be separately compiled and stored in a library.
(iii) Procedure, subroutines and functions are not examples of modules.
(iv) Modules contain instructions, logic and data

(a) i and ii (b) ii and iii
(c) iii and iv (d) ii and iv

[Ans. (d) ii and iv]

Choose the incorrect statement

1. Choose the incorrect statement from the following.

(i) There a different types of variable scope
(ii) Enclosed and extended are the type of variable scope
(iii) A variable is declared outside of all the function is called global variable
(iv) Built-in Scope is also called Module scope.

(a) i, iii and iv (b) ii and iii
(c) i and ii (d) iii only

[Ans. (c) i and ii]

Very Short Answers — 2 MARKS

1. Define variable.

Ans. Variable are addresses (references, or pointers), to an object in memory.

2. What is the use of LEGB rule?

Ans. The LEGB rule is used to decide the order in which the scopes are to be searched for scope resolution. The scopes are listed below in terms of hierarchy (highest to lowest).

3. Name the types of variable scope.

Ans. **(i)** Local scope
(ii) Enclosed scope
(iii) Global scope
(iv) Built-in scope.

4. Write the output of the following program.

Ans.

Entire program	Output of the Program
Disp( ): a:=7 print a Disp ( )	7

5. Write the output of the following program.

Ans.

Entire program	Output of the Program
a:=10 Disp( ) a:=7 print a Disp 1( ): print a	7 10

6. Write the output of the following program.

Ans.

Entire program	Output of the Program
Disp( ) a:=10 Disp 1( ): print a Disp 1( ): print a Disp( )	10 10

7. What is modular programming?

Ans. The process of subdividing a computer program into separate sub-programs is called modular programming.

8. What is meant by module?

Ans. A module is a part of a program. Programs are composed of one or more independently developed modules.

Short Answers — 3 MARKS

1. How the changes inside the function can't affect the variable on the outside of the function in unexpected ways?

Ans. **(i)** Every variable defined in a program has global scope.

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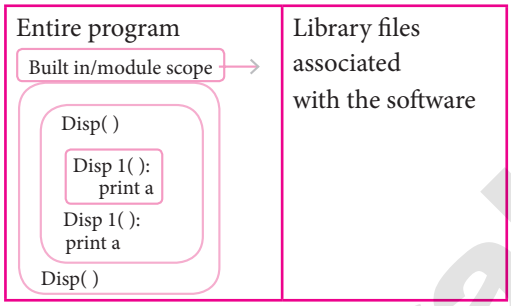
(ii) Once defined, every part of your program can access that variable. But it is a good practice to limit a variable's scope to a single definition.

(iii) This way, changes inside the function can't affect the variable on the outside of the function in unexpected ways.

2. Write a note on built-in scope.

Ans. (i) Built-in scope is the widest scope. The built-in scope has all the names that are pre-loaded into the program scope when we start the compiler or interpreter.

(ii) Any variable or module which is defined in the library functions of a programming language has Built-in or module scope. They are loaded as soon as the library files are imported to the program.



(iii) Normally only Functions or modules come along with the software, as packages, therefore they will come under Built in scope.

3. Write a note on module.

Ans. (i) A module is a part of a program. Programs are composed of one or more independently developed modules. A single module can contain one or several statements closely related each other.

(ii) Modules work perfectly on individual level and can be integrated with other modules. A software program can be divided into modules to ease the job of programming and debugging as well.

(iii) A program can be divided into small functional modules that work together to get the output. The process of subdividing a computer program into separate sub-programs is called Modular programming.

(iv) Modular programming enables programmers to divide up the work and debug pieces of the program independently. The examples of modules are procedures, subroutines, and functions.

4. How will you ensure the principle of data encapsulation in object – oriented programming?

Ans. Public members (generally methods declared in a class) are accessible from outside the class. The object of the same class is required to invoke a public method. This arrangement of private instance variables and public methods ensures the principle of data encapsulation.

5. Write a note on access modifiers of a class.

Ans. (i) Public members (generally methods declared in a class) are accessible from outside the class.

(ii) Protected members of a class are accessible from within the class and are also available to its sub-classes.

(iii) Private members of a class are denied access from outside the class. They can be handled only from within the class.

6. Write a short note on types of variable scope.

Ans. (i) Public members (generally methods declared in a class) are accessible from outside the class.

(ii) A variable which is declared outside of all the functions in a program is known as global variable.

(iii) A variable which is declared inside a function which contains another function definition with in it, the inner function can also access the variable of the outer function. This scope is called enclosed scope.

(iv) Built-in scope the widest scope has all the names that are pre-loaded into program scope when we start the compiler or interpreter.

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Long Answers 5 MARKS

1. Explain the concept access control.

Ans.

(i) Access control is a security technique that regulates who or what can view or use resources in a computing environment.

(ii) It is a fundamental concept in security that minimizes risk to the object.

(iii) In other words access control is a selective restriction of access to data. IN Object oriented programming languages it is implemented through access modifiers.

(iv) Classical object-oriented languages, such as C++ and Java, control the access to class members by public, private and protected keywords.

(v) Private members of a class are denied access from the outside the class. They can be handled only from within the class.

(vi) Public members (generally methods declared in a class) are accessible from outside the class. The object of the same class is required to invoke a public method. This arrangement of private instance variables and public methods ensures the principle of data encapsulation.

(vii) Protected members of a class are accessible from within the class and are also available to its sub-classes. No other process is permitted access to it. This enables specific resources of the parent class to be inherited by the child class.

(viii) Python doesn't have any mechanism that effectively restricts access to any instance variable or method. Python prescribes a convention of prefixing the name of the variable or method with single or double underscore to emulate the behaviour of protected and private access specifiers.

(ix) All members in a Python class are public by default, whereas by default in C++ and java they are private. Any member can be accessed from outside the class environment in Python which is not possible in C++ and java.

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CHAPTER 4

ALGORITHMIC STRATEGIES

CHAPTER SNAPSHOT

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EVALUATION

PART - I

CHOOSE THE BEST ANSWER (1 MARK)

1. The word comes from the name of a Persian mathematician Abu Ja'far Mohammed ibn-i Musa al Khowarizmi is called?
(a) Flowchart (b) Flow
(c) Algorithm (d) Syntax
[Ans. (c) Algorithm]

2. From the following sorting algorithms which algorithm needs the minimum number of swaps?
(a) Bubble sort (b) Quick sort
(c) Merge sort (d) Selection sort
[Ans. (d) Selection sort]

3. Two main measures for the efficiency of an algorithm are
(a) Processor and memory
(b) Complexity and capacity
(c) Time and space (d) Data and space
[Ans. (c) Time and space]

4. The complexity of linear search algorithm is
(a) O(n) (b) O(log n)
(c) O(n2) (d) O(n log n)
[Ans. (a) O(n)]

5. From the following sorting algorithms which has the lowest worst case complexity?
(a) Bubble sort (b) Quick sort
(c) Merge sort (d) Selection sort
[Ans. (c) Merge sort]

6. Which of the following is not a stable sorting algorithm?
(a) Insertion sort (b) Selection sort
(c) Bubble sort (d) Merge sort
[Ans. (b) Selection sort]

7. Time complexity of bubble sort in best case is
(a) θ (n) (b) θ (nlogn)
(c) θ (n2) (d) θ (n(logn) 2)
[Ans. (a) θ (n)]

8. The Θ notation in asymptotic evaluation represents
(a) Base case (b) Average case
(c) Worst case (d) NULL case
[Ans. (b) Average case]

9. If a problem can be broken into subproblems which are reused several times, the problem possesses which property?
(a) Overlapping subproblems
(b) Optimal substructure
(c) Memoization
(d) Greedy
[Ans. (a) Overlapping subporblems]

10. In dynamic programming, the technique of storing the previously calculated values is called ?
(a) Saving value property
(b) Storing value property
(c) Memoization
(d) Mapping **[Ans. (c) Memoization]**

PART - II

ANSWER THE FOLLOWING QUESTIONS (2 MARKS)

1. What is an Algorithm?

Ans. An algorithm is a finite set of instructions to accomplish a particular task. It is a step-by-step procedure for solving a given problem.

2. Define Pseudo code.

Ans. (i) Pseudo code is an informal high level description of the operations principle of a computer program or other algorithm.

(ii) It uses the structural conventions of a normal programming language, but is intended for human reading rather than machine reading.

3. Who is an Algorist?

Ans. (i) Algorism is the technique of performing basic arithmetic by writing numbers in place value form and applying a set of memorized rules and facts to the digits.

(ii) One who practices algorism is known as an algorist.

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4. What is Sorting?

Ans. Sorting is any process of arranging information or data in an ordered sequence either in ascending or descending order.

5. What is searching? Write its types.

Ans. Searching is designed to check for an element or retrieve an element from any data structure where it is store(d)

Types :

(i) Linear Search

(ii) Binary Search.

PART - III

ANSWER THE FOLLOWING QUESTIONS (3 MARKS)

1. List the characteristics of an algorithm.

Ans. (i) Input
(ii) Output
(iii) Finiteness
(iv) Definiteness
(v) Effectiveness
(vi) Correctness
(vii) Simplicity
(viii) Unambiguous
(ix) Feasibility
(x) Portable
(xi) Independent

2. Discuss about Algorithmic complexity and its types.

Ans. The complexity of an algorithm f (n) gives the running time and/or the storage space required by the algorithm in terms of n as the size of input data.

(i) **Time Complexity :** The Time complexity of an algorithm is given by the number of steps taken by the algorithm to complete the process.

(ii) **Space Complexity :** Space complexity of an algorithm is the amount of memory required to run to its completion.

3. What are the factors that influence time and space complexity?

Ans. (i) **Time Factor** -Time is measured by counting the number of key operations like comparisons in the sorting algorithm.

(ii) **Space Factor** - Space is measured by the maximum memory space required by the algorithm.

4. Write a note on Asymptotic notation.

Ans. Asymptotic Notations are languages that uses meaningful statements about time and space complexity. The following three asymptotic notations are mostly used to represent time complexity of algorithms:

(i) **Big O :** Big O is often used to describe the worst-case of an algorithm.

(ii) **Big Ω :** Big Omega is the reverse Big O, if Bi O is used to describe the upper bound (worst - case) of a asymptotic function, Big Omega is used to describe the lower bound (best-case).

(iii) **Big Θ :** When an algorithm has a complexity with lower bound = upper bound, say that an algorithm has a complexity O (n log n) and Ω (n log n), it's actually has the complexity Θ (n log n), which means the running time of that algorithm always falls in n log n in the best-case and worst-case.

5. What do you understand by Dynamic programming?

Ans. (i) Dynamic programming is an algorithmic design method that can be used when the solution to a problem can be viewed as the result of a sequence of decisions.

(ii) Dynamic programming approach is similar to divide and conquer. The given problem is divided into smaller and yet smaller possible sub-problems.

(iii) Dynamic programming is used whenever problems can be divided into similar sub-problems. So that their results can be re-used to complete the process.

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(iv) Dynamic programming approaches are used to find the solution in optimized way. For every inner sub problem, dynamic algorithm will try to check the results of the previously solved sub-problems. The solutions of overlapped sub-problems are combined in order to get the better solution.

PART - IV

ANSWER THE FOLLOWING QUESTIONS

(5 MARKS)

1. Explain the characteristics of an algorithm.

Ans.

Input	Zero or more quantities to be supplied.
Output	Al least one quantity is produced.
Finiteness	Algorithms must terminate after finites number of steps.
Definiteness	all operations should be well defined. For example operations involving division by zero or taking square root for negative number are unacceptable.
Effectiveness	Every instruction must be carried out effectively.
Correctness	The algorithms should be error free.
Simplicity	East to implement.
Unambiguous	Algorithm should be clear and unambiguous. Each of its steps and their inputs/outputs should be clear and must lead to only one meaning.
Feasibility	Should be feasible with the available resources.
Portable	An algorithm should be generic, independent of any programming language or an operating system able to handle all range of inputs.
Independent	An algorithm should have step-by-step directions, which should be independent of any programming code.

2. Discuss about Linear search algorithm.

Ans. **(i)** Linear search also called sequential search is a sequential method for finding a particular value in a list.

(ii) This method checks the search element with each element in sequence until the desired element is found or the list is exhausted. In this searching algorithm, list need not be ordered.

Pseudo code :

(i) Traverse the array using for loop

(ii) In every iteration, compare the target search key value with the current value of the list.

If the values match, display the current index and value of the array

If the values do not match, move on to the next array element.

(iii) If no match is found, display the search element not found.

To search the number 25 in the array given below, linear search will go step by step in a sequential order starting from the first element in the given array if the search element is found that index is returned otherwise the search is continued till the last index of the array. In this example number 25 is found at index number 3.

index	**0**	**1**	**2**	**3**	**4**
values	**10**	**12**	**20**	**25**	**30**

Example 1 :

Input: values[] = {5, 34, 65, 12, 77, 35}

target = 77

Output: 4

Example 2:

Input: values[] = {101, 392, 1, 54, 32, 22, 90, 93}

target = 200

Output: -1 (not found)

3. What is Binary search? Discuss with example.

Ans. **Binary search :** Binary search also called half-interval search algorithm. It finds the position of a search element within a sorted array. The binary search algorithm can be done as divide-and-conquer search algorithm and executes in logarithmic time.

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Pseudo code for Binary search :

Start with the middle element:

(i) If the search element is equal to the middle element of the array i.e., the middle value = number of elements in array/2, then return the index of the middle element.

(ii) If not, then compare the middle element with the search value,

(iii) If the search element is greater than the number in the middle index, then select the elements to the right side of the middle index, and go to Step-1.

(iv) If the search element is less than the number in the middle index, then select the elements to the left side of the middle index, and start with Step-1.

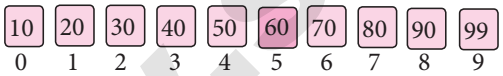
(v) When a match is found, display success message with the index of the element matched.

(vi) If no match is found for all comparisons, then display unsuccessful message.

Binary Search Working principles :

(i) List of elements in an array must be sorted first for Binary search. The following example describes the step by step operation of binary search.

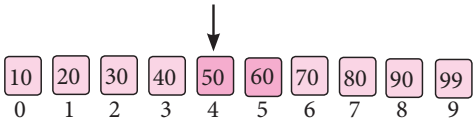
(ii) Consider the following array of elements, the array is being sorted so it enables to do the binary search algorithm. Let us assume that the search element is 60 and we need to search the location or index of search element 60 using binary search.



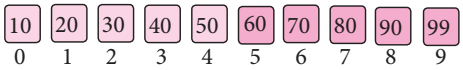
(iii) First, we find index of middle element of the array by using this formula :

mid = low + (high - low) / 2

(iv) Here it is, 0 + (9 - 0) / 2 = 4 (fractional part ignored). So, 4 is the mid value of the array.



(v) Now compare the search element with the value stored at mid value location 4. The value stored at location or index 4 is 50, which is not match with search element. As the search value 60 is greater than 50.

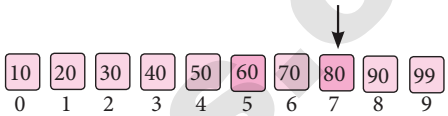


(vi) Now we change our low to mid + 1 and find the new mid value again using the formula.

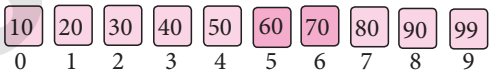
low to mid + 1

mid = low + (high - low) / 2

(vii) Our new mid is 7 now. We compare the value stored at location 7 with our target value 31.



(viii) The value stored at location or index 7 is not a match with search element, rather it is more than what we are looking for. So, the search element must be in the lower part from the current mid value location

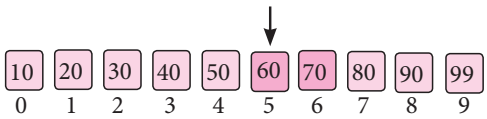


(ix) The search element still not found. Hence, we calculated the mid again by using the formula.

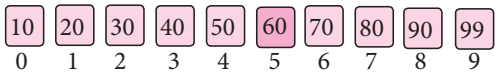
high = mid -1

mid = low + (high - low)/2

Now the mid value is 5.



(x) Now we compare the value stored at location 5 with our search element. We found that it is a match.



(xi) We can conclude that the search element 60 is found at location or index 5. For example if we take the search element as 95, For this value this binary search algorithm return unsuccessful result.

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4. Explain the Bubble sort algorithm with example.

Ans. **Bubble sort algorithm:**

(i) Bubble sort is a simple sorting algorithm. The algorithm starts at the beginning of the list of values stored in an array. It compares each pair of adjacent elements and swaps them if they are in the unsorted order.

(ii) This comparison and passed to be continued until no swaps are needed, which indicates that the list of values stored in an array is sorted. The algorithm is a comparison sort, is named for the way smaller elements "bubble" to the top of the list.

(iii) Although the algorithm is simple, it is too slow and less efficient when compared to insertion sort and other sorting methods.

(iv) Assume list is an array of n elements. The swap function swaps the values of the given array elements.

Pseudo code :

(i) Start with the first element i.e., index = 0, compare the current element with the next element of the array.

(ii) If the current element is greater than the next element of the array, swap them.

(iii) If the current element is less than the next or right side of the element, move to the next element. Go to Step 1 and repeat until end of the index is reached.

(iv) Let's consider an array with values {15, 11, 16, 12, 14, 13} Below, we have a pictorial representation of how bubble sort will sort the given array.

15>11 So interchange	15	11	16	12	14	13
15>16 No swapping	15	11	16	12	14	13
16>12 So interchange	11	15	16	12	14	13
16>14 So interchange	11	15	12	16	14	13
16>13 So interchange	11	15	12	14	16	13
	11	15	12	14	13	16

(v) The above pictorial example is for iteration–1. Similarly, remaining iteration can be done. The final iteration will give the sorted array. At the end of all the iterations we will get the sorted values in an array as given below :

11	12	13	14	15	16

5. Explain the concept of Dynamic programming with suitable example.

(i) Dynamic programming is an algorithmic design method that can be used when the solution to a problem can be viewed as the result of a sequence of decisions.

(ii) Dynamic programming approach is similar to divide and conquer. The given problem is divided into smaller and yet smaller possible sub-problems.

(iii) Dynamic programming is used whenever problems can be divided into similar sub-problems. so that their results can be re-used to complete the process.

(iv) Dynamic programming approaches are used to find the solution in optimized way. For every inner sub problem, dynamic algorithm will try to check the results of the previously solved sub-problems.

(v) The solutions of overlapped sub-problems are combined in order to get the better solution.

Steps to do Dynamic programming :

(i) The given problem will be divided into smaller overlapping sub-problems.

(ii) An optimum solution for the given problem can be achieved by using result of smaller sub-problem.

(iii) Dynamic algorithms uses Memoization.

Fibonacci Series – An example :

(i) Fibonacci series generates the subsequent number by adding two previous numbers. Fibonacci series starts from two numbers – Fib 0 & Fib 1. The initial values of Fib 0 & Fib 1 can be taken as 0 and 1.

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(ii) Fibonacci series satisfies the following conditions :

$Fibn = Fib_{n-1} + Fib_{n-2}$

(iii) Hence, a Fibonacci series for the n value 8 can look like this

$Fib_8 = 0\ 1\ 1\ 2\ 3\ 5\ 8\ 13$

Fibonacci Iterative Algorithm with Dynamic programming approach : The following example shows a simple Dynamic programming approach for the generation of Fibonacci series.

Initialize f0=0, f1 =1

step-1: Print the initial values of Fibonacci f0 and f1

step-2: Calculate fibanocci fib ← f0 + f1

step-3: Assign f0← f1, f1← fib

step-4: Print the next consecutive value of fibanocci fib

step-5: Goto step-2 and repeat until the specified number of terms generated

For example if we generate fibobnacci series upto 10 digits, the algorithm will generate the series as shown below:

The Fibonacci series is : 0 1 1 2 3 5 8 13 21 34 55.

ADDITIONAL QUESTIONS AND ANSWERS

CHOOSE THE CORRECT ANSWER 1 MARK

1. Which of the following is a finite set of instructions to accomplish a particular task?

(a) Flowchart (b) Functions
(c) Algorithm (d) Abstraction

[Ans. (c) Algorithm]

2. Which of the following are the characteristics of an algorithm?

(i) Definiteness
(ii) Correctness
(iii) Effectiveness

(a) i, ii (b) ii, iii
(c) Only ii (d) i, ii and iii

[Ans. (d) i, ii and iii]

3. Which of the following is not a characteristic of an algorithm?

(a) Definiteness (b) Correctness
(c) Data structure (d) Effectiveness

[Ans. (c) Data structure]

4. Which of the following is not an example of data structures?

(a) Control statement (b) Structure
(c) List (d) Dictionary

[Ans. (a) Control statement]

5. Which of the following is an example of data structures?

(a) List (b) Tuple
(c) Dictionary (d) All of these.

[Ans. (d) All of these]

6. Which of the following is not a type of searching technique?

(i) Linear (ii) Binary
(iii) Selection (iv) Merge
(a) Only i (b) Only ii
(c) Only iii (d) iii and iv

[Ans. (d) iii and iv]

7. Which of the following is not a sorting technique?

(a) Bubble (b) Binary
(c) Insertion (d) Quick

[Ans. (b) Binary]

8. The way of defining an algorithm is called

(a) Pseudo strategy
(b) Programmic strategy
(c) Algorithmic strategy
(d) Data structured strategy

[Ans. (c) Algorithmic strategy]

9. Which characteristics of algorithm defined the operation involving division by zero?

(a) Finiteness (b) Definiteness
(c) Input (d) Correctness

[Ans. (b) Definiteness]

10. Which characteristics of an algorithm should be generic, independent of any programming language?

(a) Independent (b) Portable
(c) Feasibility (d) Unambiguous

[Ans. (b) Portable]

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11. **Which of the following could be designed to get a solution of a given problem?**
(a) Program (b) Algorithm
(c) Flowchart (d) Input/Output
[Ans. (b) Algorithm]

12. **An algorithm that yields expected output for a valid input is called an**
(a) Algorithmic Solution
(b) Algorithmic Structure
(c) Algorithmic Strategy
(d) Algorithmic Procedure
[Ans. (a) Algorithmic Solution]

13. **Performance measurement of an algorithm is called**
(a) Posteriori testing
(b) Priori estimates
(c) Efficiency testing
(d) Algorithmic analysis
[Ans. (a) Posterior testing]

14. **An estimation of the time and space complexities of an algorithm is called**
(a) Algorithmic solution
(b) Algorithmic Strategy
(c) Algorithmic performance
(d) Algorithmic analysis
[Ans. (d) Algorithmic analysis]

15. **Efficiency of an algorithm decided by**
(a) Time, Space
(b) Definiteness, portability
(c) Priori, Postriori
(d) Input/output **[Ans. (a) Time, Space]**

16. **The number of steps taken by the algorithm to complete the process is known as**
(a) Time complexity of an algorithm
(b) Space complexity of an algorithm
(c) Efficiency of an algorithm
(d) Performance analysis of an algorithm
[Ans. (a) Time complexity of an algorithm]

17. **Which of the following should be written for the selected programming language with specific syntax?**
(a) Algorithm (b) Pseudocode
(c) Process (d) Program
[Ans. (d) Program]

18. **The amount of memory required to run an algorithm completion is known by**
(a) Efficiency of an algorithm
(b) Performance analysis of an algorithm
(c) Space complexity of an algorithm
(d) Time complexity of an algorithm
[Ans. (c) Space complexity of an algorithm]

19. **How many components required to find the space required by an algorithm?**
(a) 4 (b) 3 (c) 6 (d) 2
[Ans. (d) 2]

20. **Which of the following component is defined as the total space required to store certain data and variables for an algorithm?**
(a) Time part (b) Variable part
(c) Fixed part (d) Memory part
[Ans. (c) Fixed part]

21. **Which of the following component is defined as the total space required by variables, which sizes depends on the problem and its iteration?**
(a) Variable part (b) Time part
(c) Fixed part (d) Efficiency part
[Ans. (a) Variable part]

22. **Time and Space complexity could be considered for an**
(a) Algorithmic strategy
(b) Algorithmic analysis
(c) Algorithmic solution
(d) Algorithmic efficiency
[Ans. (d) Algorithmic efficiency]

23. **How many factors are used to measure the time efficiency of an algorithm?**
(a) Two (b) Three
(c) Six (d) Many
[Ans. (d) Many]

24. **Which of the following is not a factor use a to measure the time efficiency of an algorithm?**
(a) Speed of the machine
(b) Operating system
(c) Designing algorithm
(d) Programming language
(e) Volume of data required
[Ans. (c) Designing algorithm]

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25. How many asymptotic notations are mostly used to represent time complexity of algorithms?
(a) Three (b) Two
(c) One (d) Many
[Ans. (a) Three]

26. Which of the following notation is often used to describe the worst-case fan algorithm?
(a) Big Ω (b) Big μ
(c) Big O (d) Big α
[Ans. (c) Big O]

27. Which of the following is the reverse of Big O?
(a) Big Ω (b) Big μ
(c) Big symbol (d) Big b
[Ans. (a) Big Ω]

28. 0(1) is an example of
(a) best case
(b) worst case
(c) Average case
(d) Null casd
[Ans. (a) best case]

29. 0(n) is an example of
(a) best case (b) Average case
(c) worst case (d) Null case
[Ans. (c) worst case]

30. Linear search is also called
(a) Sequential search
(b) Quick search
(c) Binary search
(d) Selection search
[Ans. (a) Sequential search]

31. Which of the following method checks the search element with each element in sequence?
(a) Bubble search
(b) Binary search
(c) Linear search
(d) None of these
[Ans. (c) Linear search]

32. Binary search also called
(a) Sequential search
(b) Half-interval search
(c) Unordered search
(d) Full-interval search
[Ans. (b) Half-interval search]

33. Which of the following algorithm finds the position of a search element within a sorted array?
(a) Binary search
(b) Linear search
(c) Sequential search
(d) List search
[Ans. (a) Binary search]

34. Which search algorithm can be done as divide-and-conjurer search algorithm?
(a) Half-interval (b) linear
(c) Sequential (d) Bubble
[Ans. (a) Half-interval]

35. Which of the following search algorithm executes in logarithmic time?
(a) Linear
(b) Sequential
(c) Binary
(d) Half-interval
(e) c or d
[Ans. (e) c or d]

36. Bubble sort is also called
(a) Sequential sort (b) Quick sort
(c) Half-interval sort (d) Comparison sort
[Ans. (d) Comparison sort]

37. Which of the following sorting algorithm is too slow and less efficient?
(a) Bubble (b) Selection
(c) Quick (d) Merge
[Ans. (a) Bubble]

38. Which sorting algorithm compares each pair of adjacent elements and swaps them if they are in the unsorted order?
(a) Selection (b) Merge
(c) Insertion (d) None of these
[Ans. (d) None of these]

39. Which sorting algorithm sort is by making only one exchange for every pass through the list?
(a) Bubble (b) Selection
(c) Comparison (d) Merge
[Ans. (b) Selection]

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40. Which sorting algorithm repeatedly selects the next smallest element and swaps in into the right place for every pass?
(a) Bubble sort (b) Sequential sort
(c) Selection sort (d) Heap sort
[Ans. (c) Selection sort]

41. Which sorting techniques working by taking elements from the list one by one and inserting them in their correct position into a new sorted list?
(a) Bubble (b) Selection
(c) Merge (d) Insertion
[Ans. (d) Insertion]

42. Which of the following programming is used whenever problems can be divided into similar sub-problems?
(a) Dynamic (b) Object oriented
(c) Modular (d) Procedural
[Ans. (a) Dynamic]

43. In which programming the solutions of overlapped sub-problems are combined in order to get the better solution?
(a) Object oriented (b) Procedural
(c) Dynamic (d) Modular
[Ans. (c) Dynamic]

44. Which of the following algorithm used memorization?
(a) Efficient (b) Dynamic
(c) Effective (d) Modular
[Ans. (b) Dynamic]

45. Which approach is similar to divide and conquer method?
(a) Dynamic programming
(b) Object oriented
(c) Procedural
(d) Modular
[Ans. (a) Dynamic programming]

46. Which of the following optimization technique used in dynamic algorithms.
(a) Memorization
(b) Composition
(c) Specification
(d) Decomposition **[Ans. (a) Memorization]**

CHOOSE AND FILL IN THE BLANKS

1. _____ is a step-by-step procedure for solving a given problem.
(a) Algorithm (b) Program
(c) Statements (d) Structure
[Ans. (a) Algorithm]

2. Data are maintained and manipulated effectively through _____.
(a) Algorithm (b) Data Structures
(c) Pseudocode (d) Program
[Ans. (b) Data Structures]

3. Each of algorithm steps and there inputs/ outputs should be clear and must lead to only one meaning refers to the algorithm characteristics _____.
(a) Unambiguous (b) Feasibility
(c) Independent (d) Effectiveness
[Ans. (a) Unambiguous]

4. Algorithm resembles a _____ which can be implemented in any programming language.
(a) Solution (b) Program
(c) Pseudocode (d) Function
[Ans. (c) Pseudocode]

5. Efficiency of an algorithm is defined by the utilization of _____ and _____ complexity.
(a) Time, operation
(b) Time, space
(c) Time, latency
(d) Time, speed
[Ans. (b) Time, space]

6. Performance evaluation of an algorithm can be divided into _____ different phases.
(a) 3 (b) 4 (c) 2 (d) 1
[Ans. (c) 2]

7. A theoretical performance analysis of an algorithm is called _____
(a) Posteriori testing
(b) Priori estimates
(c) Algorithmic efficiency
(d) Algorithmic testing
[Ans. (b) Priori estimates]

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8. **Efficiency of an algorithm is measured by ___ factors.**
(a) 3 (b) 4 (c) 2 (d) 1
[Ans. (c) 2]

9. **Space required by an algorithm = Fixed part + _____**
(a) Constant part (b) Variable part
(c) Time part (d) Second part
[Ans. (b) Variable part]

10. **Recursion used to calculate factorial of a given value *n* in algorithm is an example of _____ component**
(a) Fixed part (b) Variable part
(c) Operator part (d) Time part
[Ans. (b) Variable part]

11. **Simple variables and constants used in an algorithm is an example of _____ component.**
(a) Time part (b) Variable part
(c) Factor part (d) Fixed part
[Ans. (d) Fixed part]

12. **The ____ of an algorithm is defined as the number of computational resources used by the algorithm.**
(a) Simplicity (b) Efficiency
(c) Feasibility (d) Potable
[Ans. (b) Efficiency]

13. **_____ are languages that uses meaningful statements about time and space complexity?**
(a) Time and space trade
(b) Asymptotic notations
(c) Complexity notations
(d) Algorithmic notations
[Ans. (b) Asymptotic notations]

14. **_____ is used to describe the upper bound of a asymptotic function.**
(a) Big μ (b) Big O
(c) Big Ω (d) Big β
[Ans. (b) Big O]

15. **_____ is used to describe the lower bound of asymptotic function.**
(a) Big Alpha (b) Big Beta
(c) Big O (d) Big Omega
[Ans. (d) Big Omega]

Choose the correct statement

1. **Choose the correct typical algorithm from the following.**
(a) Input → Output → Process
(b) Output→ Input→ Process
(c) Process→ Input → Output
(d) Input → Process → Output
[Ans. (d) Input → Process → Output]

2. **Choose the correct pair from the following**
(a) Big O – Best case
(b) Big Ω - Worst case
(c) Big Θ - Average case
(d) Big μ - First case
[Ans. (c) Big symbols - Average case]

Choose the incorrect statement

1. **Choose the incorrect statement from the following.**
(i) Linear search is also called sequential search
(ii) Bubble sort is also called comparison sort
(iii) Dynamic algorithms does not uses optimization technique memorization.
(iv) Binary search algorithm can not be done as divide and conquer search algorithm.
(a) i and ii (b) ii and iii
(c) iii and iv (d) Only iv
[Ans. (c) iii and iv]

2. **Choose the incorrect statement from the following**
(a) Prior estimates is a theoretical performance analysis of an algorithm
(b) Posteriori testing is called performance analysis of an algorithm.
(c) Efficiency of an algorithm decided by time and space factor.
(d) Space required by an algorithm is equal to the sum of fixed part and variable part
[Ans. (b) Posteriori testing is called performance analysis of an algorithm.]

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3. Choose the incorrect pair from the following

(a) Big O – Worst case
(b) Big Ω - First case
(c) Big μ - Best case
(d) Big α - Average case

[Ans. (b) Big Ω - First case]

4. Choose the incorrect statement from the following.

(i) In Algorithm, All operations in should be well defined
(ii) Algorithms must not terminate after finite number of steps.
(iii) In algorithms, errors are acceptable
(iv) An algorithm should have step-by-step directions.

(a) i and ii (b) i, iii and iv
(c) ii and iii (d) iii only

[Ans. (c) ii and iii]

Very Short Answers 2 MARKS

1. Give an example of data structures.

Ans. Examples for data structures are arrays, structures, list, tuples, dictionary.

2. What in algorithmic strategy? Give an example.

Ans. (i) The way of defining an algorithm is called algorithmic strategy.

(ii) For example to calculate factorial for the given value n then it can be done by defining the function to calculate factorial once for the iteration-1 then it can be called recursively until the number of required iteration is reached.

3. What is algorithmic solution?

Ans. An algorithm that yields expected output for a valid input is called an algorithmic solution.

4. How the efficiency of an algorithm is defined?

Ans. Efficiency of an algorithm is defined by the utilization of time and space complexity.

5. What does analysis of an algorithm deals with?

Ans. (i) Analysis of an algorithm usually deals with the running and execution time of various operations involved.

(ii) The running time of an operation is calculated as how many programming instructions is executed per operation.

6. What is algorithm analysis?

Ans. An estimation of the time and space complexities of an algorithm for varying input sizes is called algorithm analysis.

7. How the analysis of algorithms and performance evaluation can be divided? Explain.

Ans. Analysis of algorithms and performance evaluation can be divided into two different phases:

(i) **A Priori estimates :** This is a theoretical performance analysis of an algorithm. Efficiency of an algorithm is measured by assuming the external factors.

(ii) **A Posteriori testing :** This is called performance measurement. In this analysis, actual statistics like running time and required for the algorithm executions are collected.

8. Name the two factors, which decide the efficiency of an algorithm.

Ans. (i) Time factor
(ii) Space factor

9. Give an example. How the time efficiency of an algorithm is measured.

Ans. The time efficiency of an algorithm is measured by different factors. For example, write a program for a defined algorithm, execute it by using any programming language, and measure the total time it takes to run.

10. What is algorithmetic strategy?

Ans. A way of designing algorithm is called algorithmic strategy.

11. What is best algorithm?

Ans. The best algorithm to solve a given problem is one that requires less space in memory and takes less time to execute its instructions to generate output.

12. What are asymptotic notations?

Ans. Asymptotic Notations are languages that uses meaningful statements about time and space complexity.

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13. What are the three asymptotic notations used to represent time complexity of algorithms?

Ans. (i) Big O
(ii) Big W
(iii) Big μ

14. Write a note on Big omega asymptotic notation.

Ans. Big Omega is the reverse Big O, if Big O is used to describe the upper bound (worst - case) of a asymptotic function, Big Omega is used to describe the lower bound (best-case).

15. Write a note on memorization.

Ans. Memoization or memoisation is an optimization technique used primarily to speed up computer programs by storing the results of expensive function calls and returning the cached result when the same inputs occur again.

SHORT ANSWERS 3 MARKS

1. List the manipulation manipulated effectively through data structures by algorithm.

Ans.

Search	To search an item in a data structure using linear and binary search.
Sort	To sort items in a certain order using the methods such as bubble sort, insertion sort, selection sort, etc.
Insert	To insert an item (s) in a data structure.
Update	To updata an existing item (s) in a data structure.
Delete	To delete an existing item (s) in a data structure.

2. Design an algorithm to find square of the given number and display the result.

Ans. The algorithm can be written as:
Step 1 – start the process
Step 2 – get the input x
Step 3 – calculate the square by multiplying the input value ie., square ← x* x
Step 4 – display the result square
Step 5 – stop

3. Write a note on time/space trade off.

Ans. (i) A space-time or time-memory trade off is a way of solving in less time by using more storage space or by solving a given algorithm in very little space by spending more time.
(ii) To solve a given programming problem, many different algorithms may be used. Some of these algorithms may be extremely time-efficient and others extremely space-efficient.
(iii) Time/space trade off refers to a situation where you can reduce the use of memory at the cost of slower program execution, or reduce the running time at the cost of increased memory usage.

4. Write a note on two factors in which space required by an algorithm is decided.

Ans. The space required by an algorithm is equal to the sum of the following two components:
(i) **A fixed part** is defined as the total space required to store certain data and variables for an algorithm. For example, simple variables and constants used in an algorithm.
(ii) **A variable part** is defined as the total space required by variables, which sizes depends on the problem and its iteration. For example: recursion used to calculate factorial of a given value n.

5. Write the different factors in which the time efficiency of an algorithm its measured.

Ans. The execution time that you measure in this case would depend on a number of factors such as:
(i) Speed of the machine
(ii) Compiler and other system Software tools
(iii) Operating System
(iv) Programming language used
(v) Volume of data required

6. Write a pseudo code for linear search.

Ans. (i) Traverse the array using 'for loop'
(ii) In every iteration, compare the target search key value with the current value of the list.
(iii) If the values match, display the current index and value of the array

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(iv) If the values do not match, move on to the next array element.

(v) If no match is found, display the search element not found.

7. Write a pseudo code for Binary search.

Ans. **Start with the middle element:**

(i) If the search element is equal to the middle element of the array i.e., the middle value = number of elements in array/2, then return the index of the middle element.

(ii) If not, then compare the middle element with the search value,

(iii) If the search element is greater than the number in the middle index, then select the elements to the right side of the middle index, and go to Step-1.

(iv) If the search element is less than the number in the middle index, then select the elements to the left side of the middle index, and start with Step-1.

(v) When a match is found, display success message with the index of the element matched.

(vi) If no match is found for all comparisons, then display unsuccessful message.

8. Write a pseudo code for bubble sort.

Ans. (i) Start with the first element i.e., index = 0, compare the current element with the next element of the array.

(ii) If the current element is greater than the next element of the array, swap them.

(iii) If the current element is less than the next or right side of the element, move to the next element. Go to Step 1 and repeat until end of the index is reached.

9. Write a pseudo code for selection sort.

Ans. (i) Start from the first element i.e., index-0, we search the smallest element in the array, and replace it with the element in the first position.

(ii) Now we move on to the second element position, and look for smallest element present in the sub-array, from starting index to till the last index of sub - array.

(iii) Now replace the second smallest identified in step-2 at the second position in the or original array, or also called first position in the sub array.

10. Write a pseudo code for Insertion sort.

Ans. **Step 1** – If it is the first element, it is already sorted.

Step 2 – Pick next element

Step 3 – Compare with all elements in the sorted sub-list

Step 4 – Shift all the elements in the sorted sub-list that is greater than the value to be sorted

Step 5 – Insert the value

Step 6 – Repeat until list is sorted.

11. Write the steps to do dynamic programming.

Ans. (i) The given problem will be divided into smaller overlapping sub-problems.

(ii) An optimum solution for the given problem can be achieved by using result of smaller sub-problem.

(iii) Dynamic algorithms uses Memoization.

12. Write a pseudo code that defines Fibonacci Iterative algorithm with Dynamic programming approach.

Ans. The following shows a simple Dynamic programming approach for the generation of Fibonacci series.

Initialize f0=0, f1 =1

Step 1 - Print the initial values of Fibonacci f0 and f1

Step 2 - Calculate fibanocci fib ← f0 + f1

Step 3 - Assign f0← f1, f1← fib

Step 4 - Print the next consecutive value of fibanocci fib

step 5 - Goto step-2 and repeat until the specified number of terms generated

For example if we generate fibobnacci series upto 10 digits, the algorithm will generate the series as shown below:

The Fibonacci series is : 0 1 1 2 3 5 8 13 21 34 55

LONG ANSWERS 5 MARKS

1. Explain Best, worst and Average case efficiency of an algorithm with an example.

Ans. (i) Let us assume a list of n number of values stored in an array. Suppose if we want to search a particular element in this list, the algorithm that search the key element in

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the list among n elements, by comparing the key element with each element in the list sequentially.

(ii) The best case would be if the first element in the list matches with the key element to be searched in a list of elements. The efficiency in that case would be expressed as O(1) because only one comparison is enough.

(iii) Similarly, the worst case in this scenario would be if the complete list is searched and the element is found only at the end of the list or is not found in the list. The efficiency of an algorithm in that case would be expressed as O(n) because n comparisons required to complete the search.

(iv) The average case efficiency of an algorithm can be obtained by finding the average number of comparisons as given below:
Minimum number of comparisons = 1
Maximum number of comparisons = n
If the element not found then
maximum number of comparison = n
Therefore, average number
of comparisons = (n + 1)/2

(v) Hence the average case efficiency will be expressed as O (n).

2. Explain complexity of an algorithm.

Ans. Suppose A is an algorithm and n is the size of input data, the time and space used by the algorithm A are the two main factors, which decide the efficiency of A.

(i) **Time Factor :** Time is measured by counting the number of key operations like comparisons in the sorting algorithm.

(ii) **Space Factor :** Space is measured by the maximum memory space required by the algorithm. The complexity of an algorithm f (n) gives the running time and/or the storage space required by the algorithm in terms of n as the size of input data.

(iii) **Time Complexity :** The Time complexity of an algorithm is given by the number of steps taken by the algorithm to complete the process.

(iv) **Space Complexity :** Space complexity of an algorithm is the amount of memory required to run to its completion. The space required by an algorithm is equal to the sum of the following two components:

- **A fixed part** is defined as the total space required to store certain data and variables for an algorithm. For example, simple variables and constants used in an algorithm.
- **A variable part** is defined as the total space required by variables, which sizes depends on the problem and its iteration. For example: recursion used to calculate factorial of a given value n.

3. Write a note on Efficiency of an algorithm.

Ans. (i) Computer resources are limited that should be utilized efficiently. The efficiency of an algorithm is defined as the number of computational resources used by the algorithm.

(ii) An algorithm must be analyzed to determine its resource usage. The efficiency of an algorithm can be measured based on the usage of different resources.

(iii) For maximum efficiency of algorithm we wish to minimize resource usage. The important resources such as time and space complexity cannot be compared directly, so time and space complexity could be considered for an algorithmic efficiency.

Method for determining Efficiency :

(i) The efficiency of an algorithm depends on how efficiently it uses time and memory space.

(ii) The time efficiency of an algorithm is measured by different factors. For example, write a program for a defined algorithm, execute it by using any programming language, and measure the total time it takes to run.

(iii) The execution time that you measure in this case would depend on a number of factors such as:

- Speed of the machine
- Compiler and other system Software tools
- Operating System

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- Programming language used
- Volume of data required

(iv) However, to determine how efficiently an algorithm solves a given problem, you would like to determine how the execution time is affected by the nature of the algorithm.

(v) Therefore, we need to develop fundamental laws that determine the efficiency of a program in terms of the nature of the underlying algorithm.

4. Differentiate Algorithm and program.

Ans.

Algorithm	Program
Algorithm helps to solve a given problem logically and it can be contrasted with the program	Program is an expression of algorithm in a programming language.
Algorithm can be categorized based on their implementation methods, design techniques etc	Algorithm can be implemented by structured or object oriented programming approach
There is no specific rules for algorithm writing but some guidelines should be followed.	Program should be written for the selected language with specific syntax
Algorithm resembles a pseudo code which can be implemented in any language	Program is more specific to a programming language

5. Explain Selection sort sorting algorithm.

Ans. (i) The selection sort is a simple sorting algorithm that improves on the performance of bubble sort by making only one exchange for every pass through the list.

(ii) This algorithm will first find the smallest elements in array and swap it with the element in the first position of an array, then it will find the second smallest element and swap that element with the element in the second position, and it will continue until the entire array is sorted in respective order.

(iii) This algorithm repeatedly selects the next-smallest element and swaps in into the right place for every pass. Hence it is called selection sort.

Pseudo code :

(i) Start from the first element i.e., index-0, we search the smallest element in the array, and replace it with the element in the first position.

(ii) Now we move on to the second element position, and look for smallest element present in the sub-array, from starting index to till the last index of sub - array.

(iii) Now replace the second smallest identified in step-2 at the second position in the or original array, or also called first position in the sub array.

(iv) This is repeated, until the array is completely sorted.

(v) Let's consider an array with values {13, 16, 11, 18, 14, 15}

(vi) Below, we have a pictorial representation of how selection sort will sort the given array.

6. Explain the sorting algorithm that uses n-1 number passes to get the final sorted list.

Ans. (i) Insertion sort is a simple sorting algorithm. It works by taking elements from the list one by one and inserting then in their correct position in to a new sorted list.

(ii) This algorithm builds the final sorted array at the end. This algorithm uses n-1 number of passes to get the final sorted list as per the pervious algorithm as we have discussed.

Pseudo for Insertion sort :

Step 1 – If it is the first element, it is already sorted.

Step 2 – Pick next element

Step 3 – Compare with all elements in the sorted sub-list

Step 4 – Shift all the elements in the sorted sub-list that is greater than the value to be sorted

Step 5 – Insert the value

Step 6 – Repeat until list is sorted

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UNIT-II CORE PYTHON

CHAPTER 5 PYTHON-VARIABLES AND OPERATORS

CHAPTER SNAPSHOT

EVALUATION

PART - I

CHOOSE THE BEST ANSWER (1 MARK)

1. Who developed Python?
(a) Ritche
(b) Guido Van Rossum
(c) Bill Gates
(d) Sunder Pitchai
[Ans. (b) Guido Van Rossum]

2. The Python prompt indicates that Interpreter is ready to accept instruction.
(a) >>> (b) <<< (c) # (d) <<
[Ans. (a) >>>]

3. Which of the following shortcut is used to create new Python Program?
(a) Ctrl + C (b) Ctrl + F
(c) Ctrl + B (d) Ctrl + N
[Ans. (d) Ctrl + N]

4. Which of the following character is used to give comments in Python Program?
(a) # (b) & (c) @ (d) $
[Ans. (a) #]

5. This symbol is used to print more than one item on a single line.
(a) Semicolon (;) (b) Dollor ($)
(c) comma (,) (d) Colon (:)
[Ans. (c) comma (,)]

6. Which of the following is not a token?
(a) Interpreter (b) Identifiers
(c) Keyword (d) Operators
[Ans. (a) Interpreter]

7. Which of the following is not a Keyword in Python?
(a) break (b) while
(c) continue (d) operators
[Ans. (d) operator]

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8. Which operator is also called as Comparative operator?

(a) Arithmetic (b) Relational
(c) Logical (d) Assignment

[Ans. (b) Relational]

9. Which of the following is not Logical operator?

(a) and (b) or
(c) not (d) Assignment

[Ans. (d) Assignment]

10. Which operator is also called as Conditional operator?

(a) Ternary (b) Relational
(c) Logical (d) Assignment

[Ans. (a) Ternary]

Part - II

Answer the following questions

(2 marks)

1. What are the different modes that can be used to test Python Program?

Ans. The modes that can be used to test Python program are

(i) Interactive mode
(ii) Script mode

2. Write short notes on Tokens.

Ans. Python breaks each logical line into a sequence of elementary lexical components known as **Tokens**. The normal token types are

(i) Identifiers,
(ii) Keywords,
(iii) Operators,
(iv) Delimiters and
(v) Literals.

3. What are the different operators that can be used in Python?

Ans. The operators that can be used in Python

(i) Arithmetic operators
(ii) Relational or Comparative operator
(iii) Logical operators
(iv) Assignment operators
(v) Conditional operator

4. What is a literal? Explain the types of literals?

Ans. Literal is a raw data given in a variable or constant. In Python, there are various types of literals.

(i) Numeric
(ii) String
(iii) Boolean

5. Write short notes on Exponent data?

Ans. An Exponent data contains decimal digit part, decimal point, exponent part followed by one or more digits.

Example: 12.E04, 24.e04.

Part - III

Answer the following questions

(3 marks)

1. Write short notes on Arithmetic operator with examples.

Ans. (i) An arithmetic operator is a mathematical operator that takes two operands and performs a calculation on them. They are used for simple arithmetic.

(ii) Most computer languages contain a set of such operators that can be used within equations to perform different types of sequential calculations.

(iii) Python supports the following Arithmetic operators.

Operator – Operation	Examples	Result
Assume a=100 and b=10. Evaluate the following expressions		
+ (Addition)	>>> a + b	110
– (Subtraction)	>>> a – b	90
* (Multiplication)	>>> a * b	1000
/ (Division)	>>> a / b	10.0
% (Modulus)	>>> a % 30	10
** (Exponent)	>>> a ** 2	10000
// (Floor Division)	>>> a // 30 (Integer Division)	3

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2. What are the assignment operators that can be used in Python?

Ans. **(i)** In Python, = is a simple assignment operator to assign values to variable. Let **a** = 5 and **b** = 10 assigns the value 5 to **a** and 10 to **b** these two assignment statement can also be given as **a,b=5,10** that assigns the value 5 and 10 on the right to the variables a and b respectively.

(ii) There are various compound operators in Python like +=, -=, *=, /=, %=, **= and //= are also available.

3. Explain Ternary operator with examples.

Ans. **(i)** Ternary operator is also known as conditional operator that evaluate something based on a condition being true or false.

(ii) It simply allows testing a condition in a single line replacing the multiline if-else making the code compact.

Variable Name = [on_true] if [Test expression] else [on_false]

(iii) Example:

min = 50 if 49 < 50 else 70 // min = 50

min = 50 if 49 > 50 else 70 // min = 70

4. Write short notes on Escape sequences with examples.

Ans. **(i)** In Python strings, the backslash "\" is a special character, also called the **"escape"** character.

(ii) It is used in representing certain whitespace characters: **"\t"** is a tab, **"\n"** is a newline, and **"\r"** is a carriage return.

(iii) For example to print the message "It's raining", the Python command is

```
>>> print ("It\'s raining")
It's raining
```

5. What are string literals? Explain.

Ans. **(i)** In Python, a string literal is a sequence of characters surrounded by quotes. Python supports single, double and triple quotes for a string.

(ii) A character literal is a single character surrounded by single or double quotes. The value with triple-quote ''' ''' is used to give multi-line string literal.

To test String Literals :

```
# Demo Program to test String Literals
    strings = "This is Python"
    char = "C"
    multiline_str = '''This is a multiline string with more than one line code.'''
    print (strings)
    print (char)
    print (multiline_str)
# End of the Program
```

Output:

```
This is Python
C
This is a multiline string with more than one line code.
```

PART - IV

ANSWER THE FOLLOWING QUESTIONS

(5 MARKS)

1. Describe in detail the procedure Script mode programming.

Ans. A script is a text file containing the Python statements. Python Scripts are reusable code. Once the script is created, it can be executed again and again without retyping. The Scripts are editable.

Creating Scripts in Python :

(i) Choose File → New File or press Ctrl + N in Python shell window.

A – A script is a text frame

R – Text file contain Python script

(1) All text file does not Python scripts

(2) All text file must contain Python script

(3) A is T B

(ii) An untitled blank script text editor will be displayed on screen.

(iii) Type the code in Script editor

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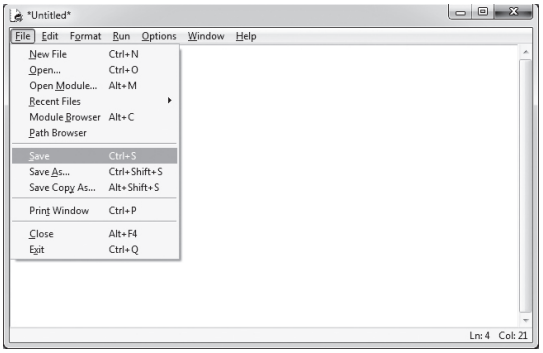
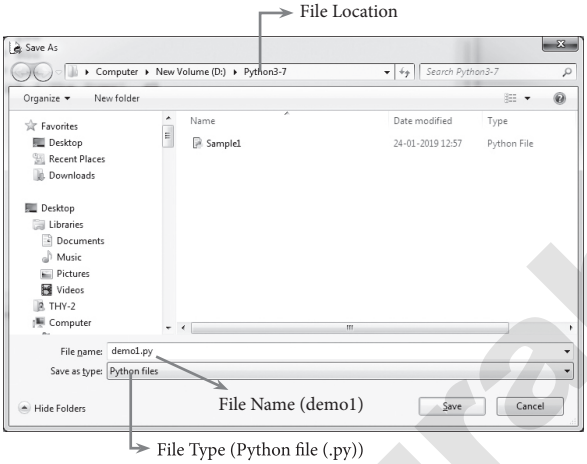
Saving Python Script :

(i) Choose **File → Save** or Press **Ctrl + S**



To Save the file First time

(ii) Now, **Save As** dialog box appears on the screen.



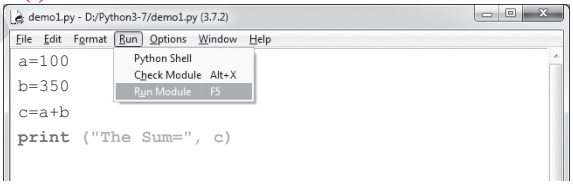
Save As Dialog Box

(iii) In the **Save As** dialog box, select the location where you want to save your Python code, and type the file name in **File Name** box. Python files are by default saved with extension **.py.** Thus, while creating Python scripts using Python Script editor, no need to specify the file extension.

(iv) Finally, click **Save** button to save your Python script.

Executing Python Script :

(i) Choose **Run → Run Module** or Press **F5**



To Execute Python Script

(ii) If code has any error, it will be shown in red color in the IDLE window, and Python describes the type of error occurred. To correct the errors, go back to Script editor, make corrections, save the file using **Ctrl + S** or **File → Save** and execute it again.

(iii) For all error free code, the output will appear in the IDLE window of Python.

2. Explain input () and print () functions with examples.

Ans. **Input and Output Functions :** A program needs to interact with the user to accomplish the desired task; this can be achieved using Input-Output functions. The input() function helps to enter data at run time by the user and the output function print() is used to display the result of the program on the screen after execution.

The input() function :

(i) In Python, input( ) function is used to accept data as input at run time. The syntax for input() function is,

Variable = input ("prompt string")

(ii) Where, prompt string in the syntax is a statement or message to the user, to know what input can be given.

(ii) If a prompt string is used, it is displayed on the monitor; the user can provide expected data from the input device. The input( ) takes whatever is typed from the keyboard and stores the entered data in the given variable.

(iv) If prompt string is not given in input( ) no message is displayed on the screen, thus, the user will not know what is to be typed as input.

(v) **Example 1 :** input( ) with prompt string

```
>>> city=input ("Enter Your City: ")
        Enter Your City: Madurai
>>> print ("I am from ", city)
        I am from Madurai
```

(vi) **Example 2 :** input( ) without prompt string

```
>>> city=input()
        Madurai
>>> print (I am from", city)
        I am from Madurai
```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(vii) Note that in example-2, the input( ) is not having any prompt string, thus the user will not know what is to be typed as input. If the user inputs irrelevant data as given in the above example, then the output will be unexpected. So, to make your program more interactive, provide prompt string with input( ).

(viii) The input ( ) accepts all data as string or characters but not as numbers. If a numerical value is entered, the input values should be explicitly converted into numeric data type. The int( ) function is used to convert string data as integer data explicitly. We will learn about more such functions in later chapters.

(ix) **Example 3 :**

```
x = int (input("Enter Number 1: "))
y = int (input("Enter Number 2: "))
print ("The sum = ", x+y)
```

(x) **Output :**

```
Enter Number 1: 34
Enter Number 2: 56
The sum = 90
```

(xi) **Example 4 :** Alternate method for the above program

```
x,y=int (input("Enter Number 1 :")),
      int(input("Enter Number 2:"))
print ("X = ",x," Y = ",y)
```

(xii) **Output :**

```
Enter Number 1 :30
Enter Number 2:50
X = 30 Y = 50
```

The print() function :

(i) In Python, the print() function is used to display result on the screen. The syntax for print() is as follows :

(ii) **Example :**

```
print ("string to be displayed as output " )
print (variable )
print ("String to be displayed as output ", variable)
print ("String1 ", variable, "String 2", variable, "String 3" ……)
```

(iii) **Example :**

```
>>> print ("Welcome to Python Programming")
    Welcome to Python Programming
>>> x = 5
>>> y = 6
>>> z = x + y
>>> print (z)
    11
>>> print ("The sum = ", z)
    The sum = 11
>>> print ("The sum of ", x, " and ", y, " is ", z)
    The sum of 5 and 6 is 11
```

(iv) The **print** ( ) evaluates the expression before printing it on the monitor.

(v) The print () displays an entire statement which is specified within print ( ). **Comma** (,) is used as a separator in **print** ( ) to print more than one item.

3. Discuss in detail about Tokens in Python.

Ans. Python breaks each logical line into a sequence of elementary lexical components known as **Tokens**. The normal token types are

(i) Identifiers,

(ii) Keywords,

(iii) Operators,

(iv) Delimiters and

(v) Literals.

(i) **Identifiers :**

- An Identifier is a name used to identify a variable, function, class, module or object.
- An identifier must start with an alphabet (A..Z or a..z) or underscore (_).
- Identifiers may contain digits (0 .. 9).
- Python identifiers are case sensitive i.e. uppercase and lowercase letters are distinct.
- Identifiers must not be a python keyword.
- Python does not allow punctuation character such as %,$, @ etc., within identifiers.

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(ii) **Keywords :** Keywords are special words used by Python interpreter to recognize the structure of program. As these words have specific meaning for interpreter, they cannot be used for any other purpose.

(iii) **Operators :** In computer programming languages operators are special symbols which represent computations, conditional matching etc. The value of an operator used is called **operands**. Operators are categorized as Arithmetic, Relational, Logical, Assignment etc. Value and variables when used with operator are known as **operands**.

(iv) **Delimiters :** Python uses the symbols and symbol combinations as delimiters in expressions, lists, dictionaries and strings. Following are the delimiters.

(	)	[	]	{	}
,	:	.	'	=	;
+=	-=	*=	/=	//=	%=
&=	|=	^=	>>=	<<=	**=

(v) **Literals :** Literal is a raw data given in a variable or constant. In Python, there are various types of literals.

- Numeric
- String
- Boolean.

ADDITIONAL QUESTIONS AND ANSWERS

CHOOSE THE CORRECT ANSWER 1 MARK

1. Python language was released in

(a) 1992 (b) 1991
(c) 1994 (d) 2001

[Ans. (b)1991]

2. IDLE expansion is

(a) Integrated Development Learning Environment
(b) Information Development Logical Environment
(c) Integrated Development Language Environment
(d) Interactive Development Learning Environment

[Ans. (a) Integrated Development Learning Environment]

3. In Python, How many ways programs can be written?

(a) 4 (b) 3
(c) 2 (d) many

[Ans. (c) 2]

4. In Python, the script mode programs can be stored with the extension.

(a) .pyt (b) .pyh
(c) .py (d) .pon

[Ans. (c) .py]

5. Which of the following mode cannot be written Python program?

(i) Interactive mode (ii) Script mode
(iii) Calculator mode (iv) Executable mode
(a) i (b) ii
(c) i and iii (d) iii and iv

[Ans. (d) iii and iv]

6. Which of the following defines the Python interactive mode of programming?

(a) >>> (b) <<<
(c) >> (d) <<

[Ans. (a) >>>]

7. Which of the following mode allows to write codes in Python command prompt?

(a) Script mode (b) Complier mode
(c) Interactive mode (d) Program mode

[Ans. (c) Interactive mode]

8. Which mode can also be used as a simple calculator in Python?

(a) Information (b) Intelligent
(c) Script (d) Interactive

[Ans. (d) Interactive]

9. Which mode displays the python code result immediately?

(a) Compiler (b) Interactive
(c) Script (d) Program

[Ans. (b) Interactive]

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10. Which of the following used to develop and run Python code?
(a) GUI
(b) Command prompt
(c) IDLE
(d) CUI
[Ans. (c) IDLE]

11. Which mode can also be used as a simple calculator?
(a) Calc mode (b) Interactive mode
(c) Script mode (d) Code mode
[Ans. (b) Interactive mode]

12. Which of the following indicates in Python that interpreter is ready to accept instructions?
(a) >>> (b) <<<
(c) .py (d) <<
[Ans. (a) >>>]

13. >>> indicates that
(a) IDLE is working in script mode
(b) Source program can be created and stored
(c) IDLE is working in Interactive mode
(d) It will not display the results immediately
[Ans. (c) IDEL is working in Interactive mode]

14. Which of the following command is used to execute Python script?
(a) Run → Python Module
(b) File → Run Module
(c) Run → Run Module
(d) Run → Module Fun
[Ans. (c) Run → Run Module]

15. Which function helps to enter data at run time by the user?
(a) input ( )
(b) read ( )
(c) get ( )
(d) Pyinput ( )
[Ans. (a) input ( )]

16. From the following statement absence of which one no message is displayed on the screen?
variable = input ("prompt string")
(a) Variable
(b) input
(c) "prompt string"
(d) " "
[Ans. (c) "prompt string"]

17. Which of the following function in Python is used to convert strings data as integer data explicitly?
(a) integer ( ) (b) num ( )
(c) int ( ) (d) number ( )
[Ans. (c) int ( )]

18. Multiline comments in Python enclosed with
(a) # # (b) < >
(c) ! ! (d) $ $
[Ans. (a) # #]

19. A sequence of elementary lexical components of Python statement is known as
(a) Keywords (b) Tokens
(c) Delimiters (d) Literals
[Ans. (b) Tokens]

20. Which of the following is not a type of token?
(a) Identifier
(b) Keywords
(c) Literals
(d) functions
[Ans. (d) functions]

21. Which of the following can not be identify by an identifier
(a) constant (b) variable
(c) function (d) class
[Ans. (a) constant]

22. Which of the following can be identify by an identifier?
(a) variable (b) function
(c) class (d) all of these
[Ans. (d) all of these]

23. If a = 100, then the expression a2 output is**
(a) 1000 (b) 10000
(c) 200 (d) 400
[Ans. (b) 10000]

24. If a = 100, then the expression a//30 is
(a) 10.0 (b) 0.10
(c) 3 (d) 3.0
[Ans. (c) 3]

25. Which of the following operator checks the relationship between two operands?
(a) Arithmetic (b) Comparative
(c) Assignment (d) Conditional
[Ans. (b) Comparative]

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26. How may logical operators in Python?
(a) 2 (b) 4 (c) 5 (d) 3
[Ans. (d) 3]

27. Which operator replaces multiline if-else in Python?
(a) Conditional (b) Logical
(c) Relational (d) Assignment
[Ans. (a) Conditional]

28. In Python, the delimiters are not used in
(a) Expressions (b) functions
(c) dictioncuries (d) strings
[Ans. (b) functions]

29. Which of the following is a raw data given in a variable or constant?
(a) Information (b) Delimiters
(c) Literal (d) Keywords
[Ans. (c) Literal]

30. Which of the following is not a type of literal?
(a) Numeric (b) Expression
(c) String (d) Boolean
[Ans. (b) Expression]

31. What is the output for the following
m = 25 if 24 < 25 else 50
(a) 25 (b) 50 (c) 24<25 (d) 0
[Ans. (a) 25]

32. Which literal are immutable?
(a) Integer (b) Float
(c) Complex (d) All of these
[Ans. (d) All of thesre]

33. Which of the following is not a numerical literal type?
(a) Integer (b) Float
(c) Boolean (d) Complex
[Ans. (c) Boolean]

34. Which of the following is a sequence of characters surrounded by quotes?
(a) String (b) Complex
(c) Boolean (d) Octal
[Ans. (a) String]

35. The multipleline string literal given in
(a) ' ' (b) " "
(c) # # (d) "" ""
[Ans. (d) "" ""]

36. Which of the following characters is also called the "escape" character?
(a) \ (b) / (c) # (d) =
[Ans. (a) \]

37. Which of the following is not a fundamental data type?
(a) tuples (b) lists
(c) character (d) dictionaries
[Ans. (c) character]

38. A built-in number datatype supports.
(a) integers
(b) floating point numbers
(c) Complex umbers (d) all of these
[Ans. (d) all of these]

39. Which of the following character is used to denote long integer?
(a) N (b) LO (c) L (d) D
[Ans. (c) L]

40. Which of the following date includes decimal point?
(a) Character
(b) String
(c) Boolean
(d) Floating point **[Ans. (d) Floating point]**

41. Exponent data example is
(a) 123.45 (b) .0537
(c) 2.4E–2 (d) Ox5
[Ans. (c) 2.4E–2]

42. How many floating point values needed to respresent complex number?
(a) 2 (b) 3 (c) 1 (d) 0
[Ans. (a) 2]

43. A boolean data type have the values
(a) 0 or 1
(b) L or O
(c) O or Ox
(d) true or false **[Ans. (d) true or false]**

44. Which data can be enclosed with Single or Double or Triple quotes?
(a) Boolean
(b) String
(c) Exponent
(d) none of these **[Ans. (b) String]**

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MATCH THE FOLLOWING

1. Match List I with List II and select the correct answer using the codes given below :

	List I		List II
i)	0b1010	1)	Hexadecimal Literal
ii)	100	2)	Octal Literal
iii)	Oo310	3)	Decimal Literal
iv)	Ox12c	4)	Binary Literal

	(i)	(ii)	(iii)	(iv)
(a)	1	2	3	4
(b)	1	3	2	4
(c)	4	2	3	1
(d)	4	3	2	1

[Ans. (d) (i)-4; (ii)-3; (iii)-2; (iv)-1]

2. Match List I with List II and select the correct answer using the codes given below :

	List I		List II
i)	567	1)	Long Integer
ii)	0432	2)	Decimal Integer
iii)	53L	3)	Hexdecimal Integer
iv)	Ox562	4)	Octal Integer

	(i)	(ii)	(iii)	(iv)
(a)	2	4	1	3
(b)	2	1	4	3
(c)	2	3	4	1
(d)	4	2	1	3

[Ans. (a) (i)-2; (ii)-4; (iii)-1; (iv)-3]

CHOOSE THE ODD MAN OUT

1. Find the odd man out. State the reason

(a) IDE
(b) GUI
(c) IDLE
(d) CWI **[Ans. (d) CWI]**

Reason : It is a National Research Institute for mathematics and computer science in Netherlands.

2. Find the odd man out. State the reason

(a) < > (b) <<< (c) < (d) >>>

[Ans. (d) >>>]

Reason : It is a Python command prompt.

3. Find the odd man out. State the reason

(a) Identifiers (b) Operators
(c) Literals (d) Tokens

[Ans. (d) Tokens]

Reason : The other options are the types of tokens.

4. Find the odd man out.

(a) Pass (b) Fail (c) Raise (d) elif

[Ans. (b) Fail]

5. Find the odd man out.

(a) and (b) or
(c) not equal to (d) not

[Ans. (c) not equal to]

6. Find the odd man out.

(a) + = (b) //= (c) /– (d) % =
(e) = =

[Ans. (e) = =]

7. Find the odd man out.

(a) ' ' (b) " "
(c) ''' ''' (d) "" ""

[Ans. (d) "" ""]

CHOOSE AND FILL IN THE BLANKS

1. Python command prompt is _____.

(a) >> (b) >>> (c) << (d) <<<

[Ans. (b) >>>]

2. Python source file is created using _____ mode.

(a) Interactive (b) Script
(c) Procedure (d) Program

[Ans. (b) Script]

3. _____ mode is used to create and edit python source file.

(a) Script (b) Interactive
(c) Informative (d) Source

[Ans. (a) Script]

4. The _____ command is used to open Python shell window.

(a) File → File New
(b) File → New
(c) File → New File
(d) File → File Open

[Ans. (c) File → New File]

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5. In Python shell window opened by pressing.
(a) Alt + N (b) Ctrl + N
(c) Shift + N (d) Ctrl + Shift + N
[Ans. (b) Ctrl + N]

6. In Python Script Editor, the errors will be shown in _____ color in the IDLE window.
(a) red (b) green
(c) blue (d) orange
[Ans. (a) red]

7. Press _____ to execute Python Script.
(a) F2 (b) F3 (c) F4 (d) F5
[Ans. (d) F5]

8. The input ( ) function helps to enter data at _____ by the user.
(a) compile time (b) linking time
(c) run time (d) module time
[Ans. (c) run time]

9. The output function _____ is used to display the result of the Python Program.
(a) out ( ) (b) write ( )
(c) print ( ) (d) execute ( )
[Ans. (c) print ( )]

10. >>> print ("A = ", a _____ "B=", b).
(a) : (b) , (c) ; (d) : :
[Ans. (b) ,]

11. _____ = input ("Prompt string").
(a) variable (b) integer
(c) keyword (d) operator
[Ans. (a) variable]

12. What must be entered in _____ from the following statement to accept the value entered as integer?
X = _____ input ("Enter number")
(a) integer (b) int
(c) number (d) numeric
[Ans. (b) int]

13. The inputs ( ) accepts all data as _____ or _____.
(a) String or characters
(b) String or numbers
(c) Characters or numbers
(d) integers or exponent
[Ans. (a) String or characters]

14. In Python, comments begin with _____.
(a) / (b) # (c) \ (d) //
[Ans. (b) #]

15. The _____ statements are ignored by the Python interpreter.
(a) input ( ) (b) print ( )
(c) int ( ) (d) comments
[Ans. (d) comments]

16. Python uses _____ and _____ to define program blocks.
(a) Alt, Shift (b) Spaces, tabs
(c) tabs, functions (d) Ctrl, Shift
[Ans. (b) Spaces, tabs]

17. In Python, there are _____ normal token types.
(a) 4 (b) 3 (c) 5 (d) 7
[Ans. (c) 5]

18. In computer programming languages _____are special symbols which represent computations.
(a) Keywords (b) Literals
(c) Delimiters (d) Operators
[Ans. (d) Operators]

19. Value and variables when used in operator are known as _____.
(a) Operands
(b) Keywords
(c) Identifiers
(d) functions
[Ans. (a) Operands]

20. _____ and _____ when used with operator are called operands.
(a) Keywords, identifiers
(b) Literals, delimiters
(c) Value, Variables
(d) Literals, Keywords
[Ans. (c) Value, Variables]

21. An arithmetic operator takes _____ operands and perform a calculations.
(a) 3 (b) 4 (c) 2 (d) 1
[Ans. (c) 2]

22. In Python _____ is a simple assignment operator.
(a) = (b) != (c) = = (d) #
[Ans. (a) =]

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23. **Python uses the symbols and symbol combinations as _____ in expressions.**
(a) literals (b) keywords
(c) identifiers (d) delimiters
[Ans. (d) delimiters]

24. **Numeric literals can belong to _____ different numerical types.**
(a) 4 (b) 3 (c) 2 (d) 5
[Ans. (b) 3]

25. **The _____ escape sequence character description is new line.**
(a) \t (b) \l (c) \n (d) \h
[Ans. (c) \n]

26. **All data values in Python are _____.**
(a) objects (b) class
(c) type (d) functions
[Ans. (a) objects]

27. **_____ data can be decimal, octal or hexadecimal.**
(a) Character (b) Integer
(c) Escape sequence (d) Symbols
[Ans. (b) Integer]

28. **Octal integer use _____ to denote octal digits.**
(a) O (b) Ox (c) 8 (d) Oc
[Ans. (a) O]

29. **_____ is to denote hexadecimal integer.**
(a) 16 (b) O*x*
(c) O*x* (d) b or c
[Ans. (d) b or c]

30. **Complex number is made up of two _____ values.**
(a) Integer (b) String
(c) floating point (d) octal
[Ans. (c) floating point]

CHOOSE THE CORRECT STATEMENT

1. **Which of the following statement is correct?**
(i) In Python, programs can be written in many ways.
(ii) Interactive mode and script mode are the modes used to write programs in Python.
(iii) Python command prompt is <<<
(iv) In Python, interactive mode displays the result immediately and also used as a calculator.
(a) i and ii (b) ii and iii
(c) ii and iv (d) i, ii, iv
[Ans. (c) ii and iv]

2. **Choose the correct statement from the following.**
(i) Python created by Guido Van Rossum.
(ii) Python shell can be used in two ways.
(iii) Python used whitespace to define blocks
(iv) Whitespace separation is necessary between tokens, identifiers or keywords.
(a) i and ii (b) ii, iii and iv
(c) i, ii and iv (d) i, ii and iii
(e) all of these **[Ans. (e) all of these]**

3. **Choose the correct pair from the following.**

(a)	File → File New	to open Python Interactive mode
(b)	File → File New	to work with Python Script Mode
(c)	F5	to modify the python script
(d)	>>>	is a python script mode prompt

[Ans. (b) File → File New – to work with Python Script Mode]

4. **Which of the following is the correct statement in Python?**
(a) print ('string to be displayed as output ')
(b) print (a) ;
(c) print (" T sum = ", a)
(d) print ("X=", x, "Y = ",y) ;
[Ans. (c) print ("T sum = ", a)]

5. **Choose the correct pair from the following if a = 100 and b = 45.**
(a) a = = b – false
(b) a > b – false
(c) a < b – false
(d) a ! = b – false **[Ans. (a) a = = b – false]**

6. **Choose the correct pair from the following.**
(a) Octal literal – Ob1010
(b) Hexadecimal literal – 0100
(c) Complex literal – 3+5.6j
(d) Binary literal – Oo310
[Ans. (c) Complex literal – 3+5.6j]

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7. Choose the correct pair from the following.

(a) O102 – hexadecimal integer
(b) Ox432 – Octal Integer
(c) 2EO – Exponent data
(d) 12.45 – Integer data

[Ans. (c) 2EO – Exponent data]

CHOOSE THE INCORRECT STATEMENT

1. Which of the following statement is incorrect?

(i) Python script is a file that contains python statements
(ii) Python script are not reusable code
(iii) Python scripts can be executed many times without retyping
(iv) Python scripts are editable

(a) i only (b) ii only
(c) iii only (d) i and iv

[Ans. (b) ii only]

2. Choose the incorrect statements from the following.

(i) Python script is a file that contains python statements
(ii) Python script are not reusable code
(iii) Python scripts cannot be executed again and again without retyping
(iv) Python scripts are editable.

(a) i and ii (b) iii and iv
(c) i and iii (d) ii and iii

[Ans. (d) ii and iii]

3. Which of the following is an incorrect statement(s)?

(i) The input ( ) accepts all types of data (string, characters, numbers)
(ii) Python uses whitespace to define program blocks
(iii) Comments in python begin with #
(iv) Python uses { } to define program blocks

(a) i and iv (b) i, iii and iv
(c) ii and iv (d) ii and iii

[Ans. (a) i and iv]

4. Which of the following is an incorrect statement?

(i) Python identifiers must start with an alphabet
(ii) Python identifiers many contain digits
(iii) Python identifiers are not case sensitive
(iv) Python allows %,$@ characters with in identifiers.

(a) i, ii (b) ii, iii
(c) iii, iv (d) ii, iv

[Ans. (c) iii, iv]

5. Choose the incorrect statement from the following.

(i) Tuples, lists and dictionaries are not fundamental data types
(ii) Python uses spaces and tabs to define program blocks
(iii) String data is denoted by O or Ox
(iv) Complex number is made up of two integer values

(a) i, ii, iii (b) i, ii
(c) ii, iii, iv (d) i, iii, iv

[Ans. (d) i, iii, iv]

6. Choose the incorrect pair from the following.

(i)	Ctrl + N	to create a new python script
(ii)	Ctrl + S	to save the python script
(iii)	F5	to modify the python script
(iv)	Run → Run Module	to excuse the python script

(a) i, ii, iii
(b) i and ii
(c) ii, iii, iv
(d) ii and iii **[Ans. (d) ii and iii]**

7. Choose the incorrect pair from the following.

(a) 100 / 10 – 10.0
(b) 100 % 30 – 10
(c) 100 // 30 – 10.0
(d) 100 *×2 – 10000

[Ans. (c) 100 // 30 – 10.0]

8. Choose the incorrect pair from the following if a = 100 and b = 45.

(a) a = = b – false
(b) a ! = b – false
(c) a > = b – True
(d) a < b – false **[Ans. (b) a! = b – false]**

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9. **Choose the incorrect pair from the following.**

(a)	Literal	Numeric, string, Boolean
(b)	Delimiters	Symbols and symbol combinations
(c)	Escape sequences	\t, \\, \n
(d)	Conditional operator	also known as operands operator

[Ans. (d) Conditional operator – also known as operands operator]

10. **Choose the incorrect pair from the following.**

(a) x = y (b) x = 'y'
(c) x = "y" (d) x = '"y"'

[Ans. (d) x = '"y"']

11. **Choose the incorrect pair from the following.**

(a)	print ("Doesn\'t")	Doesn't
(b)	print ("\" Python \" ")	"Python"
(c)	print ("Python", "\t", "lang..")	Python Lang
(d)	print ("Python", "\n", "Lang..")	Python Lang...

[Ans. (d) print ("Python", "\n", "Lang..") – Python Lang..]

12. **Choose the incorrect pair from the following.**

(a) 102 – Decimal Integer
(b) 0789 – Octal Integer
(c) Ox 102 – hexadecimal Integer
(d) 342 – Long Integer

[Ans. (b) 0789 – Octal Integer]

VERY SHORT ANSWERS 2 MARKS

1. **How will you develop and run Python code?**

Ans. The version 3.x of Python IDLE (Integrated Development Learning Environment) is used to develop and run Python code.

2. **How many ways the Python shell can be used?**

Ans. Python shell can be used in two ways, viz., Interactive mode and Script mode.

3. **How the interactive mode of Python shell can be used as simple calculator?**

Ans. In interactive mode Python code can be directly typed and the interpreter displays the result(s) immediately. The interactive mode can also be used as a **simple calculator**.

4. **How will you invoke python IDLE?**

Ans. **(i)** The following command can be used to invoke Python IDLE from Window OS.

(ii) Start → All Programs → Python 3.x → IDLE (Python 3.x)

(Or)

(iii) Click python 

Icon on the Desktop if available.

5. **How will you know the python IDLE working in interactive mode?**

Ans. The prompt (>>>) indicates that Interpreter is ready to accept instructions. Therefore, the prompt on screen means **IDLE** is working in interactive mode.

6. **What is the purpose of using. Input–output functions?**

Ans. The **input()** function helps to enter data at run time by the user and the output function **print()** is used to display the result of the program on the screen after execution.

7. **Why the following statement is incorrect? Give reason.**

Ans. **(i)** The input() is used to display the result of the program after execution.

(ii) **Reason :** The input() function helps to enter data at run time buy the user not to display the output.

8. **Write the Syntax of using print () in python.**

Ans. **Syntax :**

print ("string to be displayed as output ")
print (variable)
print ("String to be displayed as output ", variable)
print ("String1 ", variable, "String 2", variable, "String 3" ……)

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9. How will you display more than one item in print ( )?

Ans. Comma (,) is used as a separator in print ( ) to print more than one item.

10. Write the syntax of input ( ) used in python.

Ans. Variable = input ("prompt string")
Where, prompt string in the syntax is a statement or message to the user, to know what input can be given.

11. Name the tokens where the whitespace in necessary in python.

Ans. Whitespace separation is necessary between tokens, identifiers or keywords.

12. Why the following identifiers are invalid?

(i) 12 Name
(ii) name$
(iii) physics–mark
(iv) break

Ans. (i) An identifies must start with an alphabet.
(ii) No punctuation characters are allowed.
(iii) Only underscore (–) allowed.
(iv) Identifiers must not be a Python keyword.

13. Find the odd man out? Give reason.

(i) sum = 100
(ii) regno = 12401
(iii) name = "Kannan"
(iv) name = "Kumar"

Ans. (iv) name = "Kumar"
Reason : No function character allowed within identifiers.

14. Name any four keywords in Python.

Ans.

false	class	finally	Is	return
none	continue	For	Lambda	try

15. Write a note on relational or comparative operator.

Ans. A Relational operator is also called as Comparative operator which checks the relationship between two operands. If the relation is true, it returns True; otherwise it returns False.

16. Assume the value of a = 100 and b = 75. Evaluate the following expression.

(i) a==b (ii) a!=b (iii) a//b
(iv) a>=b

Ans. (i) False
(ii) true
(iii) 1
(iv) true.

17. What are the uses of logical operator? Name the operators.

Ans. In python, Logical operators are used to perform logical operations on the given relational expressions. There are three logical operators they are and, or and not.

18. Assume a = 50 and b = 40. Write the output the following statement.

(i) print ("The a > b or a == b = ",a>b or a==b)
(ii) print ("The a > b and a == b = ",a>b and a==b)
(iii) print ("The not a > b = ",not a>b)

Ans. (i) The a > b or a == b = True
(ii) The a > b and a == b = False
(iii) The not a > b = False.

19. Write the output for the following code.

```
x,y = 50,150
Z = x if x>y else y
print ("Z is", Z)
```

Ans. Z is 150.

20. Name the types of Numeric literals in python.

Ans. Numeric literals can belong to 3 different numerical types Integer, Float and Complex.

21. Write the description of the following Escape sequence character.

(i) \n (ii) \t

Ans. (i) New line
(ii) Tab

22. Name the built – in number objects in python.

Ans. The built-in number objects in Python supports integers, floating point numbers and complex numbers.

23. What are keywords?

Ans. Keywords are special words that are used by Python interpreter to recognize the structure of program.

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SHORT ANSWERS 3 MARKS

1. Write the key features of Python.

Ans. **(i)** It is a general purpose programming language which can be used for both scientific and non-scientific programming.

(ii) It is a platform independent programming language.

(iii) The programs written in Python are easily readable and understandable.

2. Differentiate two ways in which Python programs can be written.

Ans. **(i)** In Python, programs can be written in two ways namely Interactive mode and Script mode.

(ii) The Interactive mode allows us to write codes in Python command prompt (>>>) whereas in script mode programs can be written and stored as separate file with the extension.

(iii) py and executed. Script mode is used to create and edit python source file.

3. Write the function of the following

(i) Ctrl + N (ii) Ctrl + S (iii) F5

Ans. **(i)** to open Python shell window.

(ii) to save the Python file.

(iii) to run the Python program.

4. Fill in the blanks

>>>city = __(1)__("Enter your City")

Enter your city : __(2)__

>>> print ("I am from", __(3)__)

I am from Chennai.

Ans. (1) input (2) Chennai (3) City.

5. Fill up the blanks to get the following output from Python code given.

Output :

Enter Number 1 : 34

Enter Number 2 : 70

The Sum = 104

Code :

X = __(1)__ (input ("Enter Number 1 :"))

Y = __(2)__ (__(3)__ ("Enter Number 2 : "))

__(4)__ ("The sum = ", __(5)__)

Ans. (1) int (2) int (3) input (4) print (5) x + y

6. Why the following statement not accept the data as numbers? Give reason and also state what function is used to accept the number.

Ans. x = input ("Enter number")

Reason : If a numerical value is entered, the input values should be explicitly converted into numeric data type. The int( ) function is used to convert string data as integer data explicitly.

7. Write a Python programme to get the following output.

Output :

Enter Number 1 : 50

Enter Number 2 : 50

X = 50 Y = 50

Ans. x,y=int (input("Enter Number 1 :")),
int (input ("Enter Number 2:"))
print ("X = ",x," Y = ",y)

Output :

Enter Number 1 :30
Enter Number 2:50
X = 30 Y = 50

8. Write a Python program to get the following output.

Output :

Enter Number 1 : 50

Enter Number 2 : 50

The sum of 50 and 50 is 100

Ans. x = int(input ("Enter Number 1")
y = int(input("Enter Number 2")
print ("The sum of ", x, "and", y, "is", x+y)

9. Write a short note on comment statement.

(or)

Write a note on statement which are ignored by the Python interpreter.

Ans. **(i)** In Python, comments begin with hash symbol (#). The lines that begins with # are considered as comments and ignored by the Python interpreter.

(ii) Comments may be single line or no multi-lines. The multiline comments should be enclosed within a set of # as given below.

It is Single line Comment
It is multiline comment
which contains more than one line #

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10. How will you define program blocks in python?

Ans. **(i)** Python uses whitespace such as **spaces** and **tabs** to define program blocks whereas other languages like C, C++, java use curly braces { } to indicate blocks of codes for class, functions or body of the loops and block of selection command.

(ii) The number of whitespaces (spaces and tabs) in the indentation is not fixed, but all statements within the block must be indented with same amount spaces.

11. What are the rules followed while defining python identifier?

Ans. **(i)** An identifier must start with an alphabet (A..Z or a..z) or underscore (_)..

(ii) Identifiers may contain digits (0 .. 9).

(iii) Python identifiers are case sensitive i.e. uppercase and lowercase letters are distinct.

(iv) Identifiers must not be a **python** keyword.

(v) Python does not allow punctuation character such as %,$, @ etc., within identifiers.

12. Fill in the blanks

(i) _____ statements are ignored by Python interpreter.

(ii) The value of an operator used is called _____.

(iii) 100//30 = _____.

Ans. **(i)** Comment

(ii) Operands

(iii) 3

13. Assume a = 1000 b = 10, Evaluate the following expression.

(i) a%30 (ii) a/b (iii) b2 (iv) b//3**

Ans. **(i)** 100

(ii) 100.0

(iii) 100

(iv) 3

14. Identify the type of literals.

(i) OX13B (ii) i+34j (iii) 12e05

(iv) 0346

Ans. **(i)** Hexadecimal literal

(ii) Complex literal

(iii) Floating point literal

(iv) Octal literal.

15. How will you represent Octal, hexadecimal and long integer data?

Ans. Integer Data can be decimal, octal or hexadecimal. Octal integer use **O** (both upper and lower case) to denote octal digits and hexadecimal integer use **OX** (both upper and lower case) and L (only upper case) to denote long integer.

LONG ANSWERS — 5 MARKS

1. Write the output for the following python code.

```
x=10
x+=20
print ("The x += 20 is =",x)
x-=5
print ("The x -= 5 is = ",x)
x*=5
print ("The x *= 5 is = ",x)
x/=2
print ("The x /= 2 is = ",x)
x%=3
print ("The x %= 3 is = ",x)
x**=2
print ("The x **= 2 is = ",x)
x//=3
print ("The x //= 3 is = ",x)
```

Ans. **Output :**

```
Type a Value for X : 10
The x += 20 is = 30
The x -= 5 is = 25
The x *= 5 is = 125
The x /= 2 is = 62.5
The x %= 3 is = 2.5
The x **= 2 is = 6.25
The x //= 3 is = 2.0
```

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CHAPTER 6

CONTROL STRUCTURES

CHAPTER SNAPSHOT

EVALUATION

PART - I

CHOOSE THE BEST ANSWER (1 MARK)

1. How many important control structures are there in Python?
(a) 3 (b) 4 (c) 5 (d) 6
[Ans. (a) 3]

2. elif can be considered to be abbreviation of
(a) nested if (b) if..else
(c) else if (d) if..elif
[Ans. (c) else if]

3. What plays a vital role in Python programming?
(a) Statements (b) Control
(c) Structure (d) Indentation
[Ans. (a) Statements]

4. Which statement is generally used as a placeholder?
(a) continue (b) break
(c) pass (d) goto
[Ans. (c) pass]

5. The condition in the if statement should be in the form of
(a) Arithmetic or Relational expression
(b) Arithmetic or Logical expression
(c) Relational or Logical expression
(d) Arithmetic
[Ans. (c) Relational or Logical expression]

6. Which is the most comfortable loop?
(a) do..while (b) while
(c) for (d) if..elif
[Ans. (c) for]

7. What is the output of the following snippet?

```
i=1
while True:
        if i%3 ==0:
            break
        print(i,end='')
        i +=1
```

(a) 12 (b) 123 (c) 1234 (d) 124
[Ans. (A) 12]

8. What is the output of the following snippet?

```
T=1
while T:
print(True)
        break
```

(a) False (b) True
(c) 0 (d) no output
[Ans. (b) True]

9. Which amongst this is not a jump statement ?
(a) for
(b) goto
(c) continue
(d) break
[Ans. (a) for]

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10. Which punctuation should be used in the blank?

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

(a) ; (b) : (c) :: (d) !

[Ans. (b) :]

PART - II

ANSWER THE FOLLOWING QUESTIONS (2 MARKS)

1. List the control structures in Python.

Ans. **(i)** Sequential
(ii) Alternative or Branching
(iii) Iterative or Looping

2. Write note on break statement.

Ans. **(i)** The **break** statement terminates the loop containing it. Control of the program flows to the statement immediately after the body of the loop.

(ii) 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.

(iii) If break statement is inside a nested loop (loop inside another loop), break will terminate the innermost loop.

3. Write the syntax of if..else statement

Ans. **Syntax :**

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

4. Define control structure.

Ans. A program statement that causes a jump of control from one part of the program to another is called **control structure** or **control statement**.

5. Write note on range () in loop.

Ans. range() generates a list of values starting from **start** till **stop-1**.

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.

PART - III

ANSWER THE FOLLOWING QUESTIONS (3 MARKS)

1. Write a program to display

A
A B
A B C
A B C D
A B C D E

Ans.

```
For i in range (65, 70):
For j in range (65, i + 1):
print (chr(j), end = ' ')
print (end='\n')
i+ = 1
```

2. Write note on if..else structure.

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

(ii) **Syntax:**

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

(iii) 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.

3. Using if..else..elif statement write a suitable program to display largest of 3 numbers.

Ans.

```
a = int (input ("Enter number 1"))
b = int (input (" Enter number 2"))
c = int (input (" Enter number 3"))
    if a > b and a > c:
        put (" A is greatest")
    elif b > a and b > c:
     print ("B is greatest")
    else:
        print ("C is greatest")
```


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4. Write the syntax of while loop.

Ans. **Syntex:**

```
while <condition>:
        statements block 1
[else:
        statements block2]
```

5. List the differences between break and continue statements.

Ans. The break statement terminates the loop containing it and control reaches after the body of the loop where as continue statement skips the remaining part of a loop and start with next iteration.

PART - IV

ANSWER THE FOLLOWING QUESTIONS

(5 MARKS)

1. Write a detail note on for loop

Ans. **(i)** **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.

(ii) Syntax:

```
for counter_variable in sequence:
        statements-block 1
[else: # optional block
        statements-block 2]
```

(iii) The counter_variable mentioned in the syntax is similar to the control variable that we used in the **for** loop of C++ and the sequence refers to the initial, final and increment value. Usually 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-1**.

(iv) The syntax of range() is as follows:

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.

Examples for range() :

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

range (30,3,-3) - will start the range of values from 30 and end at 6

range (20) - will consider this value 20 as the end value(or upper limit) and starts the range count from 0 to 19 (remember always range() will work till stop -1 value only)

Example :

```
#Program to illustrate the use of for loop - to print single digit even number
for i in range (2,10,2):
        print (i, end=' ')
```

Output :

2 4 6 8

2. Write a detail note on if..else..elif statement with suitable example.

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

(ii) Syntax :

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

(iii) 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.

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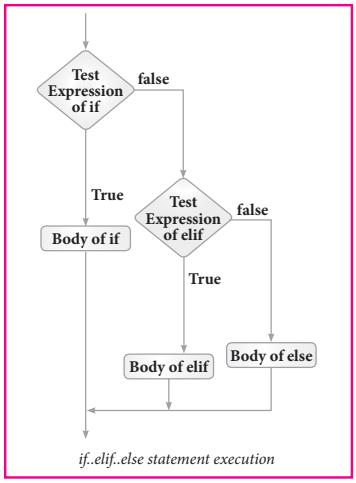

if..elif..else statement execution

(iv) **'elif'** clause combines **if..else-if..else** statements to one **if..elif…else. 'elif'** can be considered to be abbreviation of **'else if'**. In an **'if'** statement there is no limit of 'elif' clause that can be used, but an **'else'** clause if used should be placed at the end.

(v) **Example :** #Program to illustrate the use of nested if statement

Average	Grade
>=80 and above	A
>=70 and <80	B
>=60 and <70	C
>=50 and <60	D
Otherwise	E

```
m1=int (input("Enter mark in first subject : "))
m2=int (input("Enter mark in second subject : "))
avg= (m1+m2)/2
if avg>=80:
    print ("Grade : A")
elif avg>=70 and avg<80:
    print ("Grade : B")
elif avg>=60 and avg<70:
    print ("Grade : C")
elif avg>=50 and avg<60:
    print ("Grade : D")
else:
    print ("Grade : E")
```

Output 1:

```
Enter mark in first subject : 34
Enter mark in second subject : 78
Grade : D
```

Output 2 :

```
Enter mark in first subject : 67
```

3. Write a program to display all 3 digit odd numbers.

Ans.
```
for i in range (101, 100, 2):
    print (i, end = "   ")
```

4. Write a program to display multiplication table for a given number.

Ans.
```
n = int (input ("Enter the number")
for i in range (1, 13):
    print (n, 'x', i, " = ", n * i)
```

Hands on Experience

1. Write a program to check whether the given character is a vowel or not.

Ans. **Program :**

```
ch = input ("Enter a character")
if ch in ('a', 'A', 'e', 'E', 'i', 'I','o','O','u', 'U'):
 print (ch, 'is a vowel')
```

2. Using if..else..elif statement check smallest of three numbers.

Ans. **Program :**

```
a = in + (input ("Enter number 1")
b = in + (input("Enter number 2")
c = in + (input ("Enter number 3")
if a < b and a < c :
    print ("a is smallest")
elif b < a and b< c:
    print ("b is smallest")
else
    print ("c is smallest")
```

3. Write a program to check if a number is Positive, Negative or zero.

Ans. **Program :**

```
x = in + (input("aEnter a number")
if x>0:
    print (x, "is a positive number")
elif x < 0:
    print (x, "is a negative number")
else
    print (x, "is zero")
```


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4. Write a program to display Fibonacci series 0 1 1 2 3 4 5…… (upto n terms)

Ans. **Program to display Fibonacci series :**

```
a, b, c = 0, 1,0
n = in + (input("Enter number of terms"))
print (a, end = '')
print (b, end = '')
for I in range (3, n+1):
    c = a+b
    print (c, end = '')
    a = b
    b = c
```

5. Write a program to display sum of natural numbers, upto n.

Ans. **Program to display sum of natural numbers upto n :**

```
    s = 0
    n = in + (input("Enter number of terms"))
    for i in range (1, n + 1)
    s = s + i
print ("sum = ", s)
```

6. Write a program to check if the given number is a palindrome or not.

Ans. **Program :**

```
n = int (input("Enter the number"))
s, d, x = 0, 0, n
while (n ! = 0):
    d = n%10
    s = (s* 10)+d
    n = n//10
if s = = x:
    print ("The given number is palindrome"
else:
    print ("The given number is not palindrome")
```

7. Write a program to print the following pattern

```
* * * * *
* * * *
* * *
* *
*
```

Ans. **Program :**

```
for i in range (5, 0, -1):
    for j in range (1, i + 1):
    print (' * ', end = '')
    print (end = '\n')
    i + = 1
```

8. Write a program to check if the year is leap year or not.

Ans. **Program :**

```
y = int (input ("Enter the year"))
If y % 400 = = 0 or y% 4 = = 0 or y% 100 = = 0:
    print ("The given year is a leap year")
else:
    print ("The given number is not a leap year")
```

ADDITIONAL QUESTIONS AND ANSWERS

CHOOSE THE CORRECT ANSWER — 1 MARK

1. Which of the following are the executable segments that yield the result?

(a) Operator (b) Statements
(c) Keywords (d) Identifiers

[Ans. (b) Statements]

1. Find the odd man out.

(a) keywords (b) Operator
(c) Identifiers (d) Programs

[Ans. (d) Programs]

2. Find the odd man out.

(a) Statement (b) Operator
(c) Identifier (d) Keyword

[Ans. (a) Statements]

3. Which of the following is used to alter the control flow of the process depending on the state of the process?

(a) control structure
(b) control statement
(c) program statement
(d) control structure or control statement

[Ans. (d) control structure or control statement]

4. How many important control structures in python?

(a) 2 (b) 3
(c) 4 (d) many

[Ans. (b) 3]

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5. Which of the following is not control structures?
(a) Sequential (b) Branching
(c) Operator (d) Looping
[Ans. (c) Operator]

6. Find the odd man out
(a) Branching (b) looping
(c) sequential (d) Condition
[Ans. (d) Condition]

7. The following statements is an example of
Print ("ONE")
Print ("Four")
(a) iterative (b) branching
(c) sequential (d) looping
[Ans. (c) sequential]

8. What can be learned through alternative or branching statement?
(a) looping
(b) decision making
(c) functions
(d) classes **[Ans. (b) decision making]**

9. Checking whether the given number is even or odd can be done using
(a) sequential
(b) alternative or branching
(c) iterative or looping
(d) iterative or sequential
[Ans. (b) alternative or branching]

10. How many types of alternative or branching statements does python provides?
(a) 3 (b) 4
(c) 2 (d) increase than 3
[Ans. (a) 3]

11. Which of the following is not a type of branching statements?
(a) if (b) if-else
(c) if-elif (d) while
[Ans. (d) while]

12. Which of the following is not a decision making statement?
(a) if (b) if-else
(c) do-while (d) if-elif
[Ans. (c) do-while]

13. Which of the following statement provided control to check the true false and false block?
(a) if (b) while
(c) do-while (d) if-else
[Ans. (d) if-else]

14. To construct a chain of if statement, else can e replaced by
(a) while (b) ifel
(c) else if (d) elif **[Ans. (d) elif]**

15. Which of the following can be used when the user wants to execute a block of code several times bill the condition is satisfied?
(a) while (b) if-else
(c) if-elif-if (d) all of there
[Ans. (a) while]

16. Which of the following function generates the list of values starting from start till stop-1 ?
(a) sequence() (b) range()
(c) input() (d) print()
[Ans. (b) range()]

17. range (20), the range count from
(a) 1 to 20 (b) 0 to 19
(c) 1 to 19 (d) 0 to 20
[Ans. (b) 0 to 19]

18. Which of the following statement is correct when the range will start the values from 1 and end at 29?
(a) range (1, 30, 1) (b) range (1, 29, 1)
(c) range (1, 1, 30) (d) range (0, 29, 1)
[Ans. (a) range (1, 30, 1)]

19. Write the output for the following program
for I in range (1, 10, 2):
Print (I, end = ' ')
(a) 1, 3, 5, 7, 9
(b) 1, 3, 5, 7
(c) 1, 3, 5
(d) 1, 2, 3, 4, 5, 6, 7, 8, 9, 10
[Ans. (b) 1, 3, 5, 7,]

20. What will be value of s from the following for c in range (1, 5)
s = s + c;
(a) 15 (b) 5 (c) 1 (d) 10
[Ans. (c) 1]

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21. Which of the following is not a nested lopp?
(a) for within while
(b) for within if
(c) while within for
(d) while within while **[Ans. (b) for within it]**

22. Which statement in python used to transfer the center from one part of the program to another unconditionally?
(a) Jump (b) loop
(c) alternative (d) iterative
[Ans. (a) Jump]

23. How many keywords are there to achieve jump statements in python?
(a) 2 (b) 4 (c) 3 (d) 5
[Ans. (c) 3]

24. Which of the following is not a jump statement in python?
(a) break (b) continue
(c) pass (d) goto
[Ans. (d) goto]

25. Which statement transfers the control out of loop even when the loop condition is tested true?
(a) continue (b) break
(c) pass (d) goto
[Ans. (b) break]

26. Which part of the loop is not executed if a loop is left by break?
(a) if (b) else
(c) break (d) for
[Ans. (b) else]

27. Which statement is used to skip the remaining part of a loop and start with next iteration?
(a) continue (b) break
(c) pass (d) condition
[Ans. (a) continue]

28. Which of the following statement is used as a place holder in python?
(a) continue (b) break
(c) pass (d) if
[Ans. (c) pass]

29. Find the odd man out.
(a) continue (b) for
(c) break (d) pass
[Ans. (b) for]

Choose and fill in the blanks

1. The program segment executed based on the test of the condition are called _____
(a) statement (b) iteration
(c) branding (d) looping
[Ans. (c) branding]

2. The program statements executed for multiple times are called _____
(a) alterative (b) looping
(c) branching (d) objects
[Ans. (b) looping]

3. The program statements which are executed one after another is called _____ statements.
(a) sequential (b) iterative
(c) Branching (d) looping
[Ans. (a) sequential]

4. In if-else statement which block is to be executed is determined by a _____
(a) Operator (b) operands
(c) condition (d) identifier
[Ans. (c) condition]

5. Python provides _____types of looping constructs.
(a) 3 (b) 2 (c) 4 (d) 6
[Ans. (b) 2]

6. In the _____loop, the condition is any valid boolean expression returning True or false.
(a) if (b) else
(c) eif (d) while
[Ans. (d) while]

7. The _____part of while is optional part of while.
(a) if (b) else
(c) elif (d) condition
[Ans. (b) else]

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8. In Python for loop, the _____refers to the initial, final and increment value.
(a) else
(b) sequence
(c) range
(d) b or c **[Ans. (d) b or c]**

9. In Python, for loop uses the _____ function in the sequence to specify the initial, final and increment values.
(a) Input ()
(b) print ()
(c) range ()
(d) sequence () **[Ans. (c) range ()]**

10. In range (30, 3, -3), -3 denotes _____ value.
(a) start (b) stop
(c) step (d) final
[Ans. (c) step]

11. range (30, 3, -3)-will start the range of values from _____and end at_____.
(a) 30, 3 (b) 30, -3
(c) 30, 6 (d) 30, 0
[Ans. (c) 30, 6]

12. A loop placed within another loop is called as _____loop structure.
(a) entry check
(b) exit check
(c) nested
(d) conditional **[Ans. (c) nested]**

13. Control of the program flows to the statements immediately after the body of the loop by using _____statements.
(a) continue (b) pass
(c) break (d) goto
[Ans. (c) break]

14. If break statement is inside a nested loop, _____ will terminate the innermost loop.
(a) continue (b) Pass
(c) goto (d) break
[Ans. (d) break]

Choose the correct statement

1. Choose the correct pair from the following
(a) alternative statement also called branching
(b) iteration also called branching
(c) alternative statements also called looping
(d) branching also called looping
[Ans. (a) alternative statement also called branching]

Choose the incorrect statement

1. Which of the following statements are incorrect?
(i) In a if statement there is no limit of elif clause that can be use(d)
(ii) 'else' clause if used should be placed at the en(d)
(iii) python provides three types of loop constructs.
(iv) if – elif – else is not similar to C++ nested if.
(a) i and ii (b) ii and iii
(c) iii and iv (d) i and iv
[Ans. (c) iii and iv]

2. (a) In for loop, the condition is checked in the beginning.
(b) In for loop range () function in the resurgence to specify the initial, final and increment values.
(c) range () generates a list of values starting from start till stop – 1
(d) The syntax of range is range (start, step, stop)
[Ans. (d) The syntax of range is range (start, step, stop)]

3. (i) Jump statements transfer the control from are part of the program to another conditionally.
(ii) goto, continue, pass are the three jump statements in python.
(iii) In Python, indentation is important in loop and other control statements.
(iv) Pass statement used as a place holder.
(a) i and ii (b) ii and iii
(c) iii and iv (d) i and iv
[Ans. (a) i and ii]

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4. (i) if a loop is left by break, the else part is not executed

(ii) Continue statement is used to skip the remaining part of a loop and start with next iteration.

(iii) In python, pass statement is a null statement.

(iv) In python, pass statement is not completely ignored by the complier.

(a) i and ii (b) iii only

(c) iii and iv (d) iv only

[Ans. (d) iv only]

CHOOSE THE TRUE OR FALSE STATEMENT

1. State whether the following statement is true/ false.

(i) While loop is an entry check loop

(ii) for loop is an entry check loop

(iii) print() can have parameters

(iv) if-elif-else is similar to c++ nested if.

(a) i – true, ii – true, iii-true, iv-true

(b) i-true, ii-false, iii-true, iv-true

(c) i-true, ii-true, iii-false, iv-true

(d) i-true, ii-true, iii-true, iv-true

[Ans. (a) i – true, ii – true, iii-true, iv-true]

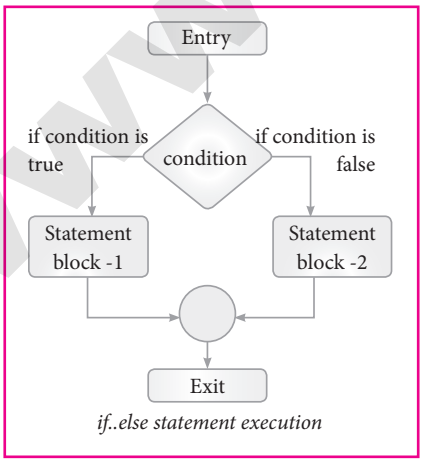
VERY SHORT ANSWERS 2 MARKS

1. What is meant by alternative or branching?

Ans. There may be situations in our real life programming where we need to skip a segment or set of statements and execute another segment based on the test of a condition. This is called **alternative** or **branching**.

2. Draw a flow chart that defines the execution of if-else statement.

Ans.



if..else statement execution

3. Write a program in python to check if the accepted number even or odd.

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

Ans. **Output 1:**

Enter any number :56

56 is an even number

Output 2:

Enter any number :67

67 is an odd number

4. Write the syntax of alternative method to write complete if-else.

Ans. **Syntax:**

variable = variable1 if condition else variable 2

5. Write a program in python to check if the accepted number us even or odd (use alternate method of if-else).

Ans.

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

Output 1:

Enter any number :3

3 is odd

Output 2:

Enter any number :22

22 is even

6. What are the two types of looping constructs in python?

Ans. Python provides two types of looping constructs:

(i) while loop

(ii) for loop

7. Write a note on the parameters used in print () statement.

Ans. (i) **print** can have end, sep as parameters. end parameter can be used when we need to give any escape sequences like '\t' for tab, '\n' for new line and so on.

(ii) sep as parameter can be used to specify any special characters like, (comma) ; (semicolon) as separator between values

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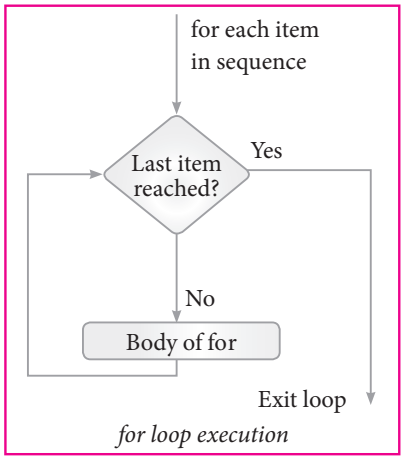
8. Write the syntax of for loop.

Ans. **Syntax:**

for counter_variable in sequence:
statements-block 1
[else: # optional block
statements-block 2]

9. Draw the flowchart that illustrate the working of for loop.

Ans.



for loop execution

10. What will the output of the following program?

```
for i in range (1, 9, 2):
    print (i, end = '  ')
else:
    print (")n End of the loop")
```

Ans. **Output:**

1, 3, 5, 7
End of the loop

11. What is the expression or statement at ?1? and ?2? in the following program to get the output 2 4 6 8

```
for ?1? in range (2, ?2?, 2):
    print (i, end = '')
```

Ans. ?1? – i
?2? – 10

12. Write a python program to calculate the sum of numbers between 1 and 100.

Ans. Program to calculate the sum of numbers 1 to 100

Program :

```
n = 100
sum = 0
for counter in range(1,n+1):
    sum = sum + counter
print("Sum of 1 until %d: %d" % (n,sum))
```

Output:

Sum of 1 until 100: 5050

13. Write a python program to find the sum of even numbers between 1 and 10.

Ans.

```
s = 0
For i in range (2, 11, 2)
s = s + i
print (s)
```

14. Write a python program to find the sum of odd numbers between 10 and 20.

Ans.

```
s = 0
for i in range (11, 21, 2)
s = s + i
print (s)
```

15. What are the values taken by range ()?

Ans. It take values from string, list, dictionary.

16. What is meant by Nested loop structure?

Ans. A loop placed within another loop is called as nested loop structure. A **while** within another **while; for** within another **for; for** within **while** and **while** within **for** to construc nested loops.

17. What is the use of Jump statements in python?

(or)

What are the statements are there to achieve jump statements in python?

Ans. 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. The following flowchart illustrates the use of break and continue.

18. Write the syntax how break statement used in for loop.

Ans.

```
for var in sequence:
    if condition:
        break
    #code inside for loop
#code outside for loop
```

19. Write the syntax how break statement used in while loop.

Ans.

```
while test expression:
    #code inside while loop
```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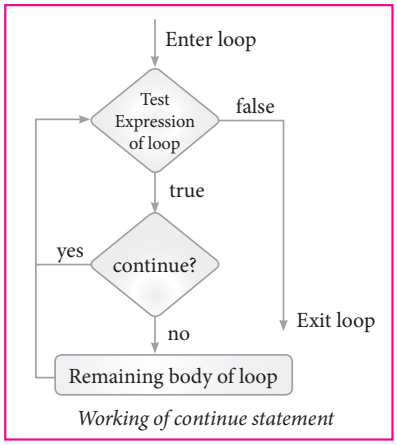
```
if condition:
    break
    #code inside while loop
#code outside while loop
```

20. What is the use of continue statement in python?

Ans. Continue statement unlike the break statement is used to skip the remaining part of a loop and start with next iteration.

21. Draw the flowchart that illustrates the working of continue statement in python.

Ans.



Working of continue statement

22. What will the output the following

```
for w in "school"?
If w = = '0':
        continue
print (w)
```

Ans. schl

23. Write a note an pass statement.

Ans. **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.

SHORT ANSWERS — 3 MARKS

1. Write a note on sequential statement with an example.

Ans. 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.

Example :

```
# Program to print your name and address - example for sequential statement
print ("Hello! This is Shyam")
print ("43, Second Lane, North Car Street, TN")
```

Output :

```
Hello! This is Shyam
43, Second Lane, North Car Street, TN
```

2. List the types of alternative or branching statement in python.

Ans. Python provides the following types of alternative or branching statements:

(i) Simple if statement
(ii) if..else statement
(iii) if..elif statement

3. Write a note on simple if statement with an example.

Ans. **Simple if statement :** 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
```

In the above syntax if the condition is true statements - block 1 will be executed.

Example : Program to check the age and print whether eligible for voting

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

Output 1:

```
Enter your age :34
You are eligible for voting
```

Output 2:

```
Enter your age :16
>>>
```

4. Write a python program to print all numbers from 10 to 15 using while loop.

Ans. **Example :** Program to illustrate the use of while loop - to print all numbers from 10 to 15

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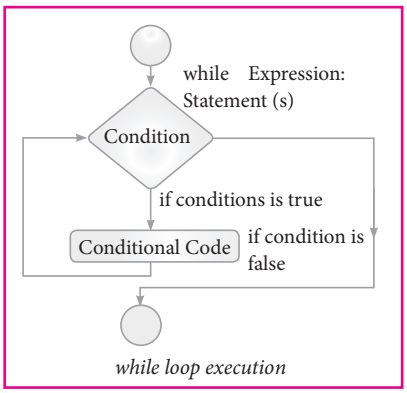
```
i=10 # intializing part of the control variable
while (i<=15): # test condition
print (i,end='\t') # statements - block 1
i=i+1 # Updation of the control variable
```

Output:

10 11 12 13 14 15

5. Draw a flowchart that illustrates the working of while loop.

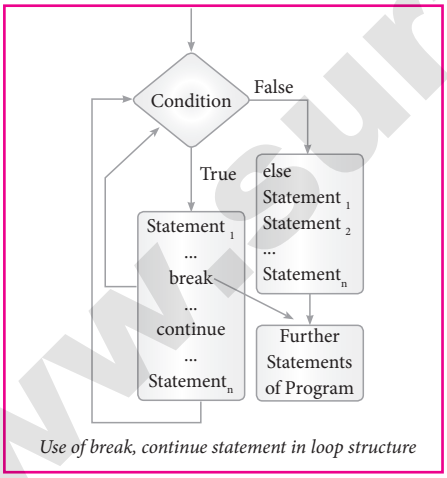
Ans.



while loop execution

6. Draw the flowchart that illustrates the use of break and continue statement in loop structure.

Ans.



Use of break, continue statement in loop structure

7. Write a program in python that illustrate the use of 'in' and 'not in' if statement

Ans. **Program :**

```
ch=input ("Enter a character :")
# to check if the letter is vowel
if ch in ('a', 'A', 'e', 'E', 'i', 'I', 'o', 'O', 'u', 'U'):
    print (ch,' is a vowel')
# to check if the letter typed is not 'a' or 'b' or 'c'
if ch not in ('a', 'b', 'c'):
    print (ch,' the letter is not a/b/c')
```

Output 1:

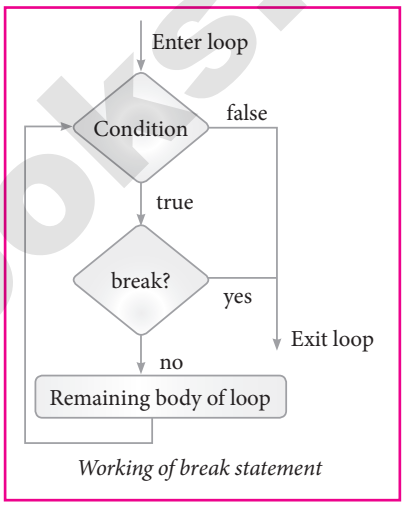
Enter a character :e
e is a vowel

Output 2:

Enter a character :x
x the letter is not a/b/c

8. Draw the flowchart that illustrates the working of break statement.

Ans.



Working of break statement

9. Write the syntax of working of continue statement in for and while loop.

Ans. **for var in sequence:**

```
# code inside for loop
if condition:
    continue
    #code inside for loop
#code outside for loop
```

while test expression:

```
#code inside while loop
if condition:
    continue
    #code inside while loop
#code outside while loop
```

10. What is the output of the following Python program?

Ans.

```
i=10 # intializing part of the control variable
while (i<=15): # test condition
```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```
print (i,end='\t') # statements - block 1
i=i+1 # Updation of the control variable
else:
print ("\nValue of i when the loop exit ",i)
```

Output: 1

10 11 12 13 14 15
Value of i when the loop exit 16

11. What will be the range of values displayed by the following?

Ans. 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
range (30,3,-3) - will start the range of values from 30 and end at 6
range (20) - will consider this value 20 as the end value(or upper limit) and starts the range count from 0 to 19 (remember always range() will work till stop -1 value only)

12. Draw a flowchart that illustrate how looping construct gets executed.

Ans.

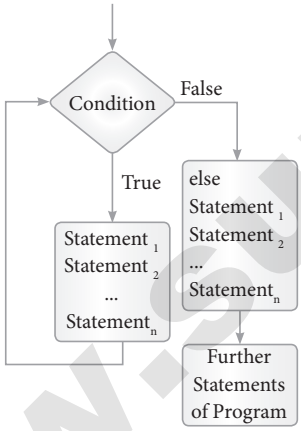


Diagram to illustrate how looping construct gets executed

13. What will be output of the following program?

Ans.

```
for word in "Jump Statement":
    if word = = "e":
        break
        print (word, end='')
else:
        print ("End of the loop")
        print ("\n End of the program")
```

Output:

Jump Stat
End of the program

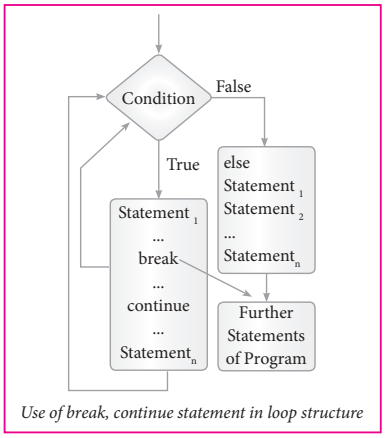
14. Why we need to construct the pass statement?

Ans. **pass** statement is generally used as a placeholder. When we have a loop or function that is to be implemented in the future and not now, we cannot develop such functions or loops with empty body segment because the interpreter would raise an error. So, to avoid this we can use pass statement to construct a body that does nothing.

Long Answers 5 MARKS

1. Explain Jump statement in python.

Ans. 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**. The following flowchart illustrates the use of break and continue.



Use of break, continue statement in loop structure

(i) **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, but 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.

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If break statement is inside a nested loop (loop inside another loop), break will terminate the innermost loop.

Syntax:

break

(ii) continue statement : Continue statement unlike the break statement is used to skip the remaining part of a loop and start with next iteration.

Syntax:

continue

(iii) pass statement : pass statement is generally used as a placeholder. When we have a loop or function that is to be implemented in the future and not now, we cannot develop such functions or loops with empty body segment because the interpreter would raise an error. So, to avoid this we can use pass statement to construct a body that does nothing.

Syntax:

pass

2. Write a program in python to display the following output.

1
1 2
1 2 3
1 2 3 4
1 2 3 4 5

Ans.

```
i=1
while (i<=6):
    for j in range (1,i):
        print (j,end='\t')
    print (end='\n')
    i +=1
```

Output:

```
1
1 2
1 2 3
1 2 3 4
1 2 3 4 5
```

3. Write a program in python to display he following output

1
2 2
3 3 3
4 4 4 4
5 5 5 5 5

Ans.

```
for i in range (1,6):
    for j in range (1, i + 1)
        print (i, end = '  ')
        print (end = '\n')
    i + = 1
```

4. Write a program in python to display the following output.

(i) 5 5 5 5 5
4 4 4 4
3 3 3
2 2
1

(ii) 1 2 3 4 5
1 2 3 4
1 2 3
1 2
1

Ans. **(i)**

```
for i in range (5, 0,-1):
    for j in range (1, i + 1):
        print (i, end = '  ')
        print (end = '\n')
    i + = 1
```

(ii)

```
for i in range (5, 0, -1):
        for j in range (1, i + 1):
        print (j end = '  ')
        print (i, end = '\n')
    i + = 1
```

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CHAPTER 7

PYTHON FUNCTIONS

CHAPTER SNAPSHOT

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swapcase()	swap uppercase characters to lowercase; vice versa
title()	Returns a Title Cased String
translate()	returns mapped charactered string
upper()	returns uppercased string
zfill()	Returns a Copy of The String Padded With Zeros

III. List Functions

Function	Description
append()	Add Single Element to The List
clear()	Removes all Items from the List
copy()	Returns Shallow Copy of a List
count()	returns occurrences of element in a list
extend()	Add Elements of a List to Another List
index()	returns smallest index of element in list
insert()	Inserts Element to The List
list() Function	creates list in Python
pop()	Removes Element at Given Index
remove()	Removes Element from the List
reverse()	Reverses a List
slice()	creates a slice object specified by range()
sort()	sorts elements of a list

IV. Tuple Functions

Function	Description
count()	returns occurrences of element in a tuple
index()	returns smallest index of element in tuple
slice()	creates a slice object specified by range()
tuple() Function	Creates a Tuple
zip()	Returns an Iterator of Tuples

V. Set Functions

Function	Description
add()	adds element to a set
clear()	remove all elements from a set
copy()	Returns Shallow Copy of a Set
difference()	Returns Difference of Two Sets
difference_update()	Updates Calling Set With Intersection of Sets
discard()	Removes an Element from The Set
frozenset()	returns immutable frozenset object
intersection()	Returns Intersection of Two or More Sets
intersection_update()	Updates Calling Set With Intersection of Sets
isdisjoint()	Checks Disjoint Sets
issubset()	Checks if a Set is Subset of Another Set
issuperset()	Checks if a Set is Superset of Another Set
pop()	Removes an Arbitrary Element
remove()	Removes Element from the Set
set()	returns a Python set
symmetric_difference()	Returns Symmetric Difference
symmetric_difference_update()	Updates Set With Symmetric Difference
union()	Returns Union of Sets
update()	Add Elements to The Set.

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VI. Dictionary Functions

Function	Description
clear()	Removes all Items
copy()	Returns Shallow Copy of a Dictionary
dict()	Creates a Dictionary
fromkeys()	creates dictionary from given sequence
get()	Returns Value of The Key
items()	returns view of dictionary's (key, value) pair
keys()	Returns View Object of All Keys
pop()	removes and returns element having given key
popitem()	Returns & Removes Element From Dictionary
setdefault()	Inserts Key With a Value if Key is not Present
update()	Updates the Dictionary
values()	returns view of all values in dictionary

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