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REVIEW OF PYTHON BASICS

KEYPOINTS

Python: Python language was developed by Guido Van Rossum in 1991.

Features of Python: Python is open source, Object oriented high level language, interpreted language, case sensitive, portable and platform independent language.

Character set: Character set of valid character recognised by Python.

Tokens: Smallest individual unit of a python program.

Keywords: Reserve words in Python having special meaning and purpose.

Identifier: Names given to any variable, constant, function or module etc.

Variable: Names given to any variable, constant, function or module etc.

Literals: Constant or Names given to any variable, constant, function or module etc.

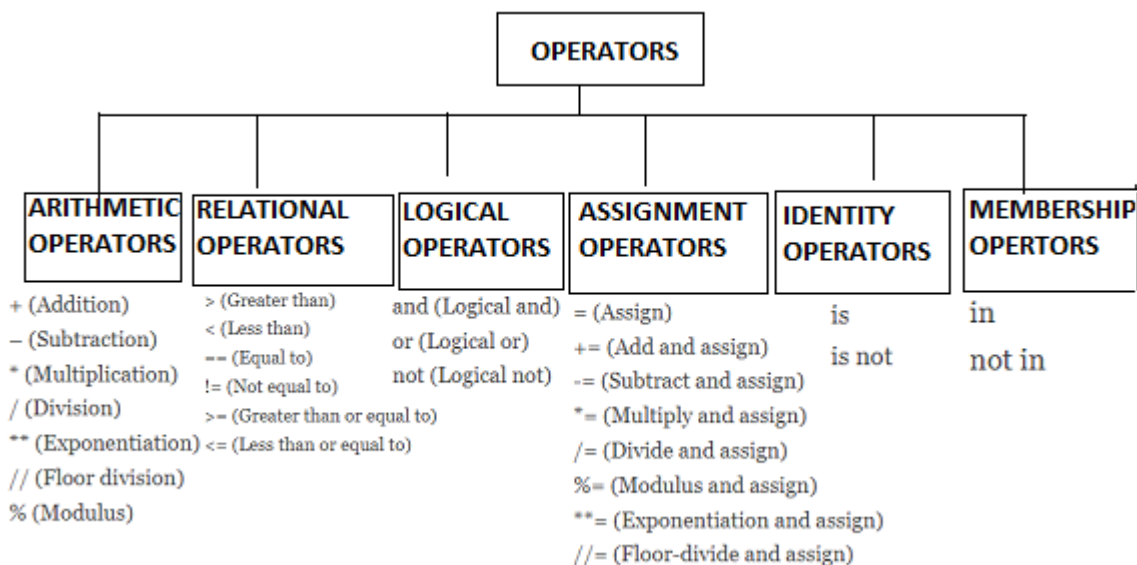
Comments: Comments are non-executable statement and begin with #.

Docstring: Comments enclosed in triple quotes (single or double).

Punctuators: Symbols which can be used as separators of values or to enclose some values.

Operators: An Operator is a symbol that operates upon operands /values and performs some action.

Categories of Operators in Python	Operators
Arithmetic operators	Addition (+), multiplication (*), division (/), subtraction (-) , modules (%), Exponentiation (**), floor division (//)
Logical operators	and, or, not
Relational operators	< (less than), > (greater than) , <= (less than equal to), >= (greater than equal to), != (Not equal to), ==(equal to)
Assignment/short hand operators	= , +=,*=, -=,/=, %=,**=, //=
Membership operators	in, not in
Identity operators	is, is not



Data Type: A data type is an attribute associated with a piece of data that tells a computer system how to interpret its value. Data type of any object/ variable can be get by using the type() function:

Data Types: Following basic data types in python are as follows:

Data type	Description
Bool	Store two values either True or False
Integer	Store whole number (decimal digit without fractional part)
Float	Store number with fractional part, it can be represented in scientific notation
Complex	Store real and imaginary numbers (a+5j)
String	Stores text enclosed in single or double quote
None	Special data type with an unidentified value.
List	Stores list of comma separated values(elements) of any data type between square [] brackets.(mutable)
Tuple	Stores list of comma separated values/elements of any data type between parentheses () (immutable)
Dictionary	Unordered set of comma-separated key: value pairs , within braces { }

Expression: An expression is a legal combination of value(s), i.e constant, variable and operators.

Mutable data type: Mutable data types are objects that can be modified or altered after they have been created.

Immutable data type: Immutable data types are objects that cannot be modified or altered after they have been created.

Type conversion: The process of converting the value from one data type to another is known as type conversion. It has two types-Implicit conversion and Explicit conversion.

Implicit conversion: When type conversion is done automatically by Python.

Type Casting: Explicit type conversion (**when data type conversion done by the user**)

Debugging: The process of finding errors in a program is termed as Debugging.

Syntax Error: It occurs when rules of programming are void or misused.

Sematic Error: It occurs when statements are meaningless.

Logical error: It occurs due to programmer's mistaken analysis of the logic.

Run Time error: It occurs during the execution of program.

Flow of Execution: The way in which the statements are executed defines the flow of executions in a Python program. Which is categorized as under:-

- i. **Sequential statements**
- ii. **Selection/ conditional/ decision making statements**
- iii. **Iteration/loop statements**

i. **Sequential statements:-**

In Python program statements are executed one after the other i.e. from the first till the last statement.

- ii. **Selection/ conditional/ decision making statements :-** These statements are used to perform action/calculation based on condition is evaluated to true or false

if statement	An if statement consists of a boolean expression followed by one or more statements. If the condition is true, then the indented statement gets executed.
if-else	An if statement can be followed by an optional else statement, which

statement	executes when the boolean expression is false.
if..elif..else statement	if the first Boolean expression is false, the next is checked and so on. If one of the conditions is true, the corresponding statement(s) executes, and the statement ends.
nested if statement	It allows checking for multiple test expression and executing different codes for more than two conditions.

Iteration or looping statements

For loop for(<control variable> in range>: <Statements in loop body> else: #optional <statements>	It is used to iterate/repeat itself over a range of values or sequence one by one. The for loop is executed for each of these items in range. When all the items in the range are executed then loop will be terminated.
While loop while<test expression>: <body of while> else: #optional <statements>	The while loop repeatedly executes the set of statement till the defined condition is true

Pass Statement: The pass statement is a null operation, nothing happens when executes.

Strings: Sequence of characters that is enclosed in single or double quotes referred as String. Strings are immutable. Various string operations are as follows:-

Operators	Syntax	Description
+ (Concatenation)	Str1+Str2	Adds or join two or more strings
*(Repetition)	Str*3	*operator creates a new string by repeating multiple copies of the same string.
in/not in (Membership)	'M' in 'Mumbai' 'M' not in 'mumbai'	Returns true if character exist in given the string and return false if the given character does not exist in the string
[:] (range(start, stop, step)	Str[1:8:2]	Extracts the characters from the given range or to extract a subset of values.
[] Slice[n:m]	Str[2:7]	Extracts the characters from the given index

String Methods and Built-in functions:

Function/Method	syntax	Description
len()	len (str)	Returns the length of the string
count()	str.count(sub, start, end)	It returns number of times substring str occurs in the given string.
split()	str.split(",")	Breaks up a string at the specified separator and returns a list of substrings
capitalize()	str.capitalize ()	Converts the first letter of the string in uppercase
title()	str.title()	It returns the string with first letter of every word in the string in uppercase and rest in lowercase.
find()	str.find (sub, start, end)	It is used to search the first occurrence of the substring in the given string.
replace()	str.replace (old, new)	It replaces all the occurrences of the old string with the new string.
index()	index(substr, start, end)	It also searches the first occurrence and returns the lowest index of the substring.
lower()	str.lower ()	It converts the string into lowercase
islower()	str.islower ()	It returns True if all the letters in the string are in lowercase otherwise false
upper()	str.upper()	It converts the string into uppercase
isupper()	str.isupper ()	It returns True if all the letters in the string are in uppercase otherwise false.
isalpha()	str.isapalha ()	It checks for alphabets in an inputted string and returns True in string contains only letters else false.
isalnum()	str.isanum ()	It returns True if all the characters are alphanumeric else false.
isdigit()	str.sidigit ()	It returns True if the string contains only digits, otherwise false.
istitle()	str.sititle()	It returns True if the string is properly "titledcase" else return false.
lstrip()	str.istrip(chars) str.istrip()	It returns the string after removing the space from the left of the string
rstrip()	str.restrip(chars) str.rstrip()	It returns the string after removing the space from the right of the string
strip()	str.strip()	It returns the string after removing the space from the both side of the string

LIST, TUPLE & DICTIONARY

List: A list is a collection of comma-separated values (items) of same or different type within square () brackets. List is a mutable data type.

Slicing: Slicing is an operation in which we can slice a particular range from a sequence. List slices are the sub parts extracted from a list.

Nested List: When a list appears as elements of another list, it is called a nested list.

Built-in Function (Manipulating Lists)

Function	Syntax	Description
append()	list.append (items)	It adds a single item to the end of the list.
extend()	list1.extend (list2)	It adds one list at the end of another list
insert()	list.insert (index_no, value)	It adds an element at a specified index
reverse()	list.reverse ()	It reverses the order of the elements in a list.
index()	list.index (item)	It returns the index of first matched item from the list.
len()	len (list)	Returns the length of the list i.e. number of elements in a list
sort()	list.sort ()	This function sorts the items of the list.
clear()	list.clear ()	It removes all the elements from the list.
count()	list.count (element)	It counts how many times an element has occurred in a list and returns it.
pop()	list.pop (index)	It removes the element from the specified index and also returns the element which was removed.
remove()	list.remove (value)	It is used when we know the element to be deleted, not the index of the element.
max()	max(list)	Returns the element with the maximum value from the list.
min()	min(list)	Returns the element with the minimum value from the list

Tuple: Tuple is a data structure in Python; A tuple consists of multiple values in a single variable separated by commas. Tuples are enclosed within parentheses (). Tuple is an immutable data type.

Common Tuple Operations:

Operation	Syntax	Description
index	Tuple.index(ele)	It finds the first index of specified items.
Slicing	Tuple[range]	It is used to retrieve a subset of values.
Concatenation	Tuple1 + Tuple2	Join/concatenate two tuple, can be added using + operator
Repetition	Tuple * x	It display the elements of a tuple a specified number of times, Repetition can be done using *operator
count	Tuple.count(ele)	Used to count the occurrence of an item in the tuple.

Tuple Functions:

Function/method	Syntax	Description
index()	tuple.index (value, start, end)	It returns the index of first matched item from the tuple.
len()	len (tup)	Returns the length of the tuple i.e. number of elements in a tuple
count()	tup.count(value)	It counts how many times an element has occurred in a tuple and returns it.
sorted()	sorted(tup)	It is used to sort the elements of a tuple. It returns a list after sorting.
sum()	sum(tup)	It returns sum of the elements of the tuple.
max()	max (tup)	Returns the element with the maximum value

		from the tuple.
min()	min (tup)	Returns the element with the minimum value from the tuple.
del statement	del tup	It is used to delete the tuple

Dictionary: Python Dictionaries are a collection of some key-value pairs. Dictionaries are mutable unordered collections with elements in the form of a key: value pairs that associate keys to values. Dictionaries are enclosed within braces { }

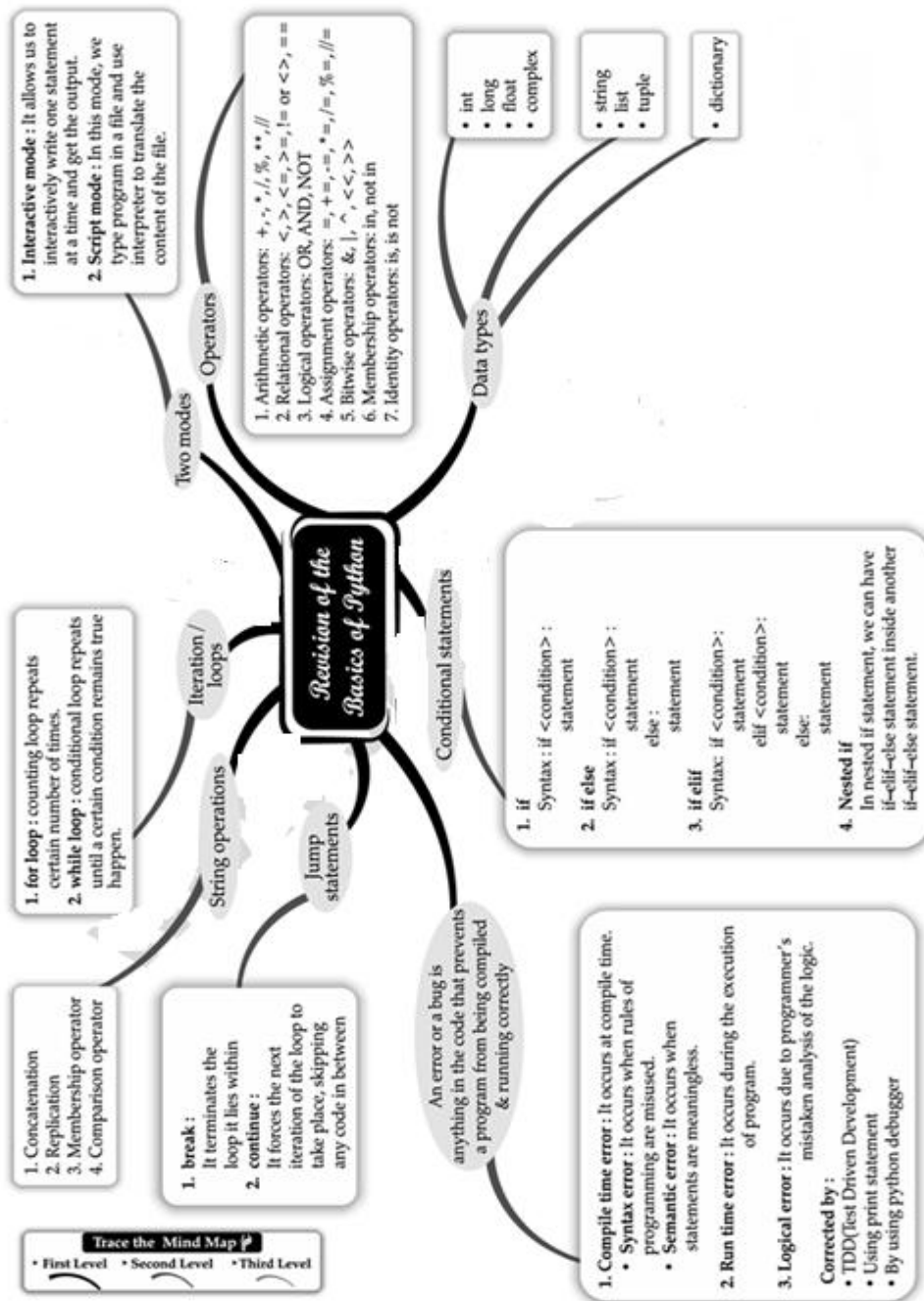
Dictionary Functions:

Function/method	syntax	Description
items()	Dict.items()	It returns the content of dictionary as a list of tuples having key-value pairs
keys()	Dict.keys()	It returns a list of the key values in a dictionary
values()	Dict.values()	It returns a list of values from key-value pairs in a dictionary
get()	Dict.get(key, default=None)	It returns the value for the given key ,if key is not available then it returns None
copy()	Dict_new=dict_old.copy()	It creates the copy of the dictionary.
len()	Len(dict)	Returns the length of the Dictionary i.e. number of key:value pairs in a Dictionary
fromkeys()	Dict.fromkeys(<ck>, <v>)	It is used to create dictionary from a collection of keys(tuple/list)
clear()	Dict.clear()	It removes all the elements from the Dictionary.
sorted()	Dict.sorted()	It sorts the elements of a dictionary by its key or values.
popitem()	Dict.popitem ()	It removes the last item from dictionary and also returns the deleted item
max()	Max(dict)	Returns the key having maximum value in the Dictionary.
min()	Min(dict)	Returns the key having minimum value in the Dictionary.

Differences in a List, Tuple & Dictionary

List	Tuple	Dictionary
List is a Mutable	Tuple is an Immutable	Dictionary is Mutable
Lists are dynamic	Tuples are of fixed size.	Keys are immutable type but values are immutable
Lists are enclosed in square bracket []	tuples are enclosed in parentheses ()	Dictionaries are enclosed in curly braces { }
Ex: List=[10,20,30)	Ex: tuple=(“red”, “green”)	Ex: { 26: “ram”, 50: “Gita”}
Slicing can be done	Slicing can be done	Slicing cannot be done

Mind Map



Precedence	Operator Sign	Operator Name
Highest	**	Exponentiation
	*, /, //, %	Multiplication, division, floor, division, modulus
	+, -	Addition, subtraction
	==, !=, <, <=, >, >=, is, is not	Comparison, Identity
	not	Boolean NOT
	and	Boolean AND
Lowest	or	Boolean OR

MULTIPLE CHOICE QUESTIONS (MCQ)-1 Mark

1	Find the valid identifier from the following (a) False (b) 39th (c) s@name (d) My_Name
2	Which of the following is a valid keyword in Python ? (a) false (b) return (c) not_local (d) none
3	Find the invalid identifier from the following (a) none (b) address (c) Name (d) pass
4	Which of the following is an invalid identifier in Python? (a) Max_marks (b) Max-marks (c) Maxmarks (d) _Max_Marks
5	Identify the valid arithmetic operator in Python from the following. (a) ? (b) < (c) ** (d) and
6	Identify the invalid logical operator in Python from the following. (a) and (b) or (c) not (d) Boolean
7	Find the operator which cannot be used with a string in Python from the following: (a) + (b) not in (c) * (d) //
8	Which of the following operators will return either True or False ? (a) += (b) != (c) = (d) *=
9	Consider the given expression: not True and False or True Which of the following will be correct output if the given expression is evaluated? (a) True (b) False (c) NONE (d) NULL
10	Which one of the following is a valid Python if statement a. if A>=9 : (b) if A>=9 (c) if (A>=9): (d) if A<=9
11	Write the output of the following python expression: print((4>5) and (2!=1) or (4<9)) a. False (b) True
12	Consider the given expression: 5<10 and 12>7 or not 7>4 Which of the following will be the correct output, if the given expression is evaluated? (a) True (b) False (c) NONE (d) NULL
13	What will the following expression be evaluated to in Python? print (4+3*5/3-5%2) (a) 8.5 (b) 8.0 (c) 10.2 (d) 10.0
14	What will the following expression be evaluated to in Python? print(15.0 / 4 + (8 + 3.0)) (a) 14.75 (b)14.0 (c) 15 (d) 15.5
15	What will be the output of the following python expression? print(2**3**2) a. 64 (b) 256 (c) 512 (d) 32
16	What will the following expression be evaluated to in Python? print(25 // 4 + 3**1**2 * 2) (a) 24 (b) 18 (c) 6 (d) 12
17	Which type of error occurs when rules of programming language are misused? a. Syntax error (b) Semantic error

	c) Run Time error (d) Logical error
18	Identify the type of error in the following X+Y=Z a. Syntax error (b) Semantic error (c) Run Time error (d) Logical error
19	Which value type does input() return? (a) Boolean (b) String c) Int (d) Float
20	Fill in the Blank The explicit conversion of an operand to a specific type is called _____. (a)Type casting (b) coercion (c) translation (d) None of these
21	Which of the following is not a core data type in Python? (a)Lists (b) Dictionaries (c)Tuple (d) Class
22	 function is used to determine the data type of a variable. a. type() (b) id() (c) print() (d) str()
23	Identify the output of the following Python statements. x = 1 for a in range(1, 10, 2): x += a + 2 print(x) a. 31 (b) 33 (c) 36 (d) 39
24	How many times will the following code be executed. y=5 while y>0: print(y) print("Bye") (a) 5 times (b) Once (c) Infinite (d) None of these
25	What will be the output of the following code: >>>import math >>>math.fabs(-5.03) a. 5.0 (b) 5.03 (c) -5.03 (d) None of the above
26	A list is declared as Lst = [1,2,3,-4,5,6,8] What will be the value of sum(Lst)? a. 21 (b) 30 (c) 25 (d) 8
27	Suppose list1=[0.5*x for x in range(0,4)], list1 is: (a) [0,1,2,3] (b) [0,1,2,3,4] (c) [0.0,0.5, 1.0,1.5] (d) [0.0,0.5,1.0,1.5,2.0]
28	Identify the output of the following Python statements. lst1 = [10, 15, 20, 25, 30] lst1.insert(3, 4) lst1.insert(2, 3) print (lst1[-5]) a. 2 (b) 3 (c) 4 (d) 20
29	Given the list L=[11,22,33,44,55], write the output of print(L[: :-1]). a. [1,2,3,4,5] (b) [22,33,44,55]

	(c) [55,44,33,22,11] (d) Error in code
30	Which of the following statements are correct: a. Lists can be used as keys in a dictionary b. A tuple cannot store list as an element c. We can use extend() function with tuple. d. We cannot delete a dictionary once created. (a) a,b,c (b) b,c,d (c) b,c,a (d) None of these
31	Suppose a tuple T is declared as T = (10, 12, 43, 39), which of the following is Incorrect? a) print(T[1]) b) print(max(T)) c) print(len(T)) d) None of the these
32	A tuple is declared as T = (12,46,67,55, 8, 69) Write the output of print(T.index(67)) a. 3 (b) 2 (c) 67 (d) None of these.
33	Match the output with the statement given in column A with Column B 1. >>>tuple([10,20,30]) a. >>> (10,20,30) 2. >>>("Tea",)* 3 b. >>> 2 3. >>>tuple("Item") c. >>> ('Tea', 'Tea', 'Tea') 4. >>>print(len(tuple([1,2]))) d. >>> ('l', 't', 'e', 'm') a. 1-b,2-c,3-d,4-a b. 1-a,2-c,3-d,4-b c. 1-c,2-d,3-a,4-a d. 1-d,2-a,3-b,4-c
34	What will be the output? d1 = {"john":40, "peter":45} d2 = {"john":466, "peter":45} d1 > d2 (a) TRUE (b) FALSE (c) ERROR (d) NONE
35	Can we modify/change keys of a dictionary? (a) Yes (b) No
36	Which is the correct form of declaration of dictionary? a. Day={1:'january',2:'february',3:'march'} b. Day=(1,'january',2,'february',3,'march') c. Day=[1:'january',2:'february',3:'march'] d. Day={1'january',2'february',3'march'}
37	Given the following dictionaries dict_student = {"rno" : "53", "name" : 'Rajveer Singh'} dict_marks = {"Accts" : 87, "English" : 65} Which statement will merge the contents of both dictionaries? (a) dict_student + dict_marks (b) dict_student.add(dict_marks) (c) dict_student.merge(dict_marks) (d) dict_student.update(dict_marks)
38	Which of the following statement(s) would give an error after executing the following code? D={'rno':32,'name':'Ms Neha','subject':['hindi','english','cs'],'marks':(85,75,89)} #S1

	D['subject'][2]='IP' #S2 D['marks'][2]=80 #S3 print(D) #S4 (a) S1 (b) S3 (c) S4 (d) S3 and S4
39	Which of the following statement(s) would give an error after executing the following code? d = {"A": 1, "B": 2, "C": 3, "D":4} #statement 1 sum_keys = 0 #statement 2 for val in d.keys(): #statement 3 sum_keys = sum_keys + val #statement 4 print(sum_keys) #statement 5 a. Statement 1 (b) Statement 2 (c) Statement 3 (d) Statement 4
40	If the following code is executed, what will be the output of the following code? name="Computer_Science_with_Python" print(name[-25:10]) a. puter_S (b) hon (c) puter_Science (d) with python
41	Which of the following statement(s) would give an error after executing the following code ? Stud={"Murugan" : 100, "Mithu" : 95} # Statement 1 print (Stud[95]) #Statement 2 Stud ["Murugan"] =99 #Statement 3 print (stud.pop ()) # Statement 4 print (Stud) #Statement 5 (a) Statement 2 (b) Statement 3 (c) Statement 4 (d) Statements 2 and4
42	Which of the following operations on a string will generate an error? a. "PYTHON"*3 (b) "PYTHON" + "20" (c) "PYTHON" + 10 (d) "PYTHON" + "LANGUAGE"
43	What is/are the possible output of the following code? import random List=["Delhi","Mumbai","Chennai","Kolkata"] for y in range(4): x = random.randint(1,3) print(List[x],end="#") a. Delhi#Mumbai#Chennai#Kolkata# b. Mumbai#Chennai#Kolkata#Mumbai# c. Mumbai# Mumbai #Mumbai # Delhi# d. Mumbai# Mumbai #Chennai #Mumbai
	Q 44-50 are ASSERTION AND REASONING based questions. Mark the correct choice as a. Both A and R are true and R is the correct explanation for A b. Both A and R are true and R is not the correct explanation for A c. A is True but R is False d. A is false but R is True
44	str1= "Class" + "Work" Assertion: Value of str1 will be "ClassWork".

	Reasoning: Operator '+' adds the operands, if both are numbers & concatenates the string if both operands are strings.
45	Assertion: If L is a list, then L+=range(5) is an invalid statement. Reason : Only a list can be concatenated to a list.
46	Assertion: Data types are used to identify the type of data Reason: Data types are two types as number and string.
47	Assertion: Assignment operator assigns or changes the value of variable on its right. Reason: The logical operator evaluates to either True or False based on the logical operands on either side.
48	Assertion: Lists can be changed after creation. Reason: Lists are mutable.
49	Assertion: Tuple in Python is an ordered. And immutable data type. Reason: Tuples can contain heterogeneous data and permit duplicate values as well.
50	Assertion: Keys of the Dictionaries must be unique. Reason: the keys of a dictionary can be accessed using values.

ANSWER (1 MARK- MULTIPLE CHOICE QUESTIONS (MCQ))

1	d	11	b	21	d	31	d	41	d
2	b	12	a	22	a	32	b	42	c
3	d	13	b	23	c	33	b	43	b
4	b	14	a	24	c	34	c	44	a
5	c	15	c	25	b	35	b	45	d
6	d	16	d	26	a	36	a	46	c
7	d	17	a	27	c	37	d	47	d
8	b	18	b	28	b	38	b	48	a
9	a	19	b	29	c	39	d	49	a
10	a	20	a	30	d	40	a	50	c

Very short answer questions(1 mark):

Q-1 Given is a Python list declaration:

Listofnames= ["Aman", "Ankit", "Ashish", "Rajan", "Rajat"]

Write the output of:

print (Listofnames [-1:-4:-1])

Q-2. Consider the following tuple declaration: :

tupl= (10, 20, 30, (10,20,30), 40)

Write the output of

print (tupl.index (20))

Q-3. Write the type of tokens from the following:

(i) if (ii) stud_age

Q-4. Name the Python Library modules which need to be imported to invoke the following functions:

(i) sin() (ii) randint () (iii) sqrt() (iv) ceil()

Q-5. Find the output:

str="PYTHON@LANGUAGE"

```
print(str[2:12:2])
```

Q-6 Find and write the output of the following python code:

```
x = "abcdef"
i = "a"
while i in x:
    print(i, end = " ")
```

Q-7. What do you understand by the term Iteration?

Q-8. Write a statement in Python to declare a dictionary whose keys are 1, 2, 3 and values are January, February and March respectively.

Q-9. Name the built-in mathematical function / method that is used to return an absolute value of a number.

Q-10. State True or False –

“Variable declaration is implicit in Python.”

ANSWERS : -

1. Ans: Rajat, Rajan, Ashish	6. Ans: aaaaaa----- OR infinite loop
2. Ans: 1	7. Ans: Repetition of statement/s finite number of times is known as Iteration
3. Ans: (i) Keyword (ii) identifier	8. Ans: Day={1:'january',2:'february',3:'march'}
4. Ans. (i) math (ii) random (iii) math (iv) math	9. Ans: abs()
5. Ans. TO@AG	10. Ans: True

Short answer type Questions (2 Marks)

1. Q- Write anyTwo features in Python?

Ans: Features of Python are:

- Simple and easy: Python is a simple language that is easy to learn and use.
- Free/Open source: Python can be used without paying any cost or freely available.
- Portable: Python codes are machine and platform independent.
- Standard Library: Python standard library contains pre written tools for programming.

2. Q- How many types of strings are supported in Python?

Ans: Python allows two string types:

- Single Line strings** –Strings that are terminated in a single line enclosed within single and double quotes
- Multiline strings**- String storing multiple lines of text enclosed within three single or double quotes.

3. Q- Differentiate between explicit and implicit type conversion?

Ans: An Implicit type conversion is a conversion performed by the compiler/interpreter without programmer's intervention. An implicit conversion is applied whenever multiple data types are intermixed in an expression, so as not to lose information.

An Explicit type conversion is user defined conversion that forces an expression to a specific type. Explicit conversion is also known as Type casting.

4. Q- What is difference between List and Tuple?

Ans: lists are mutable and tuples are immutable.

Lists are use square brackets [], whereas Tuples use parentheses ()

5. Q- What is Dictionary?

Ans: A dictionary is a mapping of unique keys to values. It is a collection of Key-Value pairs. The key in dictionary are immutable and values are immutable.

Example: {1: "one", 2: "Two", 3: "Three"}

6. Q- What is the difference between mutable and immutable data type in Python Language with example?

Ans: Mutable Data Type: Mutable data types are objects that can be modified or altered after they have been created. Example: int, list

Immutable Data Type: Immutable data types are objects that cannot be modified or altered after they have been created. Ex: tuple, string

7. Q- What is difference between insert () and append () methods of a list?

Ans: insert(): the insert() function can be used to insert an item/element at a specified index. It takes two arguments the index where an item is to be inserted and the item/element itself.

The syntax of insert method is: List.insert (index_number, value))

Append(): The append() method adds a single item to the end of the list. It does not create new lists, rather it modifies the original list.

The syntax of append method is: List.append (item)

8 Q. Evaluate the following expressions:

- a. a) $6 * 3 + 4 ** 2 // 5 - 8$
- b. b) $10 > 5$ and $7 > 12$ or not $18 > 3$

Ans: (a) 13 (b) False

9.Q.Define comment in python.

Ans: Comments are statements which are ignored and not executed by python interpreter. It is used to make program more readable and easy to understand. A comments in Python start with hash (#) symbol.

10.Q. What is None in Python?

Ans: Python has one special data called None. The None type is used to indicate something that has not yet been created. It is a non-null, unidentified value.

11.Q. Classify the valid and invalid identifier from the following:-

- i. Break (ii) my_day2 (iii) s-num (iv) percent (v) simple int (vi) def

Ans: Valid Identifier: (i) Break (ii) my_day2 (iv) percent

Invalid Identifier: (iii) s-num (v) simple int (vi) def

12.Q. Classify the keyword and identifier from the following:-

- i. None (ii) false (iii) import (iv) return (v) eval (vi) pass

Ans: Identifier: (ii) false (v) eval

Keywords: (i) None (iii) import (iv) return (vi) pass

Questions based on finding errors (2 marks):

1. Rewrite the following code in Python after removing all syntax error(s). Underlines each correction done in the code:

```
500 = N
WHILE N<=1000:
    if Nr=>1750
        print (N)
        N=N+100
else
    print( N*2)
    N=N+50
```

2. Rewrite the following code in python after removing all syntax error(s). Underline each correction done in the code

```
x=integer(input('Enter 1 or 10'))
if x==1:
for x in range(1,11)
    Print(x)
Else:
    for x in range(10,0,-1):
        print(x)
```

3. Rewrite the following code in python after removing all syntax error(s). Underline each correction done in the code.

```
Val = int("Value:")
Adder = 0
for C in range(1,Val,3)
    Adder+=C
    if C%2=0:
        Print (C*10)
    Else:
        print (C)
print (Adder)
```

4. Rewrite the following code in python after removing all the syntax errors. Underline each correction done in the code.

```
num1, num2 = 10
While num1 % num2 = 0
    num1+= 20
num2+= 30
Else:
    print('hello')
```

5. Suresh has written a code to input a positive integer and display its factorial. His code is having errors. Rewrite the correct code and underline the corrections made. (factorial of a number n is the product 1x2x3. . .n)

```
n=int(input("Enter a positive integer: "))
f=0
for i in range(n):
    f*=i
    print(f)
```

Answers:

1. <u>CORRECTED CODE</u>	2. <u>CORRECTED CODE</u>
--------------------------	--------------------------

<pre> N = 500 while N<=1000: if N >= 1750: print (N) N = N+100 else: print (N*2) N = N+50 </pre>	<pre> x=int(input('Enter 1 or 10')) if x==1: for x in range(1,11): print(x) else: for x in range(10,0,-1): print(x) /*(indentation) </pre>
3. CORRECTED CODE:- <pre> Val = int(input("Value:")) # Error 1 Adder = 0 for C in range(1,Val,3): # Error 2 Adder+=C if C%2==0: # Error 3 print (C*10) # Error 4 else: # Error 5 print (C) print (Adder) </pre>	4. CORRECTED CODE:- <pre> num1, num2 = 10, 10 while num1 % num2 == 0: num1+= 20 num2+= 30 else: print('hello') </pre>
5. CORRECTED CODE:- <pre> n=int(input("Enter a positive integer: ")) # bracket is missing f=1 # It should be 1 not 0 for i in range(1,n+1): #It must starts with 1 otherwise give 0 result f*=i print(f) #Indentation to print the factorial value </pre>	

Questions based on finding output(s) (2/3 marks):

1. Find and write the output of the following Python Code:

```

x="hello world"
print(x[:2],x[:-2],x[-2:])
print(x[6],x[2:4])
print(x[2:-3],x[-4:-2])

```

2. Find and write the output of the following Python Code:

```

a=(2+3)**3-6/2
b=(2+3)*5//4+(4+6)/2
c=12+(3*4-6)/3
d=12%5*3+(2*6)//4
print(a,b,c,d)

```

3. Find and write the output of the following Python Code:

```

L1 = [100,900,300,400,500]
START = 1
SUM = 0
for C in range(START,4):

```

```
SUM = SUM + L1[C]
print(C, ":", SUM)
SUM = SUM + L1[0]*10
print(SUM)
```

4. Find and write the output of the following code:

```
Name="PythoN3.1"
R=" "
for x in range(len(Name)):
    if Name[x].isupper():
        R=R+Name[x].lower()
    elif Name[x].islower():
        R=R+Name[x].upper()
    elif Name[x].isdigit():
        R=R+Name[x-1]
    else:
        R=R+"#"
print(R)
```

5. Find the output of the following code:

```
myvalue = ["A", 40, "B", 60, "C", 20]
alpha = 0
beta = ""
gama = 0
for i in range(1,6,2):
    alpha += i
    beta += myvalue[i-1]+ "#"
    gama += myvalue[i]
    print(alpha, beta, gama)
```

6. Find the output of the following code:

```
tuple1 = (11, 22, 33, 44, 55 ,66)
list1 =list(tuple1)
new_list = []
for i in list1:
    if i%2==0:
        new_list.append(i)
        new_tuple = tuple(new_list)
print(new_tuple)
```

7. Find the output of the following code:

```
P = (10, 20, 30, 40, 50 ,60,70,80,90)
Q =list(P)
R = []
for i in Q:
    if i%3==0:
        R.append(i)
R = tuple(R)
print(R)
```

8. Find the write the output of the following Python Code:

```
Msg1="WeLcOME"
```

```

Msg2="GUESTs"
Msg3=""
for l in range(0,len(Msg2)+1):
    if Msg1[l]>="A" and Msg1[l]<="M":
        Msg3=Msg3+Msg1[l]
    elif Msg1[l]>="N" and Msg1[l]<="Z":
        Msg3=Msg3+Msg2[l]
    else:
        Msg3=Msg3+"*"
print (Msg3)

```

9. Find and write the output of the following python code:

```

Data = ["P",20,"R",10,"S",30]
Times = 0
Alpha = ""
Add = 0
for C in range(1,6,2):
    Times= Times + C
    Alpha= Alpha + Data[C-1]+"$"
    Add = Add + Data[C]
    print (Times,Add,Alpha)

```

10. Find and write the output of the following python code:

```

Text1="DIGITAL INDIA2023"
Text2=""
l=0
while l<len(Text1):
    if Text1[l]>="0" and Text1[l]<="9":
        Val = int(Text1[l])
        Val = Val + 1
        Text2=Text2 + str(Val)
    elif Text1[l]>="A" and Text1[l] <="Z":
        Text2=Text2 + (Text1[l+1])
    else:
        Text2=Text2 + "*"
    l=l+1
print (Text2)

```

11. Find and write the output of the following python code:

```

s="welcome2cs"
n = len(s)
m=""
for i in range(0, n):
    if (s[i] >= 'a' and s[i] <= 'm'):
        m = m +s[i].upper()
    elif (s[i] >= 'n' and s[i] <= 'z'):
        m = m +s[i-1]
    elif (s[i].isupper()):

```

```

        m = m + s[i].lower()
    else:
        m = m + '&'
print(m)

```

12. Find and write the output of the following Python Code:

What possible outputs(s) are expected to be displayed on screen at the time of execution of the program from the following code? Also specify the maximum values that can be assigned to each of the variables FROM and TO.

```

import random
AR=[20,30,40,50,60,70];
FROM=random.randint(1,3)
TO=random.randint(2,4)
for K in range(FROM,TO+1):
    print (AR[K],end="# ")

```

- | | |
|---------------|---------------|
| (a) 10#40#70# | (b) 30#40#50# |
| (c) 50#60#70# | (d) 40#50#70# |

13. Find and write the output of the following Python Code:

```

import random
points=[20,40,10,30,15]
points=[30,50,20,40,45]
begin=random.randint(1,3)
last=random.randint(2,4)
for c in range(begin,last+1):
    print(points[c], "#", end=" ")

```

- | | |
|---------------|----------------------|
| (a) 20#50#30# | (b) 20#40#45 |
| (c) 50#20#40# | (d) both (b) and (c) |

14. What possible outputs(s) are expected to be displayed on screen at the time of execution of the program from the following code? Also specify the maximum values that can be assigned to each of the variables y.

```

import random
x= random.random()
y=random.randint(0,4)
print(int(x),":", y+int(x))

```

- | | | | | |
|----|-----|---------|---------|---------|
| a. | 0:6 | (b) 1:6 | (c) 2:4 | (d) 0:3 |
|----|-----|---------|---------|---------|

15. What possible output(s) are expected to be displayed on screen at the time of execution of the program from the following code? Also specify the minimum values that can be assigned to each of the variables BEGIN and LAST.

```
import random
VALUES = [10, 20, 30, 40, 50, 60, 70, 80]
BEGIN = random.randint(1, 3)
LAST = random.randint(2, 4)
for I in range (BEGIN, LAST+1):
    print (VALUES[I], end = "-")
```

(a) 30-40-50-

(b) 10-20-30-40-

(c) 30-40-50-60-

(d) 30-40-50-60-70-

16. What possible outputs(s) are expected to be displayed on screen at the time of execution of the program from the following code? Also specify the maximum values that can be assigned to each of the variables first, second and third. from random

```
import random
LST=[5,10,15,20,25,30,35,40,45,50,60,70]
first = random.randint(3,8)
second = random.randint(4,9)
third = random.randint(6,11)
print(LST[first],"#", LST[second],"#", LST[third],"#")
```

(a) 20#25#25#

(b) 30#40#70

(c) 15#60#70#

(d) 35#40#60#

Answers:-

1. Ans:

he hello wor ld

w ll

llo wo or

2. Ans: (122.0 11.0 14.0 9)

3. Ans:-= Output is:

1 : 900

1900

2 : 2200

3200

3 : 3600

4600

4. Ans: pYTHOnN# .

5. Ans:

1 A# 40

4 A#B# 100

9 A#B#C# 120

6. Ans: (22,44,66)

7. Ans: (30,60,90)

8. Ans: G*L*TME

9. Ans:

1 20 P\$

4 30 P\$R\$

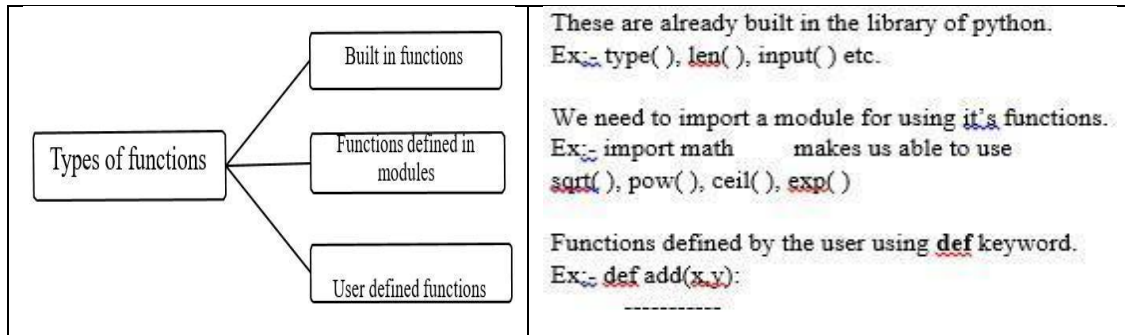
9 60 P\$R\$\$

10. Ans: IGITAL *NDIA23134
11. Ans: sELCcME&Cc
12. Ans. (b) 30#40#50# (Maximum value FROM,TO is 3,4)
13. Ans: (d) both b and c
14. Ans: (d) (Minimum value of y is 0 and Maximum value is 4))
15. Ans: (a) 30-40-50- Minimum value of BEGIN: 1 Minimum value of LAST: 2
16. Ans (d) 35#40#60# Maximum Values: First: 40, Second: 45, Third: 60

FUNCTIONS

Functions are the subprograms that perform specific task.

Types of Functions:



Creating User Defined Functions:-

The syntax to define a function is:

```
def function-name ( parameters ) :  
    #statement(s)
```

Parameters Vs Arguments

Parameters are the input variables bounded by parentheses when defining a function, whereas arguments are the values assigned to these parameters when passed into a function (or method) during a function call.

```
def ADD(x, y): #Function Definition  
    z=x+y  
    print("Sum = ", z)  
a=float(input("Enter first number: " ))  
b=float(input("Enter second number: " ))
```

```
ADD(a,b)          #Function Call
```

Here x,y are parameters and a,b i.e the values provided to variables x and y are arguments.

Types of Parameters

Positional parameter: These are mandatory arguments. Value must be provided to these parameters and values should be matched with parameters. Ex:-

```
def Test(x,y,z):  
    #statement(s)
```

Then we can call the function using these possible function calling statements:

```
p,q,r = 4,5,6  
Test(p,q,r) # 3 variables which have values, are passed.  
Test(4,q,r) # 1 Literal value and 2 variables are passed.
```

Test(4,5,6) # 3 Literal values are passed

So, x,y,z are positional parameters and the values must be provided to these parameters.

Default Parameters: Parameters which are assigned with a value in function header while defining the function, are known as default parameters. This value is optional for the parameter.

If a user explicitly passes the value in function call, then the value which is passed by the user, will be taken by the default parameter. If no value is provided, then the default value will be taken by the parameter.

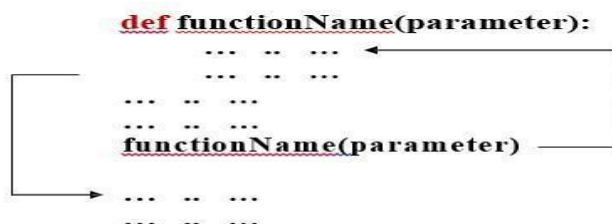
Default parameters will be written in the end of the function header, means positional parameter cannot appear to the right side of default parameter.

Ex:- `def CalcSI(p, rate, time=5):` # time is default parameter here

Valid/Invalid examples to define the function with default arguments:

<code>CalcSI(p, rate=4.5, time=5):</code> #Valid	<code>CalcSI(p, rate=4.5, time=5):</code> # Valid	<code>CalcSI(p, rate=4.5, time):</code> #Invalid
---	--	---

Flow of Execution:-



Types of Arguments

1.Positional arguments:- Positional arguments are values that are passed into a function based on the order in which the parameters were listed during the function definition.

Code A	Code B
<pre>def SUB(x, y): z=x-y print("Difference = , z) a=float(input("Enter number1:")) b=float(input("Enter number2: ")) SUB(a,b)</pre>	<pre>def SUB(x, y): z=x-y print("Difference = ", z) a=float(input("Enter number1:")) b=float(input("Enter number2: ")) SUB(b,a) #Order of arguments is changed.</pre>

Here when the positions of the arguments are changed, the output produces different results. Though the code in example B isn't wrong, the values that have been passed into the function are in the wrong order, thus producing a result that does not match our desired output.

2.Keyword arguments(Named Arguments):-

These are values that, when passed into a function, are identifiable by specific parameter names. A keyword argument is preceded by a parameter and the assignment operator '='.

Ex:-

```
def SUB(x, y):  
    z=x-y  
    print("Difference = ", z)  
    a=float(input("Enter first number: "))  
    b=float(input("Enter second number: "))  
    SUB(y=b, x=a)
```

Now the change in order of arguments doesn't make any difference as we have specified the value for each parameter. So, with keyword arguments, as long as you assign a value to the parameter, the positions of the arguments do not matter.

However, they do have to come after positional arguments and before default/optional arguments in a function call.

Calling the function:

<u>Syntax:</u> function-name(parameter)	<u>Example:</u> ADD(10,20)
---	--------------------------------------

The return statement:

a. Function returning some value (non-void function) :

Syntax: return expression/value	Ex1:- <u>Returning single value</u> def my_function(x): return 5*x	Ex2:- <u>Returning Multiple values</u> def sum(a,b,c): return a+5, b+4, c+7
--	---	--

b. Function not returning any value (void function) :

def message(): print("Hello")	Here no return statement is used.
----------------------------------	-----------------------------------

Scope and Lifetime of variables:

Scope of a variable is the portion of a program where the variable is recognized and is accessible.

Local Scope: Variable used inside the function/block. It can not be accessed outside the function/block. The lifetime of variables inside a function is as long as the function/block executes.

Global Scope: Variable can be accessed outside the function. In this scope, Lifetime of a variable is the period throughout which the variable exists in the memory. Example 1:-

<pre> : x = 10 #Local Scope print("Value inside function:",x) #Global Scope print("Value outside function:",x) </pre>	Output:- Value inside function: 10 Value outside function: 20
---	--

Example 2 of Global variable usage:- Use of global keyword to access global variable inside a function.

<pre> a=40 def outer_func(): a=20 def inner_func(): global a a=50 print("value of a inside inner() function:-",a) inner_func() print("value of a inside outer() function:-",a) print("value of a outside both functions but before function call:-",a) outer_func() print("value of a outside both functions after function call:-",a) </pre>	<u>Output:-</u> value of a outside both functions but before function call:- 40 value of a inside inner() function:- 50 value of a inside outer() function:- 20 value of a outside both functions after function call:- 50
---	---

O---O---o---O---O

MCQ/VERY SHORT ANSWER QUESTIONS(1 Mark Question)

1	A function definition in Python begins with which keyword? (a) void (b) return (c) int (d) def	1
2	Name the statement which makes us able to send back a value from a function. (a) print (b) input (c) return (d) None	1
3	Functions that do not return any value are known as: (a) fruitful functions (b) void functions (c) Null functions (d) user-defined functions	1
4	A variable created or defined within a function body is classified as: (a) local (b) global (c) built-in (d) instance	1
5	Which of the following parameter type is used if no value is provided in the function call? (a) keyword (b) required (c) variable-length (d) default	1
6	Which statement is used by the functions to communicate information back to the caller? (a) local (b) global (c) return (d) random	1
7	What is the output of the program given below? x = 50 def func (x) : x = 2	1

	func (x) print ('x is now', x) (a) x is now 50 (b) x is now 2 (c) x is now 100 (d) Error	
8	What is the default return value for a function that does not return any value explicitly? (a) None (b) int (c) double (d) null	1
9	Which of the following items are present in the function header? (a) function name only (b) both function name and parameter list (c) parameter list only (d) return value	1
10	What is the name given to that area of memory, where the system stores the parameters and local variables of a function call? (a) a heap (b) storage area (c) a stack (d) an array	1
11	Which of the following will print the pi value defined in math module? (a) print(pi) (b) print(math.pi) (c). from math import pi (d) from math import pi print(pi) print(math.pi)	1
12	Which of the following function header is correct? (a) def f(a = 1, b): (b) def f(a = 1, b, c = 2): (c) def f(a = 1, b = 1, c = 2): (d) def f(a = 1, b = 1, c = 2, d):	1
13	Which of the following statements is not true for parameter passing to functions? (a) You can pass positional arguments in any order. (b) You can pass keyword arguments in any order. (c) You can call a function with positional and keyword arguments. (d) Positional arguments must be before keyword arguments in a function call.	1
14	Which of the following function call/calls can be used to invoke the below function definition? def test(a, b, c, d) (a) test(1, 2, 3, 4) (b) test(a = 1, 2, 3, 4) (c) test(a = 1, b = 2, c = 3, 4) (d) test(a = 1, b = 2, c = 3, d = 4)	1
15	Which of the following function call/calls will cause Error while invoking the below function definition? def test(a, b, c, d) (a) test(1, 2, 3, 4) (b) test(1, 2, 3, d= 4) (c) test(a = 1, b = 2, c = 3, 4) (d) test(a = 1, b = 2, c = 3, d = 4)	1
16	What is a variable defined outside all the functions referred to as? (a) A static variable (b) A global variable (c) A local variable (d) An automatic variable	1
17	What is a variable defined inside a function referred to as (a) A static variable (b) A global variable (c) A local variable (d) An automatic variable	1
18	Carefully observe the code and give the answer. def function1(a): a= a + '1' a = a * 2 function1("hello") (a) indentation Error (b) cannot perform mathematical operation on	1

	strings (c) hello2 (d) hello2hello2	
19	What is the result of this code? def print_double(x): print(2 ** x) print(double(3)) (a) 8 (b) 6 (c) 4 (d) 10	1
20	Which of the given argument types can be skipped from a function call? (a) positional arguments (b) keyword arguments (c) named arguments (d) default arguments	1
21	What will the following expression be evaluated to in Python? print (round (100.0 / 4 + (3 + 2.55) , 1)) (a) 30.0 (b) 30.55 (c) 30.6 (d) 31	1
22	Select the correct output of the code: for i in "QUITE": print(i.lower(), end="#") a) q#u#i#t#e# b) ['quite#'] c) ['quite'] # d) ['q']#['u']#['i']#['t']#['e']#	1
23	Study the following program and select the possible output(s) from the options (i) to (iv) following it. Also, write the maximum and the minimum values that can be assigned to the variable Y. import random X= random.random() Y= random.randrange(1,4,2) print(int(X),":",Y+int(X)) (a) 0 : 0 (b) 1 : 6 (c) 2 : 4 (d) 0 : 3	1
24	What will the following expression be evaluated to in Python? print(16-(3+2)*5+2**3*4) (a) 54 (b) 46 (c) 23 (d) 32	1
25	What possible output(s) are expected to be displayed on screen at the time of execution of the program from the following code? import random points=[20,40,10,30,15] points=[30,50,20,40,45] begin=random.randint(1,3) last=random.randint(2,4) for c in range(begin,last+1): print(points[c],"#") (a) 20#50#30# (b) 20#40#45 (c) 50#20#40# (d) both (b) and (c)	1
26	Which of the following statements about functions in programming is true? A) Functions are used to store data. B) Functions are used for input/output operations. C) Functions are used to perform a specific task or a group of related tasks. D) Functions can only be defined in the main function.	1
27	Name the Python Library modules which need to be imported to invoke the following functions: (i) ceil() (ii) randint()	1

28	In Python function can return only a single value:- a. True b) False	1
29	A Local Variable can have same name as of global variable. a)True b) False	1
30	Function header and function definition is the same thing:- a)True b) False	1

ANSWER (1 MARK- MULTIPLE CHOICE QUESTIONS (MCQ))

1	(d) def	11	(c). from math import pi print(pi)	21	(c) 30.6
2	(c) return	12	(c) def f(a = 1, b = 1, c = 2):	22	a) q#u#i#t#e#
3	(b) void functions	13	(a) You can pass positional arguments in any order	23	(d) 0 : 3
4	(a) local	14	a. test(1, 2, 3, 4) (d) test(a = 1, b = 2, c = 3, d = 4)	24	(c) 23
5	(d) default	15	(c) test(a = 1, b = 2, c = 3, 4)	25	(d) both (b) and (c)
6	(c) return	16	(b) A global variable	26	c) Functions are used to perform a specific task or a group of related tasks.
7	(a) x is now 50	17	(c) A local variable	27	Ans:-(i)math module (ii)random module
8	(a) None	18	(a) indentation Error	28	b) False
9	(b) both function name and parameter list	19	(a) 8	29	b) True
10	(c) a stack	20	(d) default arguments	30	b) False

SHORT ANSWER QUESTIONS(2 or 3 marks Questions)

1	Write the output of the code given below: def printMe(q,r=2): p=r+q**3	2
---	--	---

	<pre> print(p) #main-code =10 =5 rintMe(a,b) rintMe(r=4,q=2) </pre>	
2	Write the output of the following code: <pre> def change(m, n=10): global x x+=m n+=x m=n+x print(m,n,x) x=20 change(10) change(20) </pre>	2
3	Preety has written a code to add two numbers. Her code is having errors. Rewrite the correct code and underline the corrections made. <pre> def sum(arg1,arg2): total=arg1+arg2; print("Total:",total) return total; sum(10,20) print("Total:",total) </pre>	2
4	Write a function Lshift(L), where L is the list of elements passes as an argument to the function. The function shifts all the elements by one place to the left and then prints it. For example: If L contains [9,4,0,3,11,56].The function will print - [4,0,3,11,56,9]	2
5	Write the output of the following code: <pre> def Change(P ,Q=30): P=P+Q Q=P-Q print(P,"#",Q) return(P) R=150 S=100 R=Change(R,S) print(R,"#",S) S=Change(S) </pre>	2
6	Write the output of the code given below: <pre> def fun(s): k=len(s) </pre>	2

	<pre> m=" " for i in range(0,k): if s[i].isupper(): m=m+s[i].lower() elif s[i].islower(): m=m+s[i].upper() elif s[i].isdigit(): m=m+"O" else: m=m+'#' print(m) fun('CBSE@12@Exam') </pre>	
7	Predict the output of the Python code given below: <pre> def Swap (a,b) : if a>b: print("changed ",end="") return b,a else: print("unchanged ",end="") return a,b data=[11,22,16,50,30] for i in range (4,0,-1): print(Swap(data[i],data[i-1])) </pre>	2
8	Predict the output for following code. <pre> def myfunc(str1): rstr=' ' index=len(str1)-1 while(index > 0): if str1[index].isalpha(): rstr+=str1[index-1] else: rstr+='@' index=index-1 return rstr print(myfunc('a1b2c3d4')) </pre>	2
9	Find and write the output of the following python code: <pre> a=10 def call(): global a a=15 print(a) call() print(a) </pre>	2
10	What is the output of the below program, using below mentioned function calls? <pre> def func(a, b=5, c=10): </pre>	2

	<pre> print('a is', a, 'and b is', b, 'and c is', c) func(3, 7) func(25, c = 24) func(c = 50, a = 100) </pre>	
11	What is the output of the below program? <pre> def power(x, y=2): r = 1 for i in range(y): r = r * x return r print(power(3)) print(power(3, 3)) </pre>	2
12	Ravi a python programmer is working on a project, for some requirement, he has to define a function with name CalculateInterest(), he defined it as: <pre> def CalculateInterest (principal, rate=.06,time): # code </pre> But this code is not working, Can you help Ravi to identify the error in the above function and what is the solution.	2
13	Observe the following Python code very carefully and rewrite it after removing all syntactical errors with each correction underlined. <pre> def execmain() x = input("Enter a number:") if (abs(x)== x): print("You entered a positive number") else: x=*1 print("Number made positive:" x) </pre>	2
14	What possible outputs(s)are expected to be displayed after the execution of the program from the following code? Also specify the minimum values that can be assigned to the variables FROM and TO. <pre> import random start=3 VAL=[15,25,35,45,55,65,75,85]; From=random.randint(1,3) To =random.randint(start,4) for l in range(From,To+1): print(VAL[l],"*", end=' ') </pre> (i) 35 * 45 * 55 * 65 * 75 * (ii) 35 * 45 * 55 * (iii) 15 * 25 * 35 * 45 * (iv) 35 * 45 * 55 * 65 *	2
15	Write the output of the code given below: <pre> a =30 def call (x): global a if a%2==0: </pre>	2

	<pre> x+=a else: x -= a return x x=20 print(call(35),end="#") print(call(40),end=" @") </pre>	
16	Define default argument by using suitable example. How are they different from keyword argument? Guess the Output of the following code fragment using options:- i)sum(1,3) ii) sum(3,9,-2) iii) sum() <pre> def sum(a=0,b=3,c=0): print(a+b+c) </pre>	2
17	Define the following briefly along with example. (i)Function definition ii)Function Calling.	2
18	Write 2 examples of each of:- (i)Built In Function ii)Function defined in modules	2
19	Write a function mul () which accepts list L as its parameter and transfers all even values of list L to a List named even_L and all odd values of L to a list named odd_L.	2
20	Kritika was asked to accept a list of even numbers but she did not put the relevant condition while accepting the list. Write a user-defined function oddtoeven(L) that accepts the List L as an argument and converts all the odd numbers into even by multiplying them by 2.	2
21	Write a program using function PRIME(n) to check whether a number n, accepted from the user is prime or not.	2
22	What do you understand by local and global scope of variables? How can you access a global variable inside the function, if function has a variable with same name?	2
23	What do you understand the default argument in function? Which function parameter must be given default argument if it is used? Give example of function header to illustrate default argument.	2
24	Write a function modilst(L) that accepts a list of numbers as argument and increases the value of the elements by 10 if the elements are divisible by 5. Also write a proper call statement for the function. For example: If list L contains [3,5,10,12,15] Then the modilst() should make the list L as [3,15,20,12,25]	3

25	Write a function LeftShift(Numlist, n) in Python, which accepts a list Numlist of numbers and n as a numeric value by which all elements of the list are shifted to left. Sample input data of the list Numlist= [10, 20, 30, 40, 50, 60, 70], n=2. Output Numlist=[30, 40, 50, 60, 70, 10, 20]	3
26	Write a function in python named SwapHalfList(Array), which accepts a list Array of numbers and swaps the elements of 1st Half of the list with the 2nd Half of the list ONLY if the sum of 1st Half is greater than 2nd Half of the list. Sample Input Data of the list Array= [100, 200, 300, 40, 50, 60], Output Arr = [40, 50, 60, 100, 200, 300]	3
27	Write a function SQUARE_LIST(L), where L is the list of elements passed as argument to the function. The function returns another list named 'SList' that stores the Squares of all Non-Zero Elements of L. For example: If L contains [9,4,0,11,0,6,0] then SList=[81,16,121,36].	3
28	Write a function named REP which accepts a list of integers and its size as arguments and replaces elements having even values with its half and elements having odd values with twice its value.eg: if the list contains 3, 4, 5, 16, 9 then the function should rearrange list as 6, 2,10,8, 18.	3
29	Write a function printDate() which accept day, month, and year as parameter and print in the given format. Example: if d=15, m=4, y=2023, then printDate(d,m,y) will print 15-APR-2023.	3
30	What is a default argument in function ? How to make default argument in a function? Give Example.	3

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SOLUTION SHORT ANSWER QUESTIONS(2 or 3 marks Questions)

1	1005 12
2	70 40 30 110 60 50
3	def sum(arg1,arg2): total=arg1+arg2 # No need of semicolon at two places

	<pre>print("Total:",total) return total #Wrong indentation for return statement a=sum(10,20) #Value returned from function is not received print("Total:",a) #Variable used should be a.</pre>
4	<pre>def LeftShift(numlist): L = len(numlist) for x in range(0,L+1): y = numlist[0] for i in range(0,L-1): numlist[i] = numlist[i+1] numlist[L-1] = y return numlist L=LeftShift([9,4,0,3,11,56]) print(L)</pre>
5	<pre>250 # 150 250 # 100 130 # 100</pre>
6	cbse#OO#eXAM
7	<pre>unchanged (30, 50) changed (16, 50) unchanged (16, 22) changed (11, 22)</pre>
8	@3@2@1@
9	<pre>15 15</pre>
10	<pre>a is 3 and b is 7 and c is 10 a is 25 and b is 5 and c is 24 a is 100 and b is 5 and c is 50</pre>
11	<pre>9 27</pre>
12	In the function CalculateInterest (Principal, Rate=.06,Time),parameters should be default parameters from right to left hence either Time should be provided with some default value or default value of Rate should be removed. (½ mark for the correct digit with a #)
13	<pre>def execmain(_): x = input("Enter a number:") if (abs(x)== x): print("You entered a positive number") else: x*=1 print("Number made positive:", x)</pre>
14	<pre>(ii) 35 * 45 * 55 * Minimum value for FROM = 1, TO=4</pre>
15	65#70@

16	Output:- 4 10 3
17	i. A function in programming is a named block of reusable code that performs a specific task. It can take input parameters, perform operations, and optionally return a result. Functions promote code modularity, reusability, and organization by breaking down a program into smaller, self-contained components. ii. Function calling in programming refers to the act of invoking or executing a function at a specific point in the program. It involves using the function name followed by parentheses, optionally passing arguments, to trigger the execution of the function's code and obtain any returned results for further use in the program.
18	i. print(), len(), and input() etc. ii. math.fabs(), random.random(),math.pow() etc.
19	<pre>def mul(L): even_L = [] odd_L = [] for i in L: if (i % 2 == 0): even_L.append(i) else: odd_L.append(i) print("Even lists:", even_L) print("Odd lists:", odd_L)</pre> L1 = [2, 5, 13, 17, 51, 62, 73, 84, 95] mul(L1)
20	<pre>def oddtoeven(L): LN=len(L) for i in range(LN): if (L[i] % 2 != 0): L[i]=L[i]*2 print(L)</pre> L1 = [2, 5, 13, 17, 51, 62, 73, 84, 95] oddtoeven(L1)
21	<pre>def PRIME(n): flag=0 if n > 1: for i in range(2, int(n/2)+1): if (n % i) == 0: flag=1 break if flag==1: print(num, "is not a prime number") else: print(num, "is prime number")</pre>

	<pre> else: print(n, "is not a prime number") # If the number is less than 1, its also not a prime number. num=int(input("Enter number to check Prime or Not")) PRIME(num) </pre>
22	In programming, the local and global scope of variables determines their visibility and accessibility within different parts of a program. Variables defined within a specific function have local scope and are only accessible within that function. They cannot be accessed outside of it. We can access a global variable inside the function, if function has a variable with same name using global keyword.
23	A default argument in a function is a value assigned to a parameter that is used when no argument is provided for that parameter during function call. It allows a function to be called with fewer arguments, as the default value is used when the argument is not explicitly provided. The parameter that requires a default argument should be positioned after the parameters without default arguments. This allows the function to differentiate between arguments based on their position or explicitly passed values. In the example provided, the greet() function has a default argument for the message parameter, which is set to "Hello". When calling the function, if the message argument is omitted, it will default to "Hello", otherwise, it will use the provided value.
24	<pre> def modilst(L): for i in range(len(L)): if L[i] % 5 == 0: L[i]+=10 L = [12,10,15,20,25] modilst(L) print(L) </pre>
25	<pre> def LeftShift(numlist, n): L = len(numlist) for x in range(0,n): y = numlist[0] for i in range(0,L-1): numlist[i] = numlist[i+1] numlist[L-1] = y print(numlist) </pre>
26	<pre> def SwapHalfList(Array): s1=s2=0 L=len(Array) for i in range(0,L//2): s1+=Array[i] for i in range(L//2,L): s2+=Array[i] if s1>s2: for i in range(0,L//2): Array[i],Array[i+L//2]=Array[i+L//2],Array[i] </pre>

	<pre> L=[6,5,4,1,2,3] SwapHalfList(L) print(L) </pre>
27	<pre> def SQUARE_LIST(L): SList=[] for i in L: if i!= 0: SList.append(i*i) return SList L=[9,4,0,11,0,6,0] L1=SQUARE_LIST(L) print(L1) </pre>
28	<pre> def REP(L,size): for i in range(size): if L[i]%2==0: L[i]=L[i]/2 else: L[i]=L[i]*2 print(L) L1=[3,5,10,12,15] S=len(L1) REP(L1,S) </pre>
29	<pre> def printdate(day,month,year): if month==1: m="Jan" elif month==2: m="Feb" elif month==3: m="Mar" elif month==4: m="Apr" elif month==5: m="May" elif month==6: m="Jun" elif month==7: m="Jul" elif month==8: m="Aug" elif month==9: m="Sep" elif month==10: m="Oct" elif month==11: m="Nov" </pre>

	<pre> elif month==11: m="Feb" elif month==12: m="Dec" else: print("Improper value entered") print(day,"-",m,"-",year) d=int(input("Enter day(1to 31)")) mn=int(input("Enter month(1 to 12)")) yr=int(input("Enter Year")) printdate(d,mn,yr) </pre>
30	Default argument in function- value provided in the formal arguments in the definition header of a function is called as default argument in function. They should always be from right side argument to the left in sequence. For example: <pre>def func(a, b=2, c=5): # definition of function func()</pre>

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EXCEPTION HANDLING

Exceptions:-

These are errors that get triggered automatically due to syntax errors, runtime errors or logical errors in the code. However, exceptions can also be forcefully triggered and handled through program code.

Sometimes even if a statement or expression is syntactically correct, there might arise an error during its execution. For example, trying to open a file that does not exist, division by zero and so on. Such types of errors might disrupt the normal execution of the program and exceptions get raised.

Types of Exceptions:-

Built-in Exceptions:-

These are commonly occurring exceptions that are usually defined in the compiler/interpreter. Ex:-

S. No	Name of the Built-in Exception	Explanation
1	SyntaxError	It is raised when there is an error in the syntax of the Python code.
2	ValueError	It is raised when a built-in method or operation receives an argument that has the right data type but mismatched or inappropriate values.
3	IOError	It is raised when the file specified in a program statement cannot be opened.
4	KeyboardInterrupt	It is raised when the user accidentally hits the Delete or Esc key while executing a program due to which the normal flow of the program is interrupted.
5	ImportError	It is raised when the requested module definition is not found.
6	EOFError	It is raised when the end of file condition is reached without reading any data by input().
7	ZeroDivisionError	It is raised when the denominator in a division operation is zero.
8	IndexError	It is raised when the index or subscript in a sequence is out of range.
9		

	NameError	It is raised when a local or global variable name is not defined.
10	IndentationError	It is raised due to incorrect indentation in the program code.
11	TypeError	It is raised when an operator is supplied with a value of incorrect data type.
12	OverflowError	It is raised when the result of a calculation exceeds the maximum limit for numeric data type.

Handling Exceptions

Exceptions are needed to be handled to avoid the program from crashing abruptly. Exception Handling is the process in which additional code is written in the program to give proper messages or instructions to the user on encountering an exception.

Need for Exception Handling

It is a useful technique that helps in capturing runtime errors and handling them so as to avoid the program getting crashed abruptly.

Important points regarding exceptions and their handling: -

Python categories exceptions into distinct types so that specific exception handlers can be created for each type.

Exception handlers separate the main logic of the program from the error detection and correction code.

The compiler or interpreter keeps track of the exact position where the error has occurred.

Exception handling can be done for both user-defined and built-in exceptions.

Process of Handling Exception

Flow Chart of try() except block.	Working of try() block
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Exception handling in Python

try:

Code to execute

except:

Code to execute in case of error

else:

Code to execute in case NO error

finally :

Code to execute in all cases

First, the try clause is executed i.e. the code between try.

If there is no exception, then only the try clause will run, except clause is finished.

If any exception occurs, the try clause will be skipped and except clause will run.

The code enters the else block only if the try clause does not raise an exception.

If any exception occurs, but the except clause within the code doesn't handle it, it is passed on to the outer try statements. If the exception is left unhandled, then the execution stops.

A try statement can have more than one except clause. Finally Keyword :- The final block always executes after the normal termination of the try block or after the try block terminates due to some exceptions.

Solved Examples on Exception Handling:-

Case 1:- No exception, only the try clause will run.	Output
Example:- <pre>def divide(x, y): try: result = x // y print("Yeah ! Your answer is :", result) except ZeroDivisionError: print("Sorry ! You are dividing by zero ") m=int(input("Enter Numerator")) n= int(input("Enter Denominator")) divide(m,n)</pre>	<pre>#Assuming m=3,n=2 Yeah ! Your answer is : 1</pre>
Case 2:-Exception raised. So, except block will run.	Output
Example:- <pre>def divide(x, y): try: result = x // y print("Yeah ! Your answer is :", result) except ZeroDivisionError: print("Sorry ! You are dividing by zero ") m=int(input("Enter Numerator")) n= int(input("Enter Denominator")) divide(m,n)</pre>	<pre>#Assuming m=3,n=0 Sorry ! You are dividing by zero</pre>

Case 3:Use of try, except, else and Finally together.	Output
<pre>def divide(x, y): try: #put your program code/logic in try block. result = x // y except ZeroDivisionError: #Executed only if exception raised. print("Sorry ! You are dividing by zero ") else: #will be executed if no exception raised in try block print("Yeah ! Your answer is :", result) finally: #Executed always. print("Program on Integer Division of two numbers") m=int(input("Enter Numerator")) n= int(input("Enter Denominator")) divide(m,n)</pre>	Enter Numerator5 Enter Denominator4 Yeah ! Your answer is : 1 Program on Integer Division of two numbers.
Use of Multiple try except blocks	Output
<pre>try: f = open("demofile.txt") try: f.write("Cost of 1 table is:-3000") except: print("Error in writing to the file") finally: f.close() except: print("Error in opening the file")</pre>	#Assuming file doesn't exist. Error in opening the file

MCQ/VERY SHORT ANSWER QUESTIONS(1 Mark Question)

1	What happens when '1' == 1 is executed?	1
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	<pre> num2=int(input("Enter the second number")) quotient=(num1/num2) print ("Both the numbers entered were correct") except _____: # to enter only integers print (" Please enter only numbers") except _____: # Denominator should not be zero print(" Number 2 should not be zero") else: print(" Great .. you are a good programmer") _____: # to be executed at the end print(" JOB OVER... GO GET SOME REST") </pre>	
5.	Define the following: a) Exception Handling b) Throwing an exception c) Catching an exception	3

Short Answer Questions (2/3 Marks)

1	Ans:- It is because Exception can be occurred due to Syntax Errors, Logical Error and Run Time Errors, while Syntax errors occurs only due to syntax. So that "Every syntax error is an exception but every exception cannot be a syntax error". These exceptions are not necessarily syntax errors but are events that disrupt program flow. Therefore, while every syntax error is an exception, not every exception is a syntax error.	2
2	Ans:- i,ii & iv.	2
3	Ans:-2 In the code, the finally block is always executed, and its return statement overrides the return statement in the try block. Hence, the value 2 is returned by the function and assigned to k, resulting in the output 2.	2
4	Ans:- i) ValueError ii) ZeroDivisionError iii) finally	3
5	Ans:- Exception Handling is the process in which additional code is written in the program to give proper messages or instructions to the user on encountering an exception. Throwing/Raising Exception:- Whenever program encounters an error, exception is thrown or raised by the Python interpreter or forcefully by Programmer. Catching Exception:- The statements or code that is executed in case exception occurs and handles it. These statements are written inside except clause.	3

Data File Handling :

Introduction to Files:	A file is a named location on a secondary storage media where data are permanently stored for later access.
Types of Files :	Text Files: A text file consists of human readable characters, which can be opened by any text editor. Binary Files: Binary files are made up of non-human readable characters and symbols, which require specific programs to access its contents..
Text File	A text file can be understood as a sequence of characters consisting of alphabets, numbers and other special symbols. When we open a text file using a text editor (e.g., Notepad), we see several lines of text. However, the file contents are not stored in such a way internally. Rather, they are stored in sequence of bytes consisting of 0s and 1s. In ASCII, UNICODE or any other encoding scheme, the value of each character of the text file is stored as bytes. Each line of a text file is terminated by a special character, called the End of Line (EOL). For example, the default EOL character in Python is the newline (\n). However
Binary Files	Binary files are also stored in terms of bytes (0s and 1s), but unlike text files, these bytes do not represent the ASCII values of characters. Rather, they represent the actual content such as image, audio, video, compressed versions of other files, executable files, etc. These files are not human readable. Binary files are stored in a computer in a sequence of bytes. Even a single bit change can corrupt the file and make it unreadable to the supporting application.
Csv Files	CSV(Comma Separated Values) is a file format for data storage which looks like a text file. The information is organized with one record on each line and each field is separated by comma. CSV File Characteristics •One line for each record •Comma separated fields •Space-characters adjacent to commas are ignored •Fields with in-built commas are separated by double quote characters. When Use CSV? •When data has a strict tabular structure •To transfer large database between programs •To import and export data to office applications, Qedoc modules •To store, manage and modify shopping cart catalogue

File Modes	File Mode	Description	File Offset position
	<r>	Opens the file in read-only mode.	Beginning of the file
	<rb>	Opens the file in binary and read-only mode.	Beginning of the file
	<r+> or <+r>	Opens the file in both read and write mode	Beginning of the file
	<w>	Opens the file in write mode. If the file already exists, all the contents will be overwritten. If the file doesn't exist, then a new file will be created	Beginning of the file
	<wb+> or <+wb>	Opens the file in read,write and binary mode. If the file already exists, the contents will be overwritten. If the file doesn't exist, then a new file will be created	Beginning of the file
	<a>	Opens the file in append mode. If the file doesn't exist, then a new file will be create	Beginning of the file
	<a+> or <+a>	Opens the file in append and read mode. If the file doesn't exist, then it will create a new file.	End of the file
Opening File	file_object= open(file_name, access_mode) e.g. – file = open("student.txt","w")		
Opening Text File using 'with' function	with open(file_name, access_mode) as file_object e.g. with open("student.txt","w") as file		
Closing File	File.close()		
Write()	For writing to a file, we first need to open it in write or append mode. If we open an existing file in write mode, the previous data will be erased, and the file object will be positioned at the beginning of the file. On the other hand, in append mode, new data will be added at the end of the previous data as the file object is at the end of the file. e.g. Program to Write data into the file file = open("prayer.txt","w")		

	<pre>data = "Hallo World " file.write(data) file.close()</pre>
Writelines	Writelines method is used to write the multiple lines into the file. e.g. To write multiple lines: <pre>myobject=open("myfile.txt",'w') lines = ["Hello everyone\n", "Writing multiline strings\n", "This is the"] myobject.writelines(lines) myobject.close()</pre>
Read()	This method is used to read a specified number of bytes of data from a data file. e.g. file = open("student.txt","r") ch = file.read(10) # this will read the first 10 characters print(ch) file.close() If no argument or a negative number is specified in read(), the entire file content is read. e.g. file = open("student.txt","r") ch = file.read() # this will read the whole file print(ch) file.close()
Readline()	This method is used to read only one line at a time. e.g. file = open("student.txt","r") ch = file.readline(10) # this will read the first 10 characters print(ch) file.close() If no argument or a negative number is specified in read(), the entire file content is read. e.g. file = open("student.txt","r") ch = file.readline() #this will read only one line at a time print(ch) file.close()
Readlines()	The method reads all the lines and returns the lines along with newline as a list of strings. e.g. file = open("studnet.txt","r") ch = file.readlines() print(ch) file.close()

Seek()	This method is used to position the file object at a particular position in a file. The syntax of seek() is: file_object.seek(offset [, reference_point]) In the above syntax, offset is the number of bytes by which the file object is to be moved. reference_point indicates the starting position of the file object. That is, with reference to which position, the offset has to be counted. It can have any of the following values: 0 - beginning of the file 1 - current position of the file 2 - end of file By default, the value of reference_point is 0, i.e. the offset is counted from the beginning of the file. For example, the statement fileObject.seek(5,0) will position the file object at 5th byte position from the beginning of the file.
Tell()	This function returns an integer that specifies the current position of the file object in the file. The position so specified is the byte position from the beginning of the file till the current position of the file object. The syntax of using tell() is: file_object.tell() e.g. #Illustrating seek() and tell() Reading byte by byte ''' Content of the file is india is my country i love my country all indians are my brothers and sisters to my country hi hello how you to to to toto is not to ''' <pre> file = open("pledge.txt") print("Before reading:",file.tell()) s = file.read() print ("After reading: ",file.tell()) file.seek(0) #Brings file pointer to the 0th byte so data can be written/read from the next byte print ("From the beginning again: ", file.tell()) s=file.read(4) print ("First 4 bytes are:",s) print ("Position of Tell pointer",file.tell()) s=file.read(3) print ("next 3 bytes:",s) print ("Position of Tell pointer",file.tell()) file.close() </pre> Output : Before reading: 0 After reading: 128 From the beginning again: 0 First 4 bytes are: indi Position of Tell pointer 4

	next 3 bytes: a i Position of Tell pointer 7
--	---

1 Mark Questions

1. What is the full form of CSV?
2. Which function is used to write data in the binary format?
3. What is the process of converting the structure to a byte stream before writing to the file?
4. Which mode is used when user want to write data into binary file?
5. Which function is used to read from CSV file.?
6. For both Reading and writing in a File which does not exist which of the mode should be used?
7. Which mode is used for both writing and reading in binary format in file?
8. If we do not specify file mode while opening a file, the file will open in mode.
9. Which statement is used to retrieve the current position within file?
10. Which method is used to write List of strings in the File?

Answer to 1 mark questions:

1	2	3	4	5	6	7	8	9	10
Comma separated values	dump	pickling	wb	csv.reader()	w+	wb+	read	tell()	writelines()

Some Questions based on text files :

1. Differentiate Text Files and Binary Files.

Ans. Text files are structured as a sequence of lines, where each line includes a sequence of characters (i.e. stored based on ASCII value). It can be edited in any text editor program.
Eg. Notepad

A binary file is a file stored in binary format (i.e. combination of one's and zero's).

Binary files typically contain bytes that are intended to be interpreted as something other than text characters. **Binary files** are a computer-readable form of storing data.

2. Differentiate Seek() and Tell () methods.

Ans.

3. Differentiate read() and readlines().

Ans. Read() – it reads the whole content of the file character by character, if no argument is provided. If

argument is provided it reads that many bytes.

Readlines()- Reads all lines and returns them in the form of a **List**. Every element of the list is the line of the file.

4. Differentiate write() and writelines()

Ans. Write – it takes a string as an argument and writes it to the text file.

Writelines() - This method is used to write multiple strings to a file. We need to pass an iterable object like lists, tuple, etc. containing strings to the writelines() method.

Differentiate Pickling and unpickling process.

Ans. Pickling, is the process of converting the structure (Python object like List, Dictionary etc.) to a byte stream before writing to the file.

Unpickling refers to the conversion of byte stream to the original structure (Python objects).

6. What are csv files?

Ans. A comma-separated values (**CSV**) **file** is a delimited text **file** that uses a comma to separate values. Each line of the **file** is a data record. Each record consists of one or more fields, separated by commas. The use of the comma as a field separator is the source of the name for this **file format**.

7. WAP to count the occurrence of 'to' in text file student.txt.

```
Ans. file = open("pledge.txt", "r")
      str = file.read()
      str = str.split()
      c = 0
      for i in str :
          if (i == 'to'):
              c = c + 1
      print(c)
      file.close()
```

8. WAP to count the no. of lines in text file schoolpledge.txt.

```
Ans. file = open("schoolpledge.txt", "r")
      ch = file.readlines()
      print("no. of lines", len(ch))
```

9. WAP to count the no. of lines starting with 'k' in text file schoolpledge.txt

```
Ans. file = open("schoolpledge.txt", "r")
      ch = file.readlines()
      c = 0
      for k in ch:
          if(k[0]=='k'):
              c = c + 1
      print("no. of lines", c)
```

10. WAP to count the no. of Words in text file schoolpledge.txt.

Ans.

```
file = open("schoolpledge.txt","r")
ch = file.read()
ch = ch.split()
print("Word Count ",len(ch))
```

Some More Questions :

1. WAP to count the no. of characters in text file schoolpledge.txt.
2. WAP to count the no. of words starting with 'i' in text file schoolpledge.txt.
3. Write a Program to copy the content of schoolpledge.txt to school.txt.
4. Write a program to copy words starting with 'm' from schoolpledge.txt to school.txt.
5. Write a program to count no. of words in a file schoolpledge.txt with Length function.

Answers :

1.

```
file = open("schoolpledge.txt","r")
ch = file.read()
print("content of file",ch)
print("Length of ch",len(ch))
```
2.

```
file = open("schoolpledge.txt","r")
ch = file.read()
ch = ch.split()
c = 0
for i in ch:
    if(i[0]=="i"):
        c = c + 1
print("word count",c)
print(ch)
file.close()
```
3.

```
file = open("schoolpledge.txt","r")
file2 = open("school.txt","w")
ch = file.read()
file2.write(ch)
print("Content Copied")

file.close()
file2.close()
```
4.

```
file = open("schoolpledge.txt","r")
file2 = open("school.txt","w")
ch = file.read()
ch=ch.split()
for i in ch:
    if i[0]=="m":
```

```

        file2.write(i)
        print(i)
    file.close()
    file2.close()
5.  file = open("schoolpledge.txt","r")
    ch = file.read()
    ch = ch.split()
    c = 0
    for i in ch:
        c = c + 1
    print("word count",c)
    print(ch)

```

BINARY FILES:

A binary file is a file stored in binary format (i.e. combination of one's and zero's). Binary files typically contain bytes that are intended to be interpreted as something other than text characters. Binary files are a computerreadable form of storing data.

Some Key Point of Binary Files:

- Binary Files stores data in the form of BYTES
- Binary Files are in Binary form (0's and 1's)
- There is no EOL(End of Line) character in Binary Files
- Example of Binary Files are- image files, Audio files, Video files
- Binary Files don't require any language translator as they are in Binary Level (0's and 1's)

which the computer understands. Hence, any kind of computation and working on.

A Dat file is a data file that contains specific information about the program used to create it. This file always has the .dat file extension, which is a generic format that can contain any information – video, audio, PDF, and virtually any other type of file.

BINARY FILE MODES:-

—

MODES	DESCRIPTION
Rb	Opens a file for reading only. The file pointer is placed at the beginning of the file. This is the default mod
Wb	Opens a file for writing only. Overwrites the file if the file exists. If the file does not exist, creates a new file for writing.
Ab	Opens a file for appending. The file pointer is at the end of the file if the file exists. That is, the file is in the append mode (write from end). If the file does not exist, it creates a new file for writing.
rb+	Opens a file for both reading and writing. The file pointer placed at the beginning

	of the file.
wb+	Opens a file for both writing and reading. Overwrites the existing file if the file exists. If the file does not exist, creates a new file for writing and reading.
ab+	Opens a file for both appending and reading. The file pointer is at the end of the file if the file exists. The file opens in the append mode. If the file does not exist, it creates a new file for writing and reading.

Write data to a Binary File:

Pickle is a special python package that is used to generate data in binary format. Pickle comes with few methods like dump() to write data in binary format. Example:

```
import pickle

list = [ ] #
empty list
while True:

    roll = input("Enter student Roll No:")

    sname = input("Enter student Name :")

    student = {"roll":roll,"name":sname}

    choice= input("Want to add more record(y/n) :")

    if(choice=='y'):

        break

file = open("student.dat","wb")

pickle.dump(list, file)

file.close( )
```

OUTPUT:

Enter student Roll No:1201

Enter student Name :Anil

Want to add more record(y/n) :y

Enter student Roll No:1202

Enter student Name :Sunil

Want to add more record(y/n) :n

Read data from a Binary File:

To read the data from a binary file, we have to use load() function of pickle module.

Example:

```
import pickle
file = open("student.dat", "rb")
```

```
list = pickle.load(file)
print(list)
```

```
file.close()
```

OUTPUT:

```
[{'roll': '1201', 'name': 'Anil'}, {'roll': '1202', 'name': 'Sunil'}]
```

Update a record in Binary File:

Locate the record to be updated by searching for it. Make changes in the loaded record in memory

Write back onto the file at the exact location of record. import pickle

```
roll = input('Enter roll number whose name you want to update in binary file :')
```

```
file = open("student.dat", "rb+")
```

```
list = pickle.load(file)
```

```
found=0
```

```
list=[]
```

```
for x in list:
```

```
    if roll in x['roll']:
```

```
        found=1
```

```
x['name'] = input('Enter new name: ')
```

```
    list.append(x)
```

```
if found == 1: file.seek(0)
pickle.dump(list, file)
print("Record Updated")
```



```
else: print('roll number does not exist')
```

```
file.close()
```

OUTPUT:

Enter roll number whose name you want to update in binary file :1211

Enter new name: Raj

Record Updated

Delete a record from binary file:

```
import pickle
```

```
roll = input('Enter roll number whose record you want to delete:')
```

```
file = open("student.dat", "rb+")
```

```
list = pickle.load(file)
```

```
found=0
```

```
list=[]
```

```
for x in list:
```

```
    if roll not in  
        x['roll']:
```

```
        lst.append(x)
```

```
    else:
```

```
        found = 1
```

```
if found == 1:
```

```
file.seek(0)
```

```
pickle.dump(lst, file)
```

```
    print("Record Deleted ")
```

```
else:
```

```
print('Roll Number does not exist')
```

```
file.close( )
```

OUTPUT:

Enter roll number whose record you want to delete:1201

Record Deleted

Search a record in a binary file:

```
import pickle
```

```
roll = input('Enter roll number that you want to search in binary file :')
```

```
file = open("student.dat", "rb")
```

```
list = pickle.load(file)
```

```
file.close( )
```

```
for x in list:
```

```
    if roll in x['roll']:
```

```
        print("Name of student is:", x['name'])
```

```
    break
```

```
    else:
```

OUTPUT:

```
print("Record not found")
```

Enter roll number that you want to search in binary file :1202

Name of student is: Harish

tell() and seek() methods:

tell(): It returns the current position of cursor in file. Example:

```
fout=open("story.txt","w")
```

```
fout.write("Welcome Python")
```

```
print(fout.tell( ))
```

```
fout.close( )
```

Output:

`seek(offset, reference_point)` : Change the cursor position by bytes as specified by

the offset, from the reference point. Example:

```
fout=open("story.txt","w")
fout.write("Welcome Python")
fout.seek(5)
print(fout.tell( ))
fout.close( )
```

Output:

5

Pickle Module: Python Pickle is used to serialize and deserialize a python object structure. Any object on python can be pickled so that it can be saved on disk.

Pickling: Pickling is the process whereby a Python object hierarchy is converted into a byte stream.

Unpickling: A byte stream is converted into object hierarchy.

To use the pickling methods in a program, we have to import pickle module using import keyword.

Example:

```
import pickle
```

In this module, we shall discuss to functions of pickle module, which are:

- i. `dump( )` : To store/write the object data to the file.
- ii. `load( )` : To read the object data from a file and returns the object data.

Syntax:

Write the object to the file:

pickle.dump(List_name, file-object)
Read the object from a file: pickle.load(file-object)

**1 Mark
Questions**

1	Which one of the following is correct statement? a. import – pickle b. pickle import c. import pickle d. All the above	
2	Which of the following file mode opens a file for reading and writing both as well as overwrite the existing file if the file exists otherwise creates a new file? a. w b. wb+ c. wb d. rwb	
3	Which of the following file types allows to store large data files in the computer memory? a. Binary Files b. Text Files c. CSV Files d. None of these	
4	Which functions is used to close a file in python? (A) close (B) cloose() (C) Close() (D) close()	
5	Which of the file opening mode will open the file for reading and writing in binary mode. a) rb b) rb+ c) wb d) a+	
6	Which of the following python statement will bring the read pointer to 10th character from the end of a file containing 100 characters, opened for reading in binary mode. a) File.seek(10,0) b) File.seek(-10,2) c) File.seek(-10,1) d) File.seek(10,2)	
7	Assertion (A): A binary file in python is used to store collection objects like lists and dictionaries that can be later retrieved in their original form using pickle module. Reasoning (A): A binary files are just like normal text files and can be read using a text editor like notepad	
8	Which of the following functions changes the position of file pointer and returns its new position? a.flush() b.tell() c.seek() d.offset()	
9	Which of the following mode will refer to binary data? (a)r (b) w (c) + (d) b	
10	The correct syntax of seek() is: (a) file_object.seek(offset [, reference_point]) (b) seek(offset [,reference_point]) (c) seek(offset, file_object) (d) seek.file_object(offset	
11	Which file mode can be used to open a binary file in both append and read mode? a) w+ b) wb+ c) ab+ d)a+	

3 & 4 Mark Questions

16	Consider a file, SPORT.DAT, containing records of the following structure: [SportName, TeamName, No_Players] Write a function, copyData(), that reads contents from the fileSPORT.DAT and copies the records with Sport name as “Basket Ball” to the file named BASKET.DAT. The function should return the total number of records copied to the file BASKET.DAT. OR (Option for part (ii) only) A Binary file, CINEMA.DAT has the following structure: {MNO:[MNAME, MTYPE]} Where MNO – Movie Number MNAME – Movie Name MTYPE is Movie Type Write a user defined function, findType(mtype), that accepts mtype as parameter and displays all the records from the binary file CINEMA.DAT, that have the value of Movie Type as mtype	3												
17	A binary file “EMPLOYEE.DAT” has structure (EMPID, EMPNAME, SALARY). Write a function to display number of employees having Salary more than 20000.	3												
18	A binary file data.dat needs to be created with following data written it in the form of Dictionaries. <table border="1"> <thead> <tr> <th>Rollno</th><th>Name</th><th>Age</th></tr> </thead> <tbody> <tr> <td>1001</td><td>TOM</td><td>17</td></tr> <tr> <td>1002</td><td>BOB</td><td>16</td></tr> <tr> <td>1003</td><td>KAY</td><td>16</td></tr> </tbody> </table> Write the following functions in python accommodate the data and manipulate it. a) A function insert() that creates the data.dat file in your system and writes the three dictionaries. b)A function read() that reads the data from the binary file and displays the dictionaries whose age is 16.	Rollno	Name	Age	1001	TOM	17	1002	BOB	16	1003	KAY	16	4
Rollno	Name	Age												
1001	TOM	17												
1002	BOB	16												
1003	KAY	16												
19	Write a function GetPrice(ITEMID) in Python which accepts the ITEMID as parameter and return PRICE of the Item stored in Binary file STOCK.DAT.	3												
20	A binary file “stud.dat” has structure [rollno, name, marks]. i. Write a user defined function insertRec() to input data for a student and add to student.dat. ii. Write a function searchRollNo(r) in Python which accepts the student’s rollno as parameter and searches the record in the file “student.dat” and shows the details of student i.e. rollno, name and marks (if found) otherwise shows the message as ‘No record found’	5												

Answers

1	c	
2	b	
3	a	
4	D	
5	b	
6	b) File.seek(-10,2)	
7	A is True and R is False	
8	b	
9	Option d	
10	(a) file_object.seek(offset [, reference_point])	
11	ab+	
3 & 4 ,5 Marks questions		
16	<pre>def copyData(): f1=open("SPORTS.dat","rb") f2= open("BASKET.dat" ,"wb") c=0 try: while True: data=pickle.load(f1) print(data) if data[0]== "Basket Ball": pickle.dump(data,f1) c=c+1 except: f.close() f1.close() return c OR Def searchtype(mtype): f1=open(CINEMA.DAT","rb) try: while true: data=pickle.load(f1) if data[2]==mtype: print("movie Number",data[0]) print("movie Name",data[1]) print("movie Type",data[2]) except EOFERROR:</pre>	3

	f1.close()	
17	<pre> import pickle def CountRec(): fobj=open("EMPLOYEE",'rb') num=0 try: while True: rec=pickle.load(fobj) if(rec[2]>20000): print(rec[0],rec[1],rec[2]) num=num+1 except: fobj.close() return num </pre>	3
18	<pre> import pickle def insert(): d1 = {'Rollno':1001, 'Name':'TOM', 'Age':17} d2 = {'Rollno':1002, 'Name':'BOB', 'Age':16} d3 = {'Rollno':1003, 'Name':'KAY', 'Age':16} f = open("data.dat","wb") pickle.dump(d1,f) pickle.dump(d2,f) pickle.dump(d3,f) f.close() def read(): f = open("data.dat", "rb") while True: try: d = pickle.load(f) if d['Age']==16: print(d) except EOFError: break f.close() </pre>	4
19	<pre> def GetPrice(ITEMID): fobj=open("STOCK.DAT",'rb') try: while True: rec=pickle.load(fobj) if(rec[0]in str(ITEMID)): print("Price of ", rec[0], "item is",rec[3]) return rec[0] except: </pre>	3

	fobj.close()	
20	<pre> i. import pickle def insertRec(): f=open("student.dat","ab") rollno = int (input("Enter Roll Number : ")) name=input("Enter Name :") marks = int(input("Enter Marks : ")) rec = [rollno, name, marks] pickle.dump(rec, f) f.close() ii. def searchRollNo(r): f=open("student.dat","rb") flag = False while True: try: rec=pickle.load(f) if rec[0] == r : print(rec['Rollno']) print(rec['Name']) print(rec['Marks']) flag = True except EOFError: break if flag == False: print("No record Found") f.close() </pre>	5

CSV FILES: A comma-separated values (CSV) file is a delimited text file that uses a comma to separate values. The CSV format refers to a tabular data that has been saved as plain text where data is separated by commas. The separator character of CSV Files is known as delimiter. Default and most popular delimiter is comma.

Other popular delimiters are- tab (\t) , colon (:), pipe (|) and semi-colon (;)

ADVANTAGES in working with CSV file formats:

- Simple and compact format for data storage and Common format for data interchange
- Capable of storing huge amount of data
- Nearly all spreadsheets and databases support import/export to csv format.
- It can be opened in popular spreadsheet packages like MS-Excel, Calc etc.

READING and WRITING from CSV File

Writing and reading operation from text file is very easy.

1) import csv module for file operation/method call.

2) For writing, we open file in 'w' writing mode using open () method which create newFile like object.

3) Through csv.writer() method ,we create writer object to call writerow() method to write objects.

4) For reading, we open the file in 'r' mode and create newFile like object,further we create

newfilereader object using csv.reader() method to read each row of the file.

5) Three file opening modes are there 'w','r','a' for write,read,append.

6) After processing, use close () method to close the file

import csv module:-

The CSV module of Python provides functionality to read/write tabular data in CSV format. This

module provides two types of objects

WRITE on to a CSV File

csv.writer():-

Returns a writer object which writes data into CSV File

<writerobject>.writerow()

Write one row of data onto the writer object

<writerobject>.writerows()

Writes multiple rows of data onto the writer object

READ from a CSV File

csv.reader()

Returns a reader object which loads data from CSV file into an iterable after parsing

delimited data

Questions

1	CSV files are binary files	1
---	----------------------------	---

	True/False	
2	A _____ function allows to write a single record into each row in CSV file.	1
3	Assertion: CSV (Comma Separated Values) is a file format for data storage which looks like a text file. Reason (R): The information is organized with one record on each line and each field is separated by semi-colon.	1
4	The CSV files can be operated by _____ and _____ software.	1
5	A _____ is a file format which stores records separated by comma.	1
6	What is the advantage of using a csv file for permanent storage? Write a Program in Python that defines and calls the following user defined functions: (i) ADD() – To accept and add data of a teacher to a CSV file 'teacher.csv'. Each record consists of a list with field elements as tid, name and mobile to store teacher id, teacher name and teacher mobile number respectively. (ii) COUNTRECORD() – To count the number of records present in the CSV file named 'teacher.csv'.	5
7	Give any one point of difference between a binary file and a csv file. Write a Program in Python that defines and calls the following user defined functions: (i) add() – To accept and add data of an employee to a CSV file 'employee.csv'. Each record consists of a list with field elements as eid, name and salary to store employee id, employee name and employee salary respectively. (ii) search()- To display the records of the employee whose salary is more than 40000.	5
8	Vedansh is a Python programmer working in a school. For the Annual Sports Event, he has created a csv file named Result.csv, to store the results of students in different sports events. The structure of Result.csv is : [St_Id, St_Name, Game_Name, Result] Where St_Id is Student ID (integer) ST_name is Student Name (string) Game_Name is name of game in which student is participating(string) Result is result of the game whose value can be either 'Won', 'Lost' or 'Tie' For efficiently maintaining data of the event, Vedansh wants to write the following user defined functions: Accept() – to accept a record from the user and add it to the file Result.csv. The column headings should also be added on top of the	

	csv file. wonCount() – to count the number of students who have won any event. As a Python expert, help him complete the task.	
9	Write the full form of 'CSV'. What is the default delimiter of csv files? The scores and ranks of three students of a school level programming competition is given as: ['Name', 'Marks', 'Rank'] ['Sheela', 450, 1] ['Rohan', 300, 2] ['Akash', 260, 3] Write a program to do the following: (i) Create a csv file (results.csv) and write the above data into it by using a function Accept() (ii) To display all the records present in the CSV file named 'results.csv' by using a Function Disp()	

Answers:-

1	false	
2	writerow()	
3	A is True but R is False	
4	Text Editor, Spreadsheet or Notepad, MS Excel	
5	CSV	
6	Advantage of a csv file: * It is human readable – can be opened in Excel and Notepad applications * It is just like text file Program: <pre>import csv def ADD(): fout=open("teacher.csv","a",newline="\n") wr=csv.writer(fout) tid=int(input("Enter teacher id :: ")) name=input("Enter name :: ") mobile=int(input("Enter mobile number :: ")) lst=[tid, name, mobile] ----- ½ mark wr.writerow(lst) ----- ½ mark fout.close() def COUNTR(): fin=open("teacher.csv","r",newline="\n") data=csv.reader(fin) d=list(data) print("No of records :",len(d)) fin.close() ADD() COUNTR()</pre>	

	(1 mark for advantage ½ mark for importing csv module 1 ½ marks each for correct definition of ADD() and COUNTR())	
7	Difference between binary file and csv file: (Any one difference may be given) Binary file: * Extension is .dat * Not human readable * Stores data in the form of 0s and 1s CSV file * Extension is .csv * Human readable * Stores data like a text file <pre> import csv def add(): fout=open("employee.csv","a",newline='\n') wr=csv.writer(fout) eid=int(input("Enter Employee Id :: ")) name=input("Enter employee name :: ") salary =int(input("Enter salary :: ")) FD=[eid, name, salary] wr.writerow(FD) fout.close() def search(): fin=open("employee.csv","r",newline='\n') data=csv.reader(fin) found=False print("The Details are") for i in data: if int(i[2])>40000: found=True print(i[0], i[1], i[2]) if found==False: print("Record not found") fin.close() add() print("Now displaying") search() </pre>	5
8	<pre> def Accept(): sid=int(input("enter student id")) sname= input("enter student name") sgame= input("enter student game") res= input("enter result") headings=[" Student ID","Student Name","Student Game","Result"] data=[sid,sname,sgame,res] f=open("result.csv",'a',new line='') </pre>	

	<pre> csvwriter=csv.writer(f) csvwriter.writerow(headings) csvwriter.writerow(data) f.close() def woncount(): f=open(result.csv,'r') csvreader=csv.reader(f,delimiter=',') head=list(csvreader) print(head[0]) for x in head: if x[3]=="WON": print(x) f.close() </pre>	
9	CSV- Comma Seperated Values , default delimiter- comma (,) <pre> import csv def Accept(): f = open("results.csv", "w") cwriter = csv.writer(f) examdata = [["Name", "Marks", "Rank"], ["Sheela", 450, 1], ["Rohan", 300, 2], ["Akash", 260, 3]] cwriter.writerows(examdata) f.close() def Disp(): with open("results.csv","r") as NF: NewReader=csv.reader(NF) for rec in NewReader: print(rec[0], rec[1], rec[2]) </pre>	5

Data Structure:

Stack, operations on stack (push & pop), implementation of stack using list

Introduction :

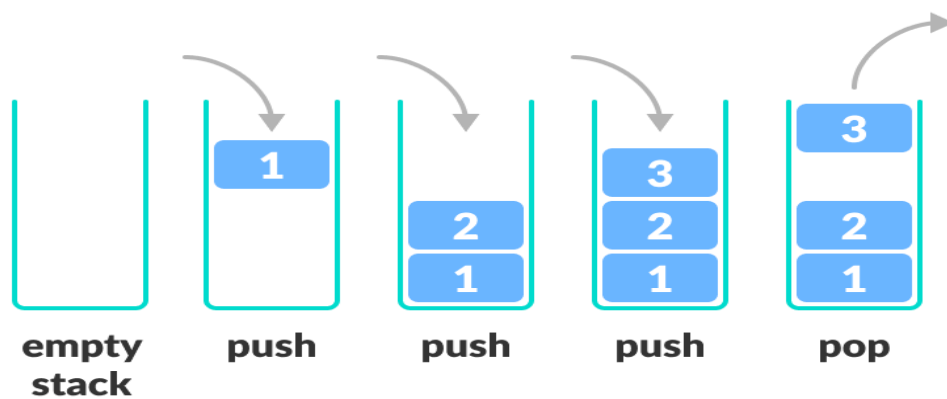
Data structures: A data structure is a named group of data of different data types which is stored in a specific way and can be processed as a single unit. It has well-defined operations, behaviour and properties.

Stack : It is a linear structure implemented in LIFO (Last In First Out) manner where insertions and deletions are restricted to occur only at one end – stack's top.



Key Points for Stack :

1. A new data element can only be added to the top of the stack (push). The insertion of element in a stack is called PUSH operation.
2. Data can only be removed from the top (pop). The removal of element from a stack is called POP Operation.



Implementation of Stack using List

The basic operations performed on the Stack are:

1. Creating a Stack
2. PUSH Operation / Adding Elements to a Stack
3. Pop Operation / Deleting Elements from a Stack
4. Traversal / Displaying a Stack.

1. Creating a Stack

To create an empty Stack, we use inbuilt function **list()** or **[]** as per the syntax given below:

Syntax :

Stack = list() OR Stack = []

In order to access the elements in a Stack, index values are used. Thus, the first element in the Stack will be Stack[0], and so on.

2. PUSH Operation adding Elements into a Stack The list function **append()** is used to add elements into the Stack.

Syntax:

Stack.append(n)

Here, n is the element to be inserted into the Stack and is inserted at the end of the list for stack.

3. Pop Operation/Deleting an Element from a Stack :-

The function **pop()** is used to remove/delete elements from a Stack.

Syntax :

Stack.pop()

It returns the popped / deleted elements from the list.

4. Traversing /displaying Stack Elements

In Traversing last inserted element, get displayed and processed in the reverse order.

Application of the Stack

- A Stack can be used for evaluating expressions consisting of operands and operators.
- Stacks can be used for Backtracking, i.e., to check parenthesis matching in an expression.
- It can also be used to convert one form of expression to another form.
- It can be used for systematic Memory Management.

Practical Implementation :-

Write a program in Python to implement the following operation on Stack containing Roll_number and Marks

1. PUSH 2. POP 3. DISPLAY

```
student= []

choice = 'y'

while (choice=='y' or choice=='Y'):

    print("1. PUSH")

    print("2. POP")

    print("3. DISPLAY STACK")

    choice1 = int(input("Enter any choice: "))

    if(choice1==1):

        r_no=int( input('Enter Roll Number of student '))

        marks= int( input('Enter Marks of student '))

        stud = (r_no,marks)

        student.append(stud)

    elif(choice1==2):

        if len(student)==0:

            print('Stack empty')

        else:

            r_no,marks = student.pop()

            print('Deleted element is ',r_no,marks)

    elif(choice1==3):
```

```

top = len(student)

while top>0:

    print(student[top-1])

    top = top -1

else:

    print('Wrong Input')

choice = input('Do you want to continue? y or n: ')

```

<u>Long Type Question – 3 Mark</u>		
1.	A list contains following record of a student: [StudentName, Class, Section, MobileNumber] Write the following user defined functions to perform given operations on the stack named 'xiia': (i) pushElement() - To Push an object containing name and mobile number of students who belong to class xii and section 'a' to the stack (ii) popElement() - To Pop the objects from the stack and display them. Also, display "Stack Empty" when there are no elements in the stack. For example: If the lists of students details are: ["Rajveer", "9999999999", "XI", "B"] ["Swatantra", "8888888888", "XII", "A"] ["Sajal", "7777777777", "VIII", "A"] ["Yash", "1010101010", "XII", "A"] The stack "xiia" should contain ["Swatantra", "8888888888"] ["Yash", "1010101010"] The output should be: ["Yash", "1010101010"] ["Swatantra", "8888888888"] Stack Empty	3
2.	A list of numbers is used to populate the contents of a stack using a function push(stack, data) where stack is an empty list and data is the list of numbers. The function should push all the numbers that are even to the stack. Also write the function pop() that removes the top element of the stack on its each call.	3
3	Write a function in Python PUSH(Num), where Num is a list of numbers. From this list push all numbers divisible by 5 into a stack implemented by using a list. Display the stack if it has atleast one element, otherwise display appropriate error message. For example:	

	If the list Num is: [66, 75, 40, 32, 10, 54]] The stack should contain: [75, 40, 10	
4	Write Add_New(Book) and Remove(Book) methods in Python to Add a new Book and Remove a Book from a List of Books, considering them to act as PUSH and POP operations of the data structure stack.	3
5	Raju has a list containing 10 integers. You need to help him create a program with separate user defined functions to perform the following operations based on this list. ➤ Traverse the content of the list and push the even numbers into a stack. ➤ Pop and display the content of the stack. For example: If the sample content of the list is as follows: N=[12,13,34,56,21,79,98,22,35,38] Sample output of the code should be: 38 22 98 56 34 12	
6	A list, NList contains following record as list elements: [City, Country, distance from Delhi] Each of these records are nested together to form a nested list. Write the following user defined functions in Python to perform the specified operations on the stack named travel. (i) Push_element(NList): It takes the nested list as an argument and pushes a list object containing name of the city and country, which are not in India and distance is less than 3500 km from Delhi. (ii) Pop_element(): It pops the objects from the stack and displays them. Also, the function should display "Stack Empty" when there are no elements in the stack. For example: If the nested list contains the following data: NList=[["New York", "U.S.A.", 11734], ["Naypyidaw", "Myanmar", 3219], ["Dubai", "UAE", 2194], ["London", "England", 6693], ["Gangtok", "India", 1580], ["Columbo", "Sri Lanka", 3405]] The stack should contain: ['Naypyidaw', 'Myanmar'], ['Dubai', 'UAE'], ['Columbo', 'Sri Lanka'] The output should be: ['Columbo', 'Sri Lanka'] ['Dubai', 'UAE'] ['Naypyidaw', 'Myanmar'] Stack Empty	

Answers

1.	<pre> xiiia=[] student=[['Rajveer', '999999999999','XI', 'B'],['Swatantra', '88888888888','XII', 'A'], ['Sajal','77777777777','VIII','A'],['Yash', '1010101010','XII','A']] def pushElement(student): for d in student: if d[2]=='XII' and d[3]=='A': xiiia.append([d[0],d[1]]) def popElement(): while len(xiiia)!=0: print(xiiia.pop()) else: print('Stack Empty') pushElement(student) print(xiiia) popElement() </pre>	3
2	<pre> data = [1,2,3,4,5,6,7,8] stack = [] def push(stack, data): for x in data: if x % 2 == 0: stack.append(x) def pop(stack): if len(stack)==0: return "stack empty" else: return stack.pop() push(stack, data) print(pop(stack)) </pre>	3
3.	<pre> def PUSH(num): s=[] for x in range(0, len(num)): if num[x]%5 ==0: s.append(num[x]) if len(s) == 0: print("Empty Stack") else: print(s) PUSH([66,75,40,32,10,54]) </pre>	
4	<pre> Books=[] Def Addnew (books,name): Books.append(name) Print("book1:",name,"inserted") </pre>	

	<pre> def remove(books): if books==[]: Print("stack is empty") else: Print("book:",books.pop(), "deleted") </pre>	
5	<pre> N=[12,12,34,56,21,79,98,22,35,38] def PUSH(S,N): S.append() def POP(S): If S!=[]: return S.pop() else: return None ST=[] for k in N: if k%2==0: PUSH(ST,k) while True: If ST![]: print(POP(ST),end=" ") else: break </pre>	
6	<pre> travel = [] def push_element(Nlist): for L in Nlist: if L[1] != "India" and L[2] < 3500: travel.append(L[0],L[1]) def pop_element(): while len(travel): print(travel.pop()) else: print("Stack empty") </pre>	

Computer Networks

EVOLUTION of networking (ARPANET, NSFNET, INTERNET)

- ARPANET(Advanced Research Projects Agency NETwork):- Started in 1969, its goal was to connect computers at different universities and U.S Defence. Engineers, Scientists, students and researchers used to exchange data and messages. It was limited to certain people only.
- In 1980's NSFnet(National Science Foundation Network) was started to make a high capacity network which was more capable than ARPANET. It allowed only academic research and not any kind of private business on it.
- Later in 1990's the inter networking of ARPANET, NSFnet and other private Networks resulted into INTERNET (INTERNETworking- A Network of Networks)

Introduction to computer networks

A group of two or more similar things or people interconnected with each other is called network

- Network of computers
- Airlines, railway, banks, hospitals networks

A computer network is an interconnection among two or more computers or computing devices. Such interconnection allows computers to share data and resources among each other.

DATA Data means information in digital form which is stored, processed and exchanged between digital devices like computer, mobile phones or laptop. Data can be text, image, audio, video or multimedia files. Computers store raw data and process these data into meaningful information. Hence, we can define Information as processed data.

COMMUNICATION The exchange of information between two or more networked or interconnected devices is called communication. These devices must be capable of sending /receiving data over a communication medium.

COMPONENTS OF DATA COMMUNICATION

The five main components of data communication are as follows:

SENDER: Sender is a device which is capable of sending data over a communication network. In data communication Sender is also called Source.

RECEIVER: Receiver is a device which is capable of receiving data over a communication network. In data communication Receiver is also called Destination.

MESSAGE: message is the information being exchanged between a sender and a receiver over a communication network.

COMMUNICATION MEDIUM: Communication medium is the path or channel through which the information is moved from the sender to the receiver. A communication medium can be either wired/guided or wireless/unguided.



PROTOCOLS: The set of standard rules which are followed in data communication are known as Data Communication Protocols. All the communicating devices like sender receiver and other connected devices in the network should follow these protocols.

Why Protocols are needed? The communicating devices may be in different geographical areas. The speed of these devices may be different. Also, the data transfer rates of different networks may be different. These complexities make it necessary to have a common set of rules to ensure the secure communication of data.

Examples of some commonly used Protocols in data communication are given below:

- Transmission Control Protocol (TCP)
- Internet Protocol (IP)
- File Transfer Protocol (FTP)
- Simple Mail Transport Protocol (SMTP)
- Hyper Text Transfer Protocol (HTTP)

MEASURING CAPACITY OF COMMUNICATION MEDIA Capacity of a communication channel means the maximum quantity of signals that a communication channel can carry. The capacity of a communication medium is measured by its bandwidth and data transfer rate.

BANDWIDTH Bandwidth is the difference between the highest and lowest frequencies a transmission media can carry. The unit of bandwidth is Hertz.

DATA TRANSFER RATES Data transfer rate is the number of bits transmitted through a channel per unit of time. Data transfer rate is measured in bits per second (bps). It is also measured in Kilobits per second (Kbps), Megabits per second (Mbps) or Gigabits per second (Gbps).

IP ADDRESS IP address or Internet Protocol address is a unique numeric address assigned to every device connected to a network. It uniquely identifies every node connected to a local network or internet. An IP address allows computers to send and receive data over the internet. They can also be used to track down a user's physical location.

There are two versions for IP address IPV4 and IPV6. IP addresses are binary numbers but are typically expressed in decimal form (IPv4) or hexadecimal form (IPv6) to make reading and using them easily. The commonly used IP address is IPV4. An IPv4 address consists of four numbers, each of which contains one to three digits, with a single dot (.) separating each set of digits. Each of the four numbers can range from 0 to 255. Example IP address: 24.171.248.170

SWITCHING TECHNIQUES

In large networks, there may be more than one paths for transmitting data from sender to receiver. The process of selecting a path of data out of the available paths is called switching.

There are two popular switching techniques – circuit switching and packet switching.

Circuit Switching In circuit switching, whenever a source end node wants to send a message to the destination end node a physical link is first established between the source and the destination. Then only the data transmission takes place. After the complete transmission of data this physical link is terminated. Simple example of a circuit switching is telephone network in which a person calls another person. When the call receiving person receives the call, then only the connection is established. Then the message is conveyed and finally the connection is terminated.

Advantages:

1. Since a dedicated communication channel is set up before communicating the message, the data transmission is reliable and is suitable for long and continuous communication.
2. Circuit switching uses fixed bandwidth as well as data rates.
3. As the data is communicated continuously, no need of sequencing or re ordering it at the receiving end.

Disadvantages: 1. Time required to setup a physical connection between the sender and the receiver makes delay in communication 2. Since a communication channel is dedicated for a particular transmission, it cannot be utilized for other communication, even if the channel is free. 3. More expensive since connection has to be established every time before communication.

Packet Switching In the packet switching technique, the whole message is split into small packets. Now, these packets are transmitted one by one from sender to the receiver through the intermediary switches in the network. The packets will take shortest path as possible. Every packet will have a sequence number in order to identify their order at the receiving end. The packets will also contain information like source address, intermediate node address, destination address etc.

Advantages:

1. Packet switching is effective type of data transmission technique as it effectively utilizes the communication channel. Multiple users can share the channel simultaneously utilizing the bandwidth effectively.
2. It is cost effective and easy to implement compared to circuit switching.
3. As the messages are sent as small sized packets, the data transmission is quick and easy.

Disadvantages:

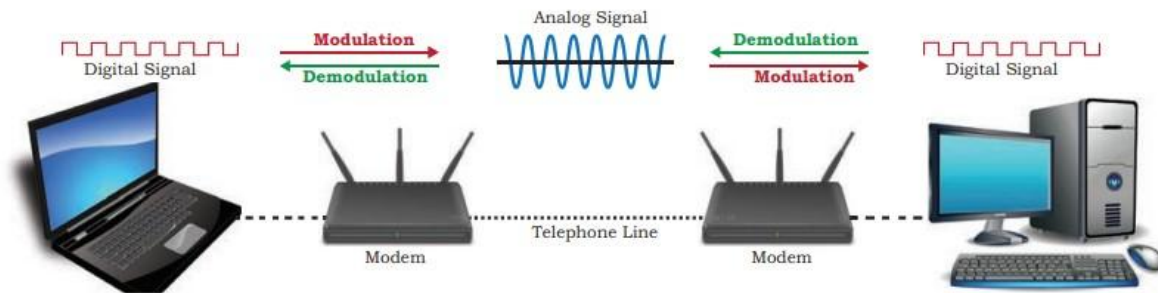
1. In packet switching the movement of packets may not be in correct order. Hence it is not suitable for voice communication.
2. Unorganized movement of packets makes it necessary to implement proper sequencing and reordering techniques.
3. As the packets flow through multiple paths from the source to the destination, complex security protocols are required to ensure reliable communication.

Network devices

(Modem, Ethernet card, RJ45, Repeater, Hub, Switch, Router, Gateway, WIFI card)

To communicate data through different transmission media and to configure networks with different functionality, we require different devices like Modem, Hub, Switch, Repeater, Router, Gateway, etc.

Modem- Modem stands for 'MOdulator DEModulator'. It refers to a device used for conversion between analog signals and digital bits. The modem at the sender's end acts as a modulator that converts the digital data into analog signals. The modem at the receiver's end acts as a demodulator that converts the analog signals into digital data for the destination node to understand.



Ethernet card

Ethernet card, also known as Network Interface Card (NIC card in short) is a network adapter used to set up a wired network. It acts as an interface between computer and the network. It is a circuit board mounted on the motherboard of a computer. The Ethernet cable connects the computer to the network through NIC.

RJ45

RJ 45 or Registered Jack-45 is an eight-pin connector that is used exclusively with Ethernet cables for networking. It is a standard networking interface that can be seen at the end of all network cables.

Repeater

Data are carried in the form of signals over the cable. These signals can travel a specified distance (usually about 100 m). Signals lose their strength beyond this limit and become weak. In such conditions, original signals need to be regenerated.

Hub

An Ethernet hub is a network device used to connect different devices through wires. Data arriving on any of the lines are sent out on all the others. The limitation of Hub is that if data from two devices come at the same time, they will collide.

Switch

A switch is a networking device that plays a central role in a Local Area Network (LAN). Like a hub, a network switch is used to connect multiple computers or communicating devices. When data arrives, the switch extracts the destination address from the data packet and looks it up in a table to see where to send the packet. Thus, it sends signals to only selected devices instead of sending to all.

Router

A router is a network device that can receive the data, analyse it and transmit it to other networks. A router connects a local area network to the internet. Compared to a hub or a switch, a router has advanced capabilities as it can analyse the data being carried over a network, decide/alter how it is packaged, and send it to another network of a different type.

Gateway

As the term “Gateway” suggests, it is a key access point that acts as a “gate” between an organisation's network and the outside world of the Internet . Gateway serves as the entry and exit point of a network, as all data coming in or going out of a network must first pass through the gateway in order to use routing paths.

WIFI card

A Wi-Fi card connects to your laptop either in your USB port or a wider card slot. · The Wi-Fi card acts as both a receiver and transmitter.

It receives the wireless signal and communicates with the wireless network, enabling you to access the Web with your laptop.

Transmission media

A transmission medium can be anything that can carry signals or data between the source (transmitter) and destination (receiver). In data communication, transmission media are the links that carry messages between two or more communicating devices.

- Transmission can be classified as guided or unguided.
- **In guided transmission**, there is a physical link made of wire/cable through which data in terms of signals are propagated between the nodes. These are usually metallic cable, fiber-optic cable, etc. They are also known as wired media.
- **In unguided transmission**, data travels in air in terms of electromagnetic waves using an antenna. They are also known as wireless media.

Wired Transmission Media

- Any physical link that can carry data in the form of signals belongs to the category of wired transmission media.
- Three commonly used guided/wired media for data transmission are, twisted pair, coaxial cable, and fiber optic cable.
- Twisted-pair and coaxial cable carry the electric signals whereas the optical fiber cable carries the light signals.

(A) Twisted Pair Cable · A twisted-pair consists of two copper wires twisted like a DNA helical structure. · Both the copper wires are insulated with plastic covers.

- Usually, a number of such pairs are combined together and covered with a protective outer wrapping.

Advantages: · It is low-cost, low-weight and flexible cables. · It is easy to install and maintain and requires RJ-45 Connector.

Disadvantages:

- Suitable for short distance (up to 100 mt.). For long distance Repeater is required.
- It supports low bandwidth and offers up to 100 Mbps speed.

(B) Coaxial cable

· Coaxial cable has a copper wire at the core of the cable which is surrounded with insulating material. The insulator is further surrounded with an outer conductor (usually a copper mesh). This outer conductor is wrapped in a plastic cover.

- The shielded design allows the cable's copper core to transmit data quickly, without interference of environmental factors.
- These types of cables are used to carry signals of higher frequencies to a longer distance.
- It is better shielded and has more bandwidth than a twisted pair.

Advantages:

- It offers high bandwidth and carry data for a long distance (185-500 m)
- Suitable for Broadband transmission (cable TV) and can be used in shared cable network.

Disadvantages: · It is less flexible and expensive compared to Twisted Pair cable.

- Not compatible with modern cables like Twisted pair cable.

(C) Optical Fiber

- The optical fiber cable carries data as light, which travels inside a thin fiber of glass.
- Optic fiber uses refraction to direct the light through the media.
- A thin transparent strand of glass at the center is covered with a layer of less dense glass called cladding. This whole arrangement is covered with an outer jacket made of PVC or Teflon.
- These cables are of light weight and have higher bandwidth which means higher data transfer rate.

Wireless Transmission Media

· In wireless communication technology, information travels in the form of electromagnetic signals through air. · Electromagnetic spectrum of frequency ranging from 3 KHz to 900 THz is available for wireless communication.

· **Radio Waves**

1. Waves of frequency range 3 KHz - 1 GHz

2. Omni-directional, these waves can move in all directions
3. Radio waves of frequency 300KHz-30MHz can travel long distance
4. Susceptible to interference
5. Radio waves of frequency 3-300KHz can penetrate walls
6. These waves are used in AM and FM radio, television, cordless phones.

Microwaves

1. Electromagnetic waves of frequency range 1GHz - 300GHz.
2. Unidirectional, can move in only one direction.
3. Cannot penetrate solid objects such as walls, hills or mountains.
4. Needs line-of-sight propagation i.e. both communicating antenna must be in the direction of each other.
5. Used in point-to-point communication or unicast communication such as radar and satellite.
6. Provide very large information-carrying capacity.

Infrared waves

1. Electromagnetic waves of frequency range 300GHz - 400THz.
2. Very high frequency waves.
3. Cannot penetrate solid objects such as walls.
4. Used for short-distance point-to-point communication such as mobile-to mobile, mobile-to-printer, remote-control-to-TV, and Bluetooth-enabled devices to other devices like mouse, keyboards etc

Network topologies

Networking Topologies We have already discussed that a number of computing devices are connected together to form a Local Area Network (LAN), and interconnections among millions of LANs forms the Internet. The arrangement of computers and other peripherals in a network is called its topology. Common network topologies are Mesh, Ring, Bus, Star and Tree

Mesh Topology

In this networking topology, each communicating device is connected with every other device in the network. Such a network can handle large amounts of traffic since multiple nodes can transmit data simultaneously.

Advantages- such networks are more reliable in the sense that even if a node gets down, it does not cause any break in the transmission of data between other nodes. This topology is also more secure as compared to other topologies because each cable between two nodes carries different data.

disadvantages, wiring is complex and cabling cost is high in creating such networks and there are many redundant or un utilized connections.

bus topology

In bus topology, each communicating device connects to a transmission medium, known as bus. Data sent from a node are passed on to the bus and hence are transmitted to the length of the bus in both directions. That means, data can be received by any of the nodes connected to the bus. In this topology, a single backbone cable called bus is shared among the nodes, which makes it cheaper and easier to maintain.

Advantages- It is good for small networks.

It requires less cable.

Disadvantages- If there is a break in a cable, no transmission takes place.

Fault isolation is difficult to detect if the entire network shuts down.

Star Topology

In star topology each communicating device is connected to a central node, which is a networking device like a hub or a switch. Star topology is considered very effective, efficient and fast as each device is directly connected with the central device. Although disturbance in one device will not affect the rest of the network, any failure in a central networking device may lead to the failure of complete network.

Advantages- It is easy to detect faults in this network.

The rate of data transfer is fast.

Disadvantages- Failure of central node makes the entire network shutdown.

More Cabling is required.

Tree

Tree Topology is a topology which is having a tree structure in which all the computers are connected like the branches which are connected with the tree. In Computer Network, tree topology is called a combination of a Bus and Star network topology. Tree network topology is considered to be the simplest topology in all the topologies which is having only one route between any two nodes on the network.

- Advantage: Tree topology provides easy maintenance and easy fault identification can be done.
As the leaf nodes can add one or more nodes in the hierarchical chain, this topology provides high scalability.
- Disadvantage: Requires a large number of cables compared to star and ring topology.
As the data needs to travel from the central cable this creates dense network traffic.

Types of networks

(PAN, LAN, MAN, WAN)

Personal Area Network (PAN) It is a network formed by connecting a few personal devices like computers, laptops, mobile phones, smart phones, printers etc. All these devices lie within an approximate range of 10 metres. A personal area network may be wired or wireless. For example, a mobile phone connected to the laptop through USB forms a wired PAN while two smartphones communicating with each other through Bluetooth technology form a wireless PAN or WPAN.



Local Area Network (LAN) It is a network that connects computers, mobile phones, tablet, mouse, printer, etc., placed at a limited distance. The geographical area covered by a LAN can range from a single room, a floor, an office having one or more buildings in the same premise, laboratory, a school, college, or university campus. These types of networks can be extended up to 1 km. Data transfer in LAN is quite high, and usually varies from 10 Mbps (called Ethernet) to 1000 Mbps.

Metropolitan Area Network (MAN) Metropolitan Area Network (MAN) is an extended form of LAN which covers a larger geographical area like a city or a town. Data transfer rate in MAN also ranges in Mbps, but it is considerably less as compared to LAN. Cable TV network or cable based broadband internet services are examples of MAN. This kind of network can be extended up to 30-40 km

Wide Area Network (WAN) Wide Area Network connects computers and other LANs and MANs, which are spread across different geographical locations of a country or in different countries or continents. The Internet is the largest WAN that connects billions of computers, smartphones and millions of LANs from different continents.

NETWORK PROTOCOL:

A protocol means the rules that are applicable for a network. Protocols defines standardized formats for data packets, techniques for detecting and correcting errors etc.

HTTP - Hyper Text Transfer Protocol

HTTP is used to transfer data across the web. HTTP specifies how to transfer hypertext (linked web documents) between two computers.

It allow users of the World Wide Web to exchange information found on web pages.

When accessing any web page entering http:// in front of the address tells the browser to communicate over HTTP.

Clients (web browsers) send requests through request object of http to web servers for web pages, resources etc

FTP- (File Transfer Protocol)

It is a standard internet protocol provided by TCP/IP used for transmitting the files from one host to another. It is mainly used for transferring the web page files from their creator to the computer that acts as a server for other computers on the internet. It is also used for downloading the files to computer from other servers.

PPP- Point-to-Point Protocol

(PPP) is protocol that is used to connect one computer system to another. Computers use PPP to communicate over the telephone network or the Internet. A PPP connection exists when two systems physically connect through a telephone line. You can use PPP to connect one system to another.

SMTP (Simple Mail Transfer Protocol.)



SMTP is a set of communication guidelines that allow software to transmit an electronic mail over the internet is called Simple Mail Transfer Protocol.

- It is a program used for sending messages to other computer users based on e-mail addresses. It provides a mail exchange between users on the same or different computers, and it also supports:

- I. It can send a single message to one or more recipients.
 - II. Sending message can include text, voice, video or graphics.
 - III. It can also send the messages on networks outside the internet.
- The main purpose of SMTP is used to set up communication rules between servers.

TCP/IP(Transmission Control Protocol/ Internet Protocol)

- It is a set of standardized rules that uses a client-server model of communication in which a user or machine (a client) requests a service by a server in the network.

- The IP protocol ensures that each computer or node connected to the Internet is assigned an IP address, which is used to identify each node independently.

- TCP ensures that the message or data is broken into smaller chunks, called IP packets. Each of these packets are routed (transmitted) through the Internet, along a path from one router to the next, until it reaches the specified destination. TCP guarantees the delivery of packets on the designated IP address. It is also responsible for ordering the packets so that they are delivered in sequence

POP3

Post Office Protocol version 3 (POP3) is a standard mail protocol used to receive emails from a remote server to a local email client. POP3 allows you to download email messages on your local computer and read them even when you are offline

HTTPS

The more secure and advanced version is HTTPS. It is used for secure communication over a computer network.

HTTPS provides,

- 1) Encryption: Encrypting the exchanged data to keep it secure from eavesdroppers.
- 2) Data integrity: Data cannot be modified or corrupted during transfer.
- 3) Authentication: Proves that your users communicate with the intended website.

Telnet

- The main task of the internet is to provide services to users. For example, users want to run different application programs at the remote site and transfers a result to the local site. This requires a client-server program such as FTP, SMTP. But this would not allow us to create a specific program for each demand.

- 
- The better solution is to provide a general client-server program that lets the user access any application program on a remote computer. Therefore, a program that allows a user to log on to a remote computer

VoIP

VoIP stands for Voice over Internet Protocol. It is also referred to as IP telephony, internet telephony, or internet calling. It's an alternative to a public switched telephone network (PSTN)

Introduction to web services:

Web Services means the services provided by World Wide Web. The World Wide Web provides services like chatting, emailing, video conferencing, e-learning, e-shopping, e-reservation, egroups and social networking. These services are the ways to communicate and here the communication takes place between two electronic devices.

WWW

The World Wide Web (WWW) commonly referred to as WWW, W3, or the Web is an interconnected system of public webpages accessible through the Internet. It is an ocean of information, stored in the form of trillions of interlinked web pages and web resources. The Web is one of many applications built on top of the Internet. It's invented by Tim Berners-Lee in 1989.

Hyper Text Markup Language (HTML)

It is not a programming language. It is a mark-up language that tells web browsers how to structure the web pages you visit.

- HTML is language that helps in creating and designing web content.
- It has a variety of tags and attributes for defining the layout and structure of the web document.

Hypertext is a text which is linked to another document

Extensible Markup Language (XML)

XML is a mark-up language like HTML.

- It is designed to transport or store data.
- In contrast to HTML, it's used to transport the data and not for displaying the data.
- Unlike HTML, it does not have predefined tags.

Domain Names

Each computer server hosting a website or web resource is given a name against its IP address. These names are called the Domain names or hostnames corresponding to unique

IP addresses assigned to each server. For easy understanding, it can be considered as the phonebook where instead of remembering each person's phone number, we assign names to their numbers.

URL

Uniform Resource Identifier. It is a unique address or path for each resource located on the web. It is also known as Uniform Resource Locator (URL). Every page on the web has a unique URL. Examples are: <https://www.mhrd.gov.in>, <http://www.ncert.nic.in>, <http://www.airindia.in>, etc. URL is sometimes also called web address. However, a URL is not only the domain name. It contains other information that completes a web address, as depicted below:

<http://www.ncert.nic.in/textbook/textbook.htm>

Website

A website is a collection of linked web pages (plus their associated resources) that share a unique domain name.

♣ Thus, a Web site is a collection of related Web pages.

♣ Each web page of a given website provides explicit links, most of the time in the form of clickable portion of text, that allow the user to move from one page of the website to another.

♣ Each Web site is owned and updated by an individual, company, or an organization.

♣ Web is a dynamically moving and changing entity, today web sites generally change on a daily or even hourly basis.

Web Browser

· Web browser is software program to navigate the web pages on the internet.

· A browser interprets the coding language of the web page and displays it in graphic form.

· A web browser allows anyone to access the web without even knowing commands used in software languages to design a web page.

· Internet works on client -server model.

· A web browser is a client which requests the information from the web server.

· The web server sends the information back to the client.

Web Servers

· A web server is a computer or a group of computers hosting one or more websites.

· "Hosting" means that all the web pages and their supporting files are available on that computer.

· The web server will send any web page from the website it is hosting to any user's browser, per user request. · More importantly, since a web server can host multiple websites, the term web server is never used to designate a website, as it could cause great confusion.

· It works on client/server model.

· It delivers the requested web page to web browser.

Web Hosting

♣ Web hosting is the process of uploading/saving the web content on a web server to make it available on WWW.

♣ In case an individual or a company wants to make its website available on the internet, it should be hosted on a web server.

♣ A good way to think about this is if the domain name is the address of our house, then web hosting is the actual house that address points to. All websites on the internet, need web hosting.

Solved Questions with Answers

Multiple Choice Questions

1. Riya wants to transfer pictures from her mobile phone to her laptop. She uses Bluetooth Technology to connect two devices. Which type of network will be formed in this case?

a. PAN b. LAN c. MAN d. WAN

Ans a. PAN

2. Which one of the following devices will you suggest for connecting all the computers within each block of a building?

1. Switch/Hub b. Modem c. Telephone d. Repeater

Ans a. Switch/Hub

3. XYZ company is planning to link its head office situated in New Delhi with the offices in hilly areas. Suggest a way to connect it economically:

1. Micro waves b. Coaxial cable c. Fibre optic d. Radio waves

Ans d. Radiowaves

4. Which of the following is/are not communication media?

1. Microwaves b. Optical Fiber cable c. Node d. Radio waves

Ans c. Node

5. The number of bits transmitted per second is called _____.

1. Bit rate b. Baud rate c. Data rate d. Transfer rate

Ans a. Bit rate

6. A _____ is established in circuit switching before actual communication.

1. Switch b. Link c. Protocol d. Hub
Ans b. link

7. The _____ is the difference between upper and lower frequencies of a communication medium.
a. Bandwidth b. Data rate c. Latency d. communication speed
Ans a. Bandwidth

8. For every device connected to a network, there will be a unique _____.
1. Name b. ID c. IP Address d. IC
Ans c. IP Address

9. What are the three common types of computer networks?
1. ROM, MAN, LAN
2. RAM, WAN, LAN
3. MAN, LAN, WAN
4. None of the above
Ans c. MAN,LAN,WAN

10. What is the acronym for LAN?
a. Local Area Network
b. Local Access Network
c. Line And Networking
d. Line-less Networking
Ans a. Local Area Network

Very Short Answer Type Questions(1-mark)

1. Give examples for Wired media and Wireless media.

Ans

Wired Medium	Wireless Medium
Optical Fiber cable	Microwaves, Radio waves

2. Name the device which connects multiple nodes to form a network. It redirects the received information only to the intended node(s).

Ans Switch

3. Identify odd one out of the following: Optical Fiber/Coaxial Cable/ Bluetooth/Twisted Pair Cable. Give reason for your answer.

Ans. Odd one: Bluetooth(Reason: Bluetooth is a wireless/unguided communication media while others are wired/guided communication media)

4. Ms. Emily is planning to connect 20 computers in her computer lab to form a local area network. Suggest an intelligent network device to connect all the computers.

Ans Switch

5. Which communication channel is/are suitable in each of the following situations? (i) Transfer of data from one mobile to another. (ii) Communication in a hilly area.

Ans (i) Bluetooth (ii). Radio waves

1. Your friend wishes to install a wireless network in his office. Explain to him the difference between guided and unguided media.

Ans Guided media uses cables to connect computers, whereas unguided media uses waves.

2. Write two points of difference between Circuit Switching and Packet Switching.

Ans In **Circuit Switching** a physical connection between the sender and the receiver is set up first. Then, through that physical link, the complete message is communicated continuously. After completion of the transmission, the physical connection is terminated.

In Packet Switching, the message is split into small units called packets. Then these packets are passed from source to destination simultaneously through different routes in the network. As the flow of packets are asynchronous, sequence numbers are assigned to each packet to facilitate re-ordering of packets at the destination.

3. Write two points of difference between XML and HTML.

Ans XML was designed to describe data and to focus on what data is.

HTML was designed to display data and to focus on how data looks.

HTML is about displaying information while XML is about describing information.

4. What do you mean by an IP Address? Give an example for IP Address.

Ans An IP Address is a numerical address that uniquely identifies every device connected to a network or internet. The user's physical location can be tracked by using an IP Address.

Eg 192.158.12.38

5. What is the use of TELNET?

Ans Telnet is used to provide a general client-server program that lets the user access any application program on a remote computer.

Unsolved Questions for practice

(answers are given at the end)

1. Mr. John is a small businessman who runs Hardware. He has been experiencing problems with his small accounting department, which he depends on to provide sales reports. Mr. John wants to share information between his 7 computer stations and have one central printing area. What type of network would you recommend to Mr. John?
a. MAN b. LAN c. WAN d. SAN
2. Ravi was trying to log-in to his internet-banking account. He noticed that the URL of the net banking starts with 'https'. The 's' in 'https' stands for _____.
a. Simple b).Smart c. Secure d.Strength
3. What's a web browser?
a. A kind of spider
b. A computer that store www files
c. A person who likes to look at websites
d. A software program that allows you to access sites on the World Wide Web
4. A _____ is a document commonly written and is accessible through the internet or other network using a browser?
a. Accounts b. Data c).Web page d. Search engine
5. Which of the following is a Web Browser?
a. MS-office b. Notepad c. Firefox d. Word 2007
6. Which of the following is not a web browser?
a. Chrome b. Microsoft Edge c. Safari d. Ubuntu
7. URL stands for
a. Uniform Research Limited
b. Uniform Resource Locator
c. Uniform Resource Labs
d. Uniform Research Locator
8. Web browsers are also called as _____.
a. Web Servers
b. Web Clients
c. Web Hosting
d. Web Designing .
9. _____ is a communication methodology designed to deliver both voice and multimedia communications over Internet protocol.
a. VoIP b. SMTP c. PPP d.HTTP
10. The modem at the sender's computer end acts as a _____.

- a. Model
- b. Modulator
- c. Demodulator
- d. Convertor

Very Short Answer Type Questions(1-mark)

1. Tagore Consultancy is planning to link its head office at Kolkata with the offices at Ernakulam. Suggest an economic way to set up a connection between these offices. The company is ready to compromise on the speed of the connectivity.
2. _____ is a real-time communication between two or more users via computer.
3. _____ helps us to learn anywhere using Internet.
4. _____ allows customers to conduct financial transactions on a secure Website.
5. Internet can be used to get reservation of trains and air planes through _____ service.
6. _____ helps to create and maintain social relationship over web.
7. Name any two common web browsers.
8. Write the full forms of the following: (i) SMTP (ii) PPP
9. Name the protocol used for remote login
10. Expand the following abbreviations: a. HTTP b. XML c. HTTPS

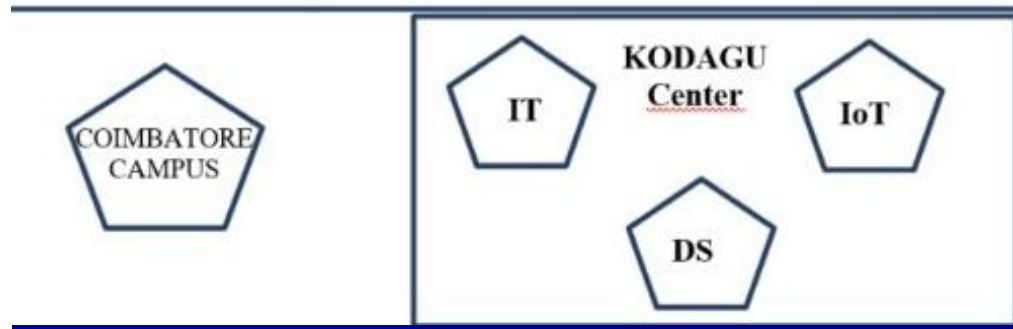
Short Answer Type Questions(2 Marks)

1. Expand the following terms: POP3, URL
2. Differentiate between website and web browser.
3. Give two advantages and two disadvantages of star topology
4. Define the following terms: www , web hosting.
5. What are cookies?

Long Answer Questions(5 marks)

1. Total-IT Corporation, a Karnataka based IT training company, is planning to set up training centers in various cities in next 2 years. Their first campus is coming up in Kodagu district. At Kodagu campus, they are planning to have 3 different blocks, one for AI, IoT and DS (Data Sciences) each. Each block has number of computers, which are required to

be connected in a network for communication, data and resource sharing. As a network consultant of this company, you have to suggest the best network related solutions for them for issues/problems raised in question nos. (i) to (v), keeping in mind the distances between various blocks/locations and other given parameters.



Distance between various blocks/locations:

Block	Distance
IT to DS	28 m
DS to IoT	55 m
IT to IoT	32 m
Kodagu Campus to Coimbatore Campus	304km

Number of computers:

Block	Number of Computers
IT	75
DS	50
IOT	80

- (i) Suggest the most appropriate block/location to house the SERVER in the Kodagu campus (out of the 3 blocks) to get the best and effective connectivity. Justify your answer.
- (ii) Suggest a device/software to be installed in the Kodagu Campus to take care of data security.
- (iii) Suggest the best wired medium and draw the cable layout (Block to Block) to most efficiently connect various blocks within the Kodagu

Campus.

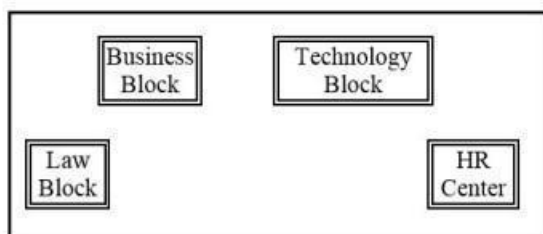
(iv) Suggest the placement of the following devices with appropriate

reasons: a) Switch/Hub b) Router

(v) Suggest a protocol that shall be needed to provide Video Conferencing

solution between Kodagu Campus and Coimbatore Campus.

2. MyPace University is setting up its academic blocks at Naya Raipur and is planning to set up a network. The University has 3 academic blocks and one Human Resource Center as shown in the diagram below: Study the following structure and answer questions (a) to (e)



Center to Center distances between various blocks/center is as follows:

Law Block to business Block	40m
Law block to Technology Block	80m
Law Block to HR center	105m
Business Block to technology Block	30m
Business Block to HR Center	35m
Technology block to HR center	15m

Number of computers in each of the blocks/Center is as follows:

Law Block	15
Technology Block	40
HR center	115
Business Block	25

i) Suggest the most suitable place (i.e., Block/Center) to install the server of this University with a suitable reason.

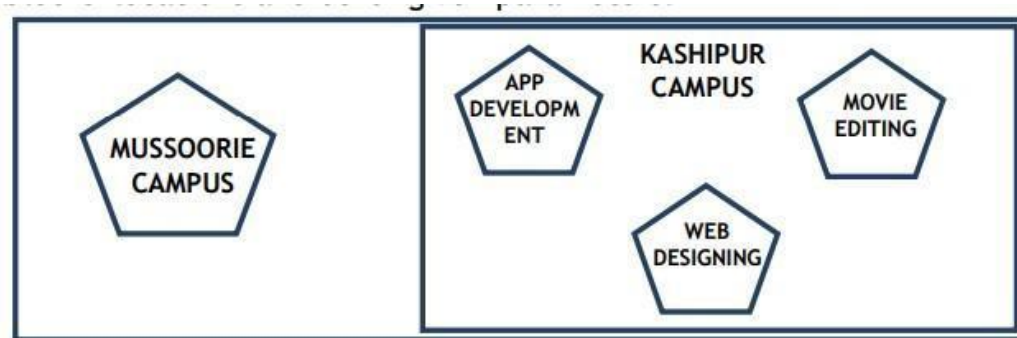
ii) Suggest an ideal layout for connecting these blocks/centers for a wired connectivity.

iii) Which device will you suggest to be placed/installed in each of these blocks/centers to efficiently connect all the computers within these blocks/centers?

iv) Suggest the placement of a Repeater in the network with justification.

v) The university is planning to connect its admission office in Delhi, which is more than 1250 km from university. Which type of network out of LAN, MAN, or WAN will be formed? Justify your answer.

3. MakeInIndia Corporation, an Uttarakhand based IT training company, is planning to set up training centres in various cities in next 2 years. Their first campus is coming up in Kashipur district. At Kashipur campus, they are planning to have 3 different blocks for App development, Web designing and Movie editing. Each block has number of computers, which are required to be connected in a network for communication, data and resource sharing. As a network consultant of this company, you have to suggest the best network related solutions for them for issues/problems raised in question nos. (i) to (v), keeping in mind the distances between various blocks/locations and other given parameters.



Distance between various blocks/locations:

Block	Distance
App development to Web designing	28 m
App development to Movie editing	55 m
Web designing to Movie editing	32 m
Kashipur Campus to Mussoorie Campus	232 km

Number of computers	Block
Number of Computers App development	75
Web designing	50
Movie editing	80

- Suggest the most appropriate block/location to house the SERVER in the Kashipur campus (out of the 3 blocks) to get the best and effective connectivity. Justify your answer.
- Suggest a device/software to be installed in the Kashipur Campus to take care of data security.
- Suggest the best wired medium and draw the cable layout (Block to Block) to economically connect various blocks within the Kashipur Campus.
- Suggest the placement of the following devices with appropriate reasons: a. Switch / Hub b. Repeater

- v. Suggest a protocol that shall be needed to provide Video Conferencing solution between Kashipur Campus and Mussoorie Campus.

Answer Key

Multiple Choice Questions(MCQ)

1. b 2. c 3. d 4. c 5. c 6. d 7. b 8. b 9. a 10. b

Very Short Answer Type Questions(1-mark)

1. Satellite
2. Chat
3. E-learning
4. Internet banking
5. E-reservation
6. Social networking websites
7. Google Chrome, Microsoft Edge
8. SMTP -Simple Mail Transfer Protocol PPP- Point to Point Protocol
9. Telnet
10. a. HTTP- HyperText Transfer Protocol b. XML – eXtensible Mark-up Language c. HTTPS - HyperText Transfer Protocol Secure

Short Answer Type Questions(2 Marks)

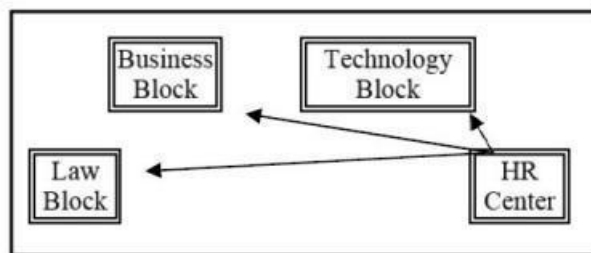
1. POP3-Post Office Protocol URL-Uniform Resource Locator
2. Website:- It is a collection of inter-linked web pages stored in a server.
Web Browser:- It is a software application for retrieving, presenting and traversing through information resources in the form of web pages available on the World Wide Web.
3. Advantages- It is easy to detect faults in this network.
The rate of data transfer is fast.
Disadvantages- Failure of central node makes the entire network shutdown.
More Cabling is required.
4. WWW- The World Wide Web (WWW) commonly referred to as WWW, W3, or the Web is an interconnected system of public webpages accessible through the Internet
Web Hosting- Web hosting is the process of uploading/saving the web content on a web server to make it available on WWW.

5. Cookies are files stored temporarily on www browser's computer, which allow the www server to store persistent information associated with browsing user on user's system.

Long Answer Questions

1. i) IoT block, as it has the maximum number of computers.
ii) Firewall
iii) Optical fiber
iv) a) Switch/Hub: In each block to interconnect the computers in that block.
b) Router: In IoT block (with the server) to interconnect all the three blocks.
v) VoIP
2.i). Most suitable place to install the server is HR center, as this center has maximum number of computers.

ii).



- iii). Switch
iv). Repeater may be placed when the distance between 2 buildings is more than 70 meter.
v). WAN, as the given distance is more than the range of LAN and MAN.

3.

- i) Movie editing block is the most appropriate to house the server as it has the maximum number of computers.

ii) Firewall

iii) Ethernet Cable



- iv) Switch/hub will be placed in all blocks to have connectivity within the block.

v) Voip

DATABASE CONCEPT

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1. Database - A database is collection of interrelated data , a database system is basically a computer record keeping system
2. Type of database model
 1. Relational
 2. Hierarchical
 3. Network
 4. Object oriented
3. Key Concepts of Database
 1. Database Schema -table
 2. Data Constraint -keys
 3. Meta data - data about data
 4. Database Instance – Copy of Schema
 5. Query -Sql Command
 6. Data Manipulation - insertion, deletion and updating
4. Properties of data base
 1. Databases Reduces Redundancy
 2. Database Controls Inconsistency
 3. Database facilitate Sharing data
 4. Database ensures Security
 5. Database maintains Integrity
 6. Database enforce Standard
5. Common Databases (RDBMS)
 1. Oracle, SQL Server, DB2, Foxpro etc – These are proprietary RDBMS
 2. MySQL, SQLite, PostgreSQL etc – these are open source RDBMS
6. Definitions

Database.- It refers to collection of logically related data.

Data Redundancy.- The duplication of data is known as data redundancy.

Data Inconsistency.- Multiple mismatching copies of same data represent data inconsistency.

Data Security.- Protection of data against accidental or intentional disclosure to unauthorized persons, or unauthorised modification or destruction.

Data Privacy.- Rights of individuals and organizations to determine for themselves when, how and to what extent information about them is to be transmitted to others.

DDL.- Data Definition Language. SQL part-language that facilitates defining creation/modification etc. of database objects such as tables, indexes, sequences etc.

DML.- Data Manipulation Language. SQL part-language that facilitates manipulation (addition/ deletion/modification) of data residing in database tables.

Relational Data Model. The data model wherein the data is organized into tables called relations. Relationship among multiple tables is established on the basis of common column.

Attribute.- A column in a relation is called attribute.

Tuple - A row in a relation is called tuple

Degree.- Number of attributes in a relation is called its degree.

Cardinality.- Number of tuples in a relation is called its cardinality.

Domain.- A pool of values where from a field can draw values is called domain.

Relation. A table having non-empty atomic values with unordered rows and columns is a relation. SQL. Structured Query Language. A non-procedural UGL used for querying upon relational databases. Tuple. A row in a relation is called tuple.

View. A virtual table that does not really exist in its own right but is instead derived from one or more underlying base tables is called a view.

MCQ

1	Each table comprises of _____ and _____ (A) rows, columns (B) data, information (C) database, table (D) None of these
	Ans. Option (A) is correct. Explanation: A database is an organized collection of data that is arranged in rows and columns.
2	The design of the database is known as what? (A) Attribute (b) Database Schema (C) obstruction (D) Database Oriented
	Ans. Option (B) is correct Explanation: Database schema is the logical representation of data which shows how the data is stored logically in the entire database.
3	A relational database is a collection of (A) Attributes (C) Records (B) Tables (D) Fields Explanation: In a relational database, all data is arranged in tables, which are made up of rows and columns.
4	A tuple in RDBMS is referred to _____ of a table (A) Record (B) Field (C) Table (D) Key
	Ans. Option (A) is correct Explanation: A single row of a table, that contains a single record for that relation is called a tuple.
5	Which of the following are used in data defini- tion? (a) DML (c) TCL (b) DDL (d) None of these
	Ans. Option (B) is correct.

6	A field of a table is termed as A. Row (C)Attribute B. Tuple (D) Key
Ans - Option (c) is Correct Explanation – In RDBMS Columns or field are termed as attributes	
7.	A _____ is a collection of interrelated data, stored to server multiple applications A. File (C) Information B. Datafile (D) Database
Ans. Option D is correct	
Assertion and Reason Based MCQs Directions: In the following questions, A statement of Assertion (A) is followed by a statement of Reason (R). Mark the correct choice as. A. Both A and R are true and R is the correct explanation for A (B) Both A and R are true and R is not correct explanation for A. (C) A is true but R is false. (D) A is false but R is true.	
8	Assertion (A): A database consists of a number of tables. Reason (R): Each table comprises of rows and re- cords.
Ans. Option (C) is correct. Explanation: A database consists of a number of tables. Each table comprises of rows (records) and columns (attributes). Each record contains values for the the corresponding attributes. The value of the attributes for a record are interrelated.	
9	Assertion (A): TCL stands for Transaction Control Language. Reason (R): These commands perform retrieval, insertion, deletion and modification etc. on data- bases.
Ans. Option (C) is correct. Explanation: TCL commands allows you to manage and control the transactions.	
10	Assertion (A): Databases Reduces Redundancy Reason (R): Database Controls Inconsistency
Ans – Option A is Correct	

Short Answer Question

Q. 1. What is relation? Define the relational data model.

Ans. A relation is a table having atomic values, unique and unordered rows and columns. The relational model represent data and relationship among data by a collection of tables known as relation, each of which has a number of columns with unique

Q. 2. What is table? Also, define Candidate Key.

Ans. A table consists of a number of rows and columns. Each record contains values for the attributes. A candidate key is the smallest subset of the super key for which there does not exist a proper subset that is super key. In other words, all attribute combinations inside a relation that can serve as primary key are candidate keys.

Q3. Define degree and cardinality.

Ans. Degree is the number of attributes or columns present in a table.

Cardinality is the number of tuples or rows present in a table.

Q4. What is database Schema

Ans. The design of the database is known as the database schema.

Q5. What is DBMS

Ans - The term DBMS expand to database management System. A DBMS is specialised software that is responsible for the creation, maintenance and use of a database.

Q6. What is RDBMS ?

Ans. The term expands to Relational Database Management System. AN RDBMS stores the data centrally in the form of a collection of tables known as relations. The relationship between two 'tables/relations is established on common fields between the tables.

Q7. What is data redundancy ? What are the problems associated with it ?

Ans. Duplication of data is data redundancy. It leads to the problems like wastage of space and data inconsistency.

Q8. What is data inconsistency?

Ans. The problem of multiple mismatched copies of same data, in a database, is called data inconsistency. It is the result of unsupervised data redundancy. -

Long Question

Q4. What is Difference between DDL and DML

Ans . The difference between DDL and DML:

DDL	DML
It stands for Data Definition Language.	It stands for Data Manipulation Language.
It is used to create database schema and can be used to define some constraints as well.	It is used to add, retrieve or update the data.
It basically defines the column (Attributes) of the table.	It add or updates the row of the table. These rows are called tuple.

Basic command present in DDL are CREATE, DROP, RENAME, ALTER etc.	BASIC command present in DML are UPDATE, INSERT, MERGE etc.
DDL is used to define the structure of a database.	DML is used to manipulate the data within the database.
DDL is used to create and modify database objects like tables, indexes, views, and constraints.	DML is used to perform operations on the data within those database objects.

Q5. What is Difference between DML and TCL

Ans . The difference between DML and TCL:

S. no.	Category	DML	TCL
1.	Full Form	DML stands for Data Manipulation Language.	TCL stands for Transaction Control Language.
2.	Definition	DML stands for Data Manipulation Language and is used to manipulate data in the database by performing insertion, updating and deletion operations.	Transaction Control Language (TCL) consists of commands that deal with the transactions within databases.
3	Use in Transactions	DML cannot be used for database transactions.	TCL is used for handling database transactions.
4.	Commands	Frequently used commands present in DML are: UPDATE, INSERT, MERGE, SELECT, DELETE, CALL, EXPLAIN PLAN, LOCK TABLE.	Frequently used commands present in TCL are: COMMIT, ROLLBACK, SAVEPOINT, SET TRANSACTION.

Q6. What is Difference between DDL and DML

Ans . The difference between DDL and DML:

Difference between DDL and TCL :

S.No.	DDL	TCL
1.	It stands for Data Definition Language.	It stands for Transaction Control Language.

S.No.	DDL	TCL
2.	It is used to define data structures or overall database schema.	It contains those commands, which are used to manage transactions within the database.
3.	By using DDL commands, database transactions cannot be handled.	TCL commands are meant to handle database transactions.
4.	Some DDL commands which are frequently used : CREATE, ALTER, DROP.	Some TCL commands which are frequently used : COMMIT, ROLLBACK.

Q. What is SQL? What are different categories of commands available in SQL?

Answer =In order to access data within the Oracle database, all programs and users must use, Structured Query Language (SQL). SQL is the set of commands that is recognized by nearly all RDBMS.

SQL commands can be divided into following categories:

1. Data Definition Language (DDL) Commands.
2. Data Manipulation Language (DML) Commands.
3. Transaction Control Language (TCL) Commands.
4. Session Control Commands.
5. System Control Commands.

CONSTRAINTS

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Keys

- **NOT NULL:** This constraint tells that we cannot store a null value in a column. That is, if a column is specified as NOT NULL then we will not be able to store null in this particular column any more.
- **PRIMARY KEY:** A set of one or more attributes that can uniquely identify tuples within the relation
- **FOREIGN KEY:** . A non-key attribute whose values are derived from the primary key of some other tables.
- **Candidate Key.** All attribute combinations inside a relation that can serve as primary key.
- **Unique Key** - This constraint when specified with a column, tells that all the values in the column must be unique. That is, the values in any row of a column must not be repeated.
- **CHECK** - This constraint helps to validate the values of a column to meet a particular condition. That is, it helps to ensure that the value stored in a column meets a specific condition.

- **DEFAULT:** This constraint specifies a default value for the column when no value is specified by the user.

Constraint.-> Rules and conditions set for data being stored in a database.

Table constraint -

Column Constraint-

Consider the following two tables:

Student_detail

Admn_no_new	Name	Class
1001	A	12
1002	B	11
1003	C	12

Attendance_table_12

Admn_no	Roll_no	Total_present	Total_absent
1001	1	110	10
1003	10	98	22

Column Constraint - at the time of column define

Create table Attendaance_table_12(

Admn_no int (4) references student_detail(admn_no_new),

Roll_no int(2),

.

.

);

Table Constraint – written after define of all column, at the last before closing closing parenthesis.

Create table Attendaance_table_12 (

Admn_no int (4) ,

Roll_no

.

.

Foreign Key Admn_no references student_detail(admn_no),

);

Required Condition for making foreign key

1. Primary key in primary table/parents table
2. Both table in Same database
3. Same data type and size of column

Referential Integrity is enforced following rules

1. In Parent table can't delete row if row value is used in another table.
2. In Parent table can't modify row if row value is used in another table.

3. In Child table can't insert new value which are not in parents table.

MCQ

1	An attribute whose value is derived from the primary key of some other table A. Primary key (C) Alternate key B. Foreign key (D) None of these
	Ans. Option (B) is correct. Explanation: A foreign key is a column or a group of columns in a relational database table that provides a link between data in two tables
2	. An Alternate key can be defined as (A) An attribute which is a primary key (C) A candidate key (B) An attribute which is not a primary key (D) None of These
	Ans – option (B) is Correct Explanation- all the keys which did not become the primary key are called alternate key
3	The attributes which have all the properties of primary key (A) Foreign key (C) Candidate key (B) Alternate key (D) Both (a) and (c)
	Ans. Option (C) is correct. Explanation: The purpose of both candidate key and the primary key is the same, i.e. to uniquely identify the tuples. The difference between two is that a table can have one or more than one candidate key, there can be only one primary key for a table.
4	An Attribute in a relation is termed as a foreign key when it refers the _____ of another table A. Primary key (C) Alternate key B. Foreign key (D) check constraint
	Ans – option a is Correct
5	Which of the following is not a legal constraint for a CREATE table command A. Primary key (C) Alternate key B. Foreign key (D) Distinct
	Ans- Option D is correct Explanation- Distinct is function to unique value from column and others are constraint
6	The primary key is selected from a. Composite key c) determinants b. Candidate key d) foreign Key
	Ans- Option B is correct
7	Which of the following types of table constraint will prevent the entry of duplicate rows? a. Unique c) distinct b. Foreign key d) NULL
	Ans – option A is correct
8	Assertion (A): INSERT command is an SQL command. Reason (R): NOT NULL constraint ensures that a column cannot have a NULL value.

	Ans. Option (B) is correct. Explanation: INSERT command is used to add tuples (rows) in a table.
9	Assertion (A): UNIQUE constraint holds same value for the column. Reason (R): There can be multiple UNIQUE constraints.
	Ans. Option (D) is correct. Explanation: UNIQUE constraint ensures that all values in a column are distinct. No two rows can hold the same value in a column.
10	Assertion (A): The columns that are not PRIMARY should have FOREIGN KEY constraint. Reason (R): Referential integrity is ensured through FOREIGN KEY.
	Ans. Option (A) is correct. Explanation: Whenever two tables are related by a common column then the related columns in the parent table should be either declared PRIMARY KEY or UNIQUE key and the related columns in the child table should have FOREIGN KEY constraint.

Short Question

Q1. How are constraints related to data integrity?

Ans. Through constraints, data integrity is maintained and assured, as before some data is put in a table, it must fulfil the conditions and rules imposed by the constraints. This ensures data integrity by allowing only the correct data 'as per the rules and conditions, to enter in the table.

Q2. What is the role of NOT NULL constraint?

Ans. It indicates that in the data being inserted, the column must have some value and cannot be left NULL.

Q3. What is the role of UNIQUE constraint?

Ans. This constraint ensures that for an attribute there will be a unique value for each row and no value is being repeated in any other row for that attribute.

Q4. What is the role of PRIMARY KEY constraint?

Ans. This constraint implements NOT NULL and UNIQUE constraints together and designated an attribute or a set of attributes as the primary key of the table so that its value can identify each record with a unique identity.

Q5. What is the role of FOREIGN KEY constraint?

Ans. This constraint is used to ensure the referential integrity of data in the table. It matches the value of the column designated as the foreign key in one table with another table's PRIMARY KEY.

Q6. What is the role of CHECK constraint?

Ans. This constraint ensures whether the value in columns fulfils the specified condition.

Q7. What is an Alternate Key ?

Ans. A candidate key that is not a primary key is called an Alternate Key. In Supplier table if there are 2 candidate keys — Suppld and Supp_Name and Suppld is the primary Key then Supp_Name is the alternate key

Q8. What is a unique key ? Is it a primary key ?

Ans. A unique key in a table/relation is any non-primary-key field which also store unique values for each row just like a primary-key does. But only one key is designate as a primary key. So unique is unique non-key field of a table.

Q9 How many primary keys and unique keys can be there in a table ?

Ans . There can be multiple unique keys in a table but there can be only primary key in Table.

Long Question

Q1 Difference between Primary key and unique key

Ans.

Parameters	PRIMARY KEY	UNIQUE KEY
Basic	Used to serve as a unique identifier for each row in a table.	Uniquely determines a row that isn't the primary key.
NULL value acceptance	Cannot accept NULL values.	Can accept NULL values.
Number of keys that can be defined in the table	Only one primary key	More than one unique key
Uses	The primary Key is used for indicating the rows uniquely.	The Unique Key is used for preventing duplicate entries.

Q2 Difference between Primary key and unique key

Ans.

The following table highlights all the important differences between primary key and foreign key –

Key	Primary Key	Foreign Key
Basic	It is used to uniquely identify data in the table.	It is used to maintain relationship between tables.
Null	It can't be NULL.	It can accept the NULL values.
Duplicate	Two or more rows can't have same primary key.	It can carry duplicate value for a foreign key attribute.
Tables	Primary key constraint can be defined on temporary table.	It can't be defined on temporary table

Q3. Are NULL values are same as a zero or a blank space ?



Ans No, A NULL value isn't the same as a zero or a blank space. A zero is a legal numeric value and a blank space is a legal character value, whereas NULL is a legal empty value that cannot be accessed or compared with other values.

Q4. What is Referential Integrity?

Ans. Referential Integrity is a set of rules that applies to tables having relationships through common fields (foreign keys linked with primary keys). The Referential integrity ensures that every foreign key must store only a valid value, i.e.

The value stored in a foreign key column must exist in the primary key column of its parent table.

Parent table cannot delete a record if its referenced value is stored in some foreign key.

Q5. What is the similarity between UNIQUE and PRIMARY KEY constraints?

Ans. The UNIQUE and the PRIMARY KEY constraints, both, ensure that the attribute(s) they are applied upon, contain the unique values (non-duplicate values) for each row/tuple in those attributes.

STRUCTURED QUERY LANGUAGE(SQL)

SQL(Structured Query Language) is a language that is used to manage data that is held in a relational database management system. It uses tables to manipulate and retrieve information from databases for analysis.

By using SQL commands, one can search for any data in the database and perform other functions like creating tables, adding records, modifying data, removing rows, dropping tables etc.

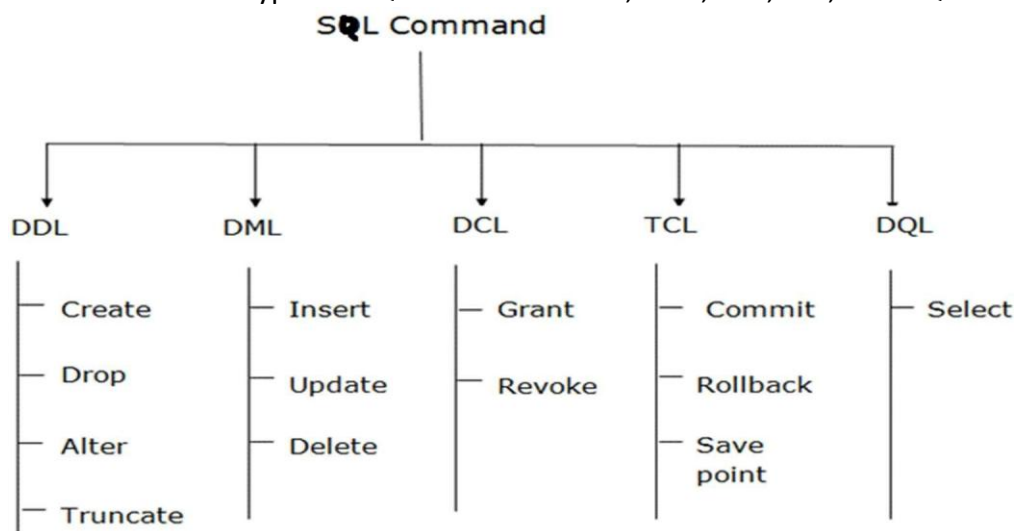
SQL Commands

SQL commands are instructions. It is used to communicate with the database. It is also used to perform specific tasks, functions, and queries of data.

SQL can perform various tasks like create a table, add data to tables, drop the table, modify the table, set permission for users.

Types of SQL Commands

There are five types of SQL commands: DDL, DML, DCL, TCL, and DQL.



DDL or Data Definition Language

DDL or Data Definition Language actually consists of the SQL commands that can be used to define the database schema. It simply deals with descriptions of the database schema and is used to create and modify the structure of database objects in the database. DDL is a set of SQL commands used to create, modify, and delete database structures but not data.

List of DDL commands:

CREATE: This command is used to create the database or its objects (like table, index, function, views, store procedure, and triggers).

DROP: This command is used to delete objects from the database.

ALTER: This is used to alter the structure of the database.

TRUNCATE: This is used to remove all records from a table, including all spaces allocated for the records are removed.

COMMENT: This is used to add comments to the data dictionary.

RENAME: This is used to rename an object existing in the database.

DML (Data Manipulation Language):

The SQL commands that deals with the manipulation of data present in the database belong to DML or Data Manipulation Language and this includes most of the SQL statements. It is the component of the SQL statement that controls access to data and to the database. Basically, DCL statements are grouped with DML statements.

List of DML commands:

INSERT : It is used to insert data into a table.

UPDATE: It is used to update existing data within a table. **DELETE** : It is used to delete records from a database table.

DATA TYPES

Data types are means to identify the type of data and associated operations for handling it.

MySQL data types are divided into three categories:

- Numeric
- Date and time
- String types

Numeric Datatype

1. int– used for number without decimal.
2. decimal(m,d) – used for floating/real numbers. m denotes the total length of number and d is number of decimal digits.

Date and Time Datatype

1. date–used to store date in YYYY-MM-DD format.
2. time–used to store time in HH:MM:SS format.

String Datatype

1. char(m)–used to store a fixed length string, m denotes max. number of characters.

2. `varchar(m)`—used to store a variable length string, **m** denotes max. no. of characters.

DATABASE COMMANDS

1. VIEW EXISTING DATABASE

To view existing database names, the command is: **SHOW DATABASES;**

2. CREATING DATABASE IN MYSQL

For creating the database in MySQL, we write the following command:

**CREATE
DATABASE**
<dbname>; e.g. In
order to create a database
Student, command is:

CREATE DATABASE Student;

3. ACCESSING A DATABASE

For accessing already existing database, we write:

USE<dbname>;

e.g. to access a database named Student, we write command as:

USE Student;

4. DELETING DATABASE

For deleting any existing database, the command is:

DROP DATABASE <dbname>;

e.g. to delete a database, say student, we write command as:

DROP DATABASE Student;

5. VIEWING TABLE IN DATABASE

In order to view tables present in currently accessed database, command is:

SHOW TABLES;

CREATING TABLES IN MYSQL

Syntax of CREATE TABLE command is:

CREATE TABLE <table-name>(<colname> datatype,<colname> datatype,...);

E.g. In order to create table EMPLOYEE given below:

ECODE	ENAME	GENDER	GRADE	GROSS
-------	-------	--------	-------	-------

Create table employee (ecode integer, ename varchar(20), gender
char(1), grade char(2), gross integer);

Inserting Data into Table:

Syntax:

Insert into <tablename> values(<v1>,<v2>,...);

Or

Insert into <tablename>(<column list>) values(<values list>);

Eg: insert into employee values(1001,'Ravi','M','E4',50000);

Or

Insert into employee(ecode,ename) values(1002,'Meena');

The left out columns will be filled with null values.

Select Command:

It helps to display the records as per our requirement.

Different forms of select command:

1. Select * from employee;

It displays all rows and columns from the table.

2. Select ecode, ename from employee;

It displays selected columns from the table.

3. For displaying particular rows.

Syntax: select * from

<tablename> where

<cond>; Eg. Select *

from employee where

gender='M';

4. ELIMINATING REDUNDANT DATA

DISTINCT(GENDER)
M
F

The distinct keyword is used to eliminate duplicate records from the table. Eg.

Select distinct (gender) from employee;

5. USING COLUMN ALIASES

The columns that we select in a query can be given a different name, i.e. column alias name for output purpose.

**Syntax: SELECT <columnname>AS column alias ,<columnname>AS column alias
.....FROM<tablename>;**

Eg. select ecode as "EMP_Code" from employee;

CONDITION BASED ON A RANGE

The **BETWEEN** operator defines a range of values that the column values must fall into make the condition true. The range include both lower value and upper value.

e.g.To display ECODE,ENAME and GRADE of those employees whose salary is between 40000 and 50000,command is:

```
SELECT ECODE , ENAME ,GRADE FROM EMPLOYEE
```

```
WHERE GROSS BETWEEN 40000 AND 50000;
```

NOTE: For displaying records not in the specified range, we have to use **not between** operator.

CONDITION BASED ON A LIST

The **in** operator is used to display records based on a list of values.

Eg. To display details of employees who have scored A,B and C grades. Select * from employee where grade in('A','B','C');

Note: For displaying records that do not match in the list, we have to use **not in** operator.

CONDITION BASED ON PATTERN MATCHES

LIKE operator is used for pattern matching in SQL. Patterns are described using two special wildcard characters: % and _ (underscore)

1. percent(%)- The % character matches any substring.
2. underscore(_)- The _ character matches any single character.

e.g.To display names of employee whose name starts with R in EMPLOYEE table, the command is: select ename from employee where ename like "R%";

e.g. To display details of employee whose second character in name is: select * from employee where ename like '_e%';

SEARCHING FOR NULL

The NULL value in a column can be searched for in a table using IS NULL in the WHERE clause. E.g. to list employee details whose salary contain NULL, we use the command:

```
Select * from employee where gross is null;
```

Note: For listing employees who earn salary, then it is:

```
Select * from employee where gross is not null;
```

Relational Operators

- To compare two values, a relational operator is used. The result of the comparison is true or false. Relational Operators recognized by SQL: =, >, <, <=, >=, <> (not equal or !=)

Eg. Select * from employee where ecode <> 1001;

Above query will not display those employee details whose ecode column value is 1001.

Logical Operators- (OR, AND, NOT)

1. To list the employee details having grades E2 or E3.

Select ecode, ename, grade, gross from employee where (grade='E2' OR grade='E3');

2. To list all the employees' details having grades as 'E4' but with gross < 9000.

Select ecode, ename, grade, gross from employee where grade='E4' and gross< 9000;

3. To list all the employees' details whose grades are other than 'G1'.

Select ecode, ename, grade, gross from employee where (NOT grade= 'G1');

Sorting Results- ORDER BY clause

Results of SQL query can be sorted in a specific order using ORDER BY clause. The ORDER BY clause allows sorting of query results by one or more columns. The sorting can be done either in ascending or descending order.

Eg. Select * from emp order by ename;

Above query arranges the records in alphabetical order of ename value.

By default order by clause arranges in ascending order.

TO DISPLAY RECORDS IN DESCENDING ORDER

- Select * from employee order by ename desc;
Above query gives output in descending order of ename.
- Select * from employee ORDER BY grade DESC, ename ASC;
Above query displays records first in the descending order of grade and within the same grade, employees are displayed in the ascending order of Ename.

SQL AGGREGATE FUNCTIONS:

All the aggregate functions ignore null values except count(*).

Avg – to compute average value Min – to find minimum value Max – to find maximum value Sum – to find total value

Count – to count non-null values in a column

Count(*) – to count total number of rows in a table including null values.

Examples:

Select avg(gross) from employee;

Select min(gross) from employee where deptno= 10;

Select count(*) from emp where gross> 10000; Select count (DISTINCT gender) from employee;

GROUP BY Clause

GROUP BY clause is used in SELECT statements to display the table contents based on similar values in a column into groups.

Eg: To calculate the number of employees in each grade, the query is:

SELECT grade, count(*) from employee group by grade;

Placing conditions on Groups HAVING Clause

- The HAVING clause places conditions on groups in contrast to WHERE clause that places conditions on individual rows.
- WHERE conditions cannot include aggregate functions but HAVING conditions can do so.

Eg: SELECT avg(gross), sum(gross) from employee GROUP BY grade HAVING grade= 'E4' ;

DELETE Command

This command removes rows from a table.

Syntax: DELETE FROM <tablename> [WHERE <cond>];

Eg: To remove all the contents of items table, the query is:

DELETE from items;

Eg: To remove the tuples from employee that have gross less than 20000 is :

DELETE from employee WHERE gross<20000;

UPDATE Command

Update Command allows to change some or all the values in an existing rows. Update command specifies the rows to be changed using the WHERE clause and the new data using the SET keyword.
Eg. UPDATE employee SET gross= 25000;

The above query sets the gross of all records as 25000.

UPDATE employee SET gross=40000, grade='A' WHERE ecode=1001;
The above query changes the gross and grade values for the record with ecode 1001.

ALTER TABLE

ALTER TABLE command is used to change the structure of the existing table. It can be used to add or drop new columns or modify the existing columns of table.

Eg. 1. Alter table Employee Add comm int;

2. ALTER TABLE Emp MODIFY (ename varchar(60));

3. Alter table emp drop comm;

DROP TABLE:

DROP TABLE command allows to remove a table from database. Once the DROP command is issued, the table will no longer be available in the database.

Eg. DROP TABLE employee;

INTEGRITY CONSTRAINTS

A constraint is a condition or check applicable on a field or set of fields. Common types of constraints include:

S.No.	Constraints	Description
1	NOT NULL	Ensures that a column cannot have NULL value
2	DEFAULT	Provides a default value for a column when none is Specified
3	UNIQUE	Ensures that all values in a column are different
4	PRIMARY KEY	Used to uniquely identify a row in the table
5	FOREIGN KEY	Used to ensure referential integrity of the data

ADDING CONSTRAINT TO A TABLE

ALTER TABLE statement can be used to add constraints to your existing table by using it in following manner:

Eg: alter table employee add primary key(ecode);

REMOVING CONSTRAINTS FROM A TABLE

Eg: alter table employee drop primary key;

Setting primary and foreign key constraint:

Eg: CREATE TABLE STUDENT(ROLL_NO integer
PRIMARY KEY ,NAME
VARCHAR(30),CLASS VARCHAR(3));

CREATE TABLE SCORE(ROLL_NO integer ,MARKS integer, FOREIGN
KEY(ROLL_NO) REFERENCES STUDENT(ROLL_NO));

SQL JOINS

SQL Joins are essential to display data from more than one table.
SQL JOIN clause is used to combine rows from two or more tables,
based on a common field between them. SQL provides various types
of joins:

1. Cartesian Product or Cross Join
2. Equi-Join
3. Natural Join.

Cartesian Product (Cross Join)

Cartesian product of two tables is obtained by pairing up each row of
one table with each row of the other table.

- The number of columns in the Cartesian product is the sum
of the number of columns in both the tables.
- The number of rows in the Cartesian product is the product of rows of the
tables.

Example:

Equi-Join

A join which is obtained by putting a condition of equality on cross join is called an
'equi join'.

We can extract meaningful information from the Cartesian product by placing some
conditions in the statement.

The join in which columns are compared for equality is called equi-join.

In this type of join we put * in the select list therefore the common column will appear
twice in the output.

Example: Consider the 2 tables emp and dept.

```
mysql> select*from emp;
+-----+
| eno | name | salary | deptno |
+-----+
| 12 | Ram | 12000 | 10 |
| 14 | Sari | 20000 | 20 |
| 15 | Seema | 25000 | 20 |
| 16 | Suni | 24000 | 30 |
| 18 | Arav | 30000 | 20 |
+-----+
5 rows in set (0.00 sec)

mysql> select*from dept;
+-----+
| deptno | dname |
+-----+
| 10 | Sales |
| 20 | Production |
| 30 | HR |
+-----+
3 rows in set (0.00 sec)
```

On performing equi-join, the result is as follows:

```
mysql> select * from emp,dept where emp.deptno=dept.deptno;
+-----+
| eno | name | salary | deptno | deptno | dname |
+-----+
| 12 | Ram | 12000 | 10 | 10 | Sales |
| 14 | Sari | 20000 | 20 | 20 | Production |
| 15 | Seema | 25000 | 20 | 20 | Production |
| 16 | Suni | 24000 | 30 | 30 | HR |
| 18 | Arav | 30000 | 20 | 20 | Production |
+-----+
5 rows in set (0.16 sec)
```

Note: We see that deptno column appears twice in output.

Natural Join

- The join in which only one of the identical columns exists is called natural join.
- It is similar to equi-join except that duplicate columns are eliminated in natural join that would otherwise appear in equi-join.

Example:

```
mysql> select * from emp natural join dept;
+-----+
| deptno | eno | name | salary | dname |
+-----+
| 10 | 12 | Ram | 12000 | Sales |
| 20 | 14 | Sari | 20000 | Production |
| 20 | 15 | Seema | 25000 | Production |
| 30 | 16 | Suni | 24000 | HR |
| 20 | 18 | Arav | 30000 | Production |
+-----+
5 rows in set (0.00 sec)
```

Note: We see that deptno column appears only once in output.

Multiple Choice Questions (MCQs)

Q1. MySQL database system consists of-

- (a) MySQLServerInstance
- (b) MySQLDatabase
- (c) MySQL Query Optimizer
- (d) (a)&(b)both

Q2. Which commands are used to define or redefine schema objects?

- (a) DDL
- (b) DML
- (c) TCL
- (d) (a)&(b)both

Q3. Data definition includes:

- (a) Creating of database
- (b) Undoing changes to the database.
- (c) Modification of data stored in the database.
- (d) All of the above

Q4. Which is not a TCL command?

- (a) Commit
- (b) Rollback
- (c) Exit
- (d) Savepoint

Q5. Which is not a function of DML?

- (a) Retrieval of data stored in the database
- (b) Insertion of data into the database
- (c) Deletion of data from the database
- (d) Making changes permanent to the database.

Q6. Which is not a numeric type?

- (a) Int
- (b) Float
- (c) Blob
- (d) Double

Q7. The default date format in MySQL is:

- (a) DD/MM/YYYY
- (b) YYYY/MM/DD
- (c) MM-DD-YYYY
- (d) YYYY-MM-DD

Q8. Which is not a way to represent comment in MySQL? (a)/ * */

- (b) --
- (c) #
- (d) //

Q9. The command is used to access database in MySQL is-

- (a) Open <dbname>;
- (b) USE <dbname>;
- (c) Access <dbname>;
- (d) (a)&(b) both

10. Which is a valid CREATE TABLE statement?

- (a) Create table emp add(id integer(3));
- (b) Create table emp(id integers(3));
- (c) Create table emp modified(id integer(3));
- (d) Create table emp(id integer(3));

Q11. How can you insert a new row into the "STORE" table.

- (a) INSERT ROW(1,"RAMSINGH")INTO STORE;
- (b) INSERT VALUES(1,"RAMSINGH")INTO STORE;
- (c) INSERT INTO(1,"RAMSINGH")STORE;
- (d) INSERT INTO STORE VALUES(1,"RAMSINGH");

Q12. Select statement has four clauses 1.Where 2.Having 3.Group By 4.Orderby

The correct order of all clauses in a select is:- (a)1,2,3&4

(b)1,3,2&4

(c)1,4,3&2

(d)1,3,4&2

Q13. Conditionally retrieval of rows from a table with SELECT, which clause is used?

- (a) Where
- (b) Having
- (c) Group By
- (d) Order by

Q14. The key word eliminates duplicate rows from the result of a SELECT statement.

- (a) All
- (b) Unique
- (c) Distinct
- (d) IN

Q15. Which operator defines a range of values that the column values must fall in?

- (a) In
- (b) Like
- (c) Between
- (d) Is

Q16. To specify a list of values.....Operator is used.

- (a) In
- (b) Like
- (c) Between

(d) Is

Q17. We use operator with select for condition based on pattern matching.

- (a) In
- (b) Like
- (c) Between
- (d) Is

Q18. Which SQL statement will not generate any error message?

- (a) SELECT*FROM EMP WHERE EMPNO LIKE(1,2,3,4);
- (b) SELECT*FROM EMP WHERE SAL BETWEEN 3000 TO 15000;
- (c) SELECT*FROM EMP WHERE COMM IS NOT NULL;
- (d) All of the above

Q19.To display the detail of employee having 'e' in their name in descending order of salary.

The correct SQL statement is:

- (a) SELECT*FROM emp WHERE ename LIKE "e%" ORDER BY SAL;
- (b) SELECT*FROM emp ORDER BY SAL DESC WHERE ename LIKE

"%e%";

- (c) SELECT*FROM emp WHERE ename LIKE "%e%" ORDER BY DESC SAL;
- (d) SELECT*FROM emp WHERE ename LIKE "%e%" ORDER BY SAL DESC;

Q20. Which statement is valid?

- (a) ALTER TABLE EMPLOYEE MODIFY(last_name CHAR2(2000));
- (b) ALTER TABLE EMPLOYEE CHANGE(last_name CHAR2(2000));
- (c) ALTERTABLE EMPLOYEE CHANGE(last_name VARCHAR2(2000));
- (d) ALTER TABLE EMPLOYEE MODIFY(last_name VARCHAR2(2000));

Answers

Q.No. Answers

- 1 d
- 2 a
- 3 a
- 4 c
- 5 d
- 6 c
- 7 d
- 8 d
- 9 b
- 10 d
- 11 d
- 12 b
- 13 a
- 14 c
- 15 c

- 16 a
- 17 b
- 18 c
- 19 d
- 20 d

Very Short Answer Questions(VSA)

(1 Mark each)

Q1. Define the terms:

Database Abstraction
Data inconsistency
Conceptual level of database implementation/abstraction
Primary Key
Candidate Key
Relational Algebra
Domain

Answer

Define the terms:

i. Database Abstraction

Ans: Database system provides the users only that much information that is required by them, and hides certain details like, how the data is stored and maintained in database at hardware level. This concept/process is Database abstraction.

ii. Data inconsistency

Ans: When two or more entries about the same data do not agree i.e. when one of them stores the updated information and the other does not, it results in data inconsistency in the database.

iii. Conceptual level of database implementation/abstraction

Ans: It describes what data are actually stored in the database. It also describes the relationships existing among data. At this level the database is described logically in terms of simple data-structures.

iv. Primary Key

Ans : It is a key/attribute or a set of attributes that can uniquely identify tuples within the relation.

v. Candidate Key

Ans : All attributes combinations inside a relation that can serve as primary key are candidate key as they are candidates for being as a primary key or a part of it.

vi. Relational Algebra

Ans : It is the collections of rules and operations on relations(tables). The various operations are selection, projection, Cartesian product, union, set difference and intersection, and joining of relations.

vii. Domain

Ans : it is the pool or collection of data from which the actual values appearing in a given column are drawn.

Q2. Answer the following questions :

- i. Differentiate between DDL and DML?
- ii. What is a constraint?
- iii. What are single row functions ?
- iv. Compare CHAR and VARCHAR data types.
- v. What are the differences between DELETE and DROP commands of SQL?
- vi. What do you understand by MySQL Client?
- vii. Differentiate between WHERE and HAVING clause.
- viii. A table "Animals" in a database has 3 columns and 10 records. What is the degree and cardinality of this table?
- ix. What is the difference between commit and rollback command.
- x. Which keyword is used to remove redundant data from a relation.

Answers:

- i. **Data Definition Language (DDL): This is a category of SQL commands. All the commands** which are used to create, destroy, or restructure databases and tables come under this category. Examples of DDL commands are - CREATE, DROP, ALTER. **Data Manipulation Language (DML): This is a category of SQL commands. All the commands** which are used to manipulate data within tables come under this category. Examples of DML commands are - INSERT, UPDATE, DELETE.
- ii. A constraints is a condition or check application on a field or set of fields.
Example: NOT NULL (ensure that column can not have null value), CHECK (make sure that all value satisfy certain criteria), UNIQUE (ensure that all values in a column are different) etc.
- iii. Single Row Function work with a single row at a time. A single row function returns a result for every row of a quired table
Examples of Single row functions are Sqrt(), Concat(), Lcase(), Upper(), Day(), etc.
- iv. The CHAR data-type stores fixed length strings such that strings having length smaller than the field size are padded on the right with spaces before being stored. The VARCHAR on the other hand supports variable length strings and therefore stores strings smaller than the field size without modification.
- iv. DELETE is DML command while DROP is a DDL command. Delete is used to delete rows from a table while DROP is used to remove the entire table from the database.
- iv. MySQL Clients are programs that connect to MySQL Server and issue queries in predefined format.

- iv. WHERE clause is used to select particular rows that satisfy the condition where having clause is used in connection with the aggregate function GROUP BY clause. FOR EXAMPLE-
- select * from student where marks >80;
Select * from student group by stream having marks>90;
- viii. Degree 3 and Cardinality=10
- viii. COMMIT command permanently saves the changes made during the transaction execution. ROLLBACK command undoes the changes made during transaction execution.
- viii. DISTINCT

Short Answer Questions

(2 Marks Each)

Q1. Categorize the following SQL commands into DDL and DML :

CREATE, UPDATE, INSERT, DROP

Ans. DDL Commands : CREATE, DROP

DML Commands : INSERT, UPDATE

Q2. A SQL table ITEMS contains the following columns:

INO, INAME, QUANTITY, PRICE, DISCOUNT

Write the SQL command to remove the column DISCOUNT from the table.

Ans. ALTER TABLE ITEMS DROP COLUMN DISCOUNT; OR

ALTER TABLE ITEMS DROP DISCOUNT;

Q3. Differentiate between Candidate Key and Primary Key in the context of Relational Database Model.

Ans. A table may have more than one or a combination of attribute(s) that identifies a tuple uniquely. All such attribute(s) are known as Candidate Keys.

Out of all the Candidate keys, the most appropriate one, which is used for unique identification of the Tuples, is called the Primary Key.

Q4. In the table Loan below

- Identify the candidate key(s) from the table Loan.
- Which field will be considered as the foreign key if the tables Customers and Loan are related in a database?

Table Loan

LoanID	LoanDate	ID	EMI	Years
1101	2021-03-01	5	20000	4
1102	2021-02-06	3	10000	2
1103	2021-04-12	4	10000	3
1104	2021-05-15	5	5000	3

Table Customers:

ID	Name	Age	City	Salary
1	Kashika	37	Jammu	80000.00
2	Anupriya	35	Shimla	75000.00
3	Vijayan	36	Hyderabad	65000.00
4	Krishnan	35	Chennai	55000.00
5	Harsh	37	Gandhinagar	85000.00
6	Raisa	32	Mumbai	45000.00

Q5. Sreenath created the following table STUDENT in his database.

Table : STUDENT

Rollno	Name	CLASS	Mark
1	Ritika	12	40
2	Angad	12	35
3	Kaveri	11	42
4	Lalitha	12	21
5	Daniel	11	44
6	Rabindra	11	39
7	Rabia	11	28

He wants to now count number of students in each CLASS where the number of students is more than 3. He has executed the following query.

```
SELECT MAX(MARKS) FROM STUDENT WHERE COUNT(*)>3 GROUP BY CLASS;
```

But, he got an error. Identify the error and rewrite the query.

Ans. To filter more condition with group by clause HAVING clause is used in place of WHERE clause. Correct query is

```
SELECT MAX(MARKS) FROM STUDENT  
GROUP BY CLASS HAVING COUNT(*)>3;
```

Q6. Write the names of SQL functions to perform the following operations i) Convert email-id to lowercase.

ii) Count the number of characters in your name.

Ans. i) Select lower(email);

ii) Select length(name);

Q7. Mr. Roger is using a table LIBRARY. It has the following columns:

BCode, BName, Price, author. He wants to display maximum price Author wise.

He wrote the following command:

```
SELECT Author, Max(Price) FROM LIBRARY;
```

But he did not get desired result. Rewrite the above query with necessary change to help him get the desired output and explain the reason.

Ans.

```
SELECT Author, Max(Price) FROM LIBRARY GROUP BY AUTHOR;
```

Group By clause is used to group the rows together that contain the same values in a specified column. so to display maximum price of each author, the table must be grouped author wise using group by clause.

Q8. Differentiate ORDER BY and GROUP BY with an example.

Ans. Order By : Order by keyword sort the result-set either in ascending or in descending order. This clause sorts the result-set in ascending order by default. In order to sort the result-set in descending order DESC keyword is used.

Order By Syntax –

```
SELECT column_1, column_2, column_3.....
```

```
FROM Table_Name
```

```
ORDER BY column_1, column_2, column_3 ASC|DESC;
```

Group By : Group by statement is used to group the rows that have the same value. It is often used with aggregate functions for example:AVG(), MAX(), COUNT(), MIN() etc. One thing to remember about the group by clause is that the tuples are grouped based on the similarity between the attribute values of tuples.

Group By Syntax –

```
SELECT function_Name(column_1), column_2
```

```
FROM Table_Name
```

```
WHERE condition
```

```
GROUP BY column_1, column_2 ORDER BY column_1, column_2;
```

Long Answer Questions

(6 Marks)

Q1. Consider the following tables GAMES and PLAYER. Write SQL commands for the statements to (iv) and give outputs for SQL queries (v) to (viii).

Table:GAMES

GCode	GameName	Number	PrizeMoney	ScheduleDate
101	Carom Board	2	5000	23-Jan-2004
102	Badminton	2	12000	12-Dec-2003
103	Table Tennis	4	8000	14-Feb-2004
105	Chess	2	9000	01-Jan-2004
108	Lawn Tennis	4	25000	19-Mar-2004

Table: PLAYER

PCode	Name	Gcode
1	Nabi Ahmad	101
2	Ravi Sahai	108
3	Jatin	101
4	Nazneen	103

- i. To display the name of all Games with their Gcodes.
- ii. To display details of those games which are having PrizeMoney more than 7000.
- iii. To display the content of the GAMES table in ascending order of ScheduleDate.
- iv. To display sum of PrizeMoney for each of the Number of participation groupings (as shown in column Number 2 or 4)
- v. SELECT COUNT(DISTINCT Number) FROM GAMES;
- vi. SELECT MAX(ScheduleDate),MIN(ScheduleDate) FROM GAMES;
- vii. SELECT SUM(PrizeMoney) FROM GAMES;
- viii. SELECT DISTINCT Gcode FROM PLAYER;

Answer

- (i) SELECT GameName,Gcode FROM GAMES;
- ii. SELECT * FROM GAMES WHERE PrizeMoney>7000;
- ii. SELECT * FROM GAMES ORDER BY ScheduleDate;
- ii. SELECT SUM(PrizeMoney),Number FROM GAMES GROUP BY Number;
- ii. 2
- ii. 19-Mar-2004 12-Dec-2003
- ii. 59000
- ii. 101
- 103
- 108

Q2. Consider the following tables FACULTY and COURSES. Write SQL commands for the statements (i) to (iv) and give outputs for SQL queries (v) to (vi).

FACULTY

F_ID	Fname	Lname	Hire_date	Salary
102	Amit	Mishra	12-10-1998	12000
103	Nitin	Vyas	24-12-1994	8000
104	Rakshit	Soni	18-5-2001	14000
105	Rashmi	Malhotra	11-9-2004	11000
106	Sulekha	Srivastava	5-6-2006	10000

COURSES

C_ID	F_ID	Cname	Fees
C21	102	Grid Computing	40000
C22	106	System Design	16000
C23	104	Computer Security	8000
C24	106	Human Biology	15000
C25	102	Computer Network	20000
C26	105	Visual Basic	6000

- i. To display details of those Faculties whose salary is greater than 12000.
- ii. To display the details of courses whose fees is in the range of 15000 to 50000 (both values included).
- iii. To increase the fees of all courses by 500 of "System Design" Course.
- iv. To display details of those courses which are taught by 'Sulekha' in descending order of courses?
- v. Select COUNT(DISTINCT F_ID) from COURSES;
- vi. Select Fname,Cname from FACULTY,COURSE where COURSE.F_ID=FACULTY.F.ID;

Answer

- i. Select * from faculty where salary > 12000;
- ii. Select * from Courses.where fees between 15000 and 50000;
- iii. Update courses set fees = fees + 500 where Cname = "System Design";
- iv. Select * from faculty fac,courses cour where fac.f_id = cour.f_id and fac.fname = 'Sulekha' order by cname desc;
- v. 4
- vi.

Amit	Grid Computing
Rakshit	Computer Security
Rashmi	Visual Basic
Sulekha	Human Biology

Q-3 Write SQL Command for (a) to (e) and output of (f)

TABLE : GRADUATE

S.NO	NAME	STIPEND	SUBJECT	AVERAGE	DIV
1	KARAN	400	PHYSICS	68	I
2	DIWAKAR	450	COMP Sc	68	I
3	DIVYA	300	CHEMISTRY	62	I
4	REKHA	350	PHYSICS	63	I
5	ARJUN	500	MATHS	70	I
6	SABINA	400	CHEMISTRY	55	II
7	JOHN	250	PHYSICS	64	I
8	ROBERT	450	MATHS	68	I
9	RUBINA	500	COMP Sc	62	I
10	VIKAS	400	MATHS	57	II

- List the names of those students who have obtained DIV I sorted by NAME.
- Display a report, listing NAME, STIPEND, SUBJECT and amount of stipend received in a year assuming that the STIPEND is paid every month.
- To count the number of students who are either PHYSICS or COMPUTER SC graduates.
- To insert a new row in the GRADUATE table: 11,"KAJOL", 300, "computer sc", 75, 1
- Add a new column GRADE of character type.
- Give the output of following sql statement based on table GRADUATE:
 - Select MIN(AVERAGE) from GRADUATE where SUBJECT="PHYSICS";
 - Select SUM(STIPEND) from GRADUATE WHERE div=2;
 - Select AVG(STIPEND) from GRADUATE where AVERAGE>=65;
 - Select COUNT(distinct SUBJECT) from GRADUATE;

Answer

- SELECT NAME from GRADUATE where DIV = 'I' order by NAME;
- SELECT NAME,STIPEND,SUBJECT, STIPEND*12 from GRADUATE;
- SELECT SUBJECT,COUNT(*) from GRADUATE group by SUBJECT having SUBJECT='PHYISCS' or SUBJECT='COMPUTER SC';
- INSERT INTO GRADUATE values(11,'KAJOL',300,'COMPUTER SC',75,1);
- ALTER TABLE GRADUATE ADD(GRADE CHAR(2));
- 63
 - 800
 - 475
 - 4

Q-4 Consider the following tables Sender and Recipient. Write SQL commands for the statements (i) to (iv) and give the outputs for SQL queries (v) to (viii).

Table: Sender

SenderID	SenderName	SenderAddress	Sendercity
ND01	R Jain	2, ABC Appls	New Delhi
MU02	H Sinha	12 Newtown	Mumbai
MU15	S Jha	27/A, Park Street	Mumbai
ND50	T Prasad	122-K,SDA	New Delhi

Table: Receiptant

RecID	SenderID	RecName	RecAddress	recCity
KO05	ND01	R Bajpayee	5, Central Avenue	Kolkata
ND08	MU02	S Mahajan	116, A-Vihar	New Delhi
MU19	ND01	H Singh	2A, Andheri East	Mumbai
MU32	MU15	P K Swamy	B5, C S Terminals	Mumbai
ND48	ND50	S Tripathi	13, BI D Mayur Vihar	New delhi

- To display the names of all Senders from Mumbai
- To display the RecID, Sendername, SenderAddress, RecName, RecAddress for every Recipient
- To display Recipient details in ascending order of RecName
- To display number of Recipients from each city
- SELECT DISTINCT SenderCity from Sender;
- SELECT A.SenderName, B.RecName From Sender A, Recipient BWhere A.SenderID = B.SenderID AND B.RecCity ='Mumbai';
- SELECT RecName, RecAddress From Recipient Where RecCity NOT IN ('Mumbai', 'Kolkata');
- SELECT RecID, RecName FROM Recipient Where SenderID='MU02' or SenderID='ND50';

Answer

- SELECT sendername from Sender where sendercity='Mumbai';
- Select R.RecID, S.Sendername, S.SenderAddress, R.RecName, R.RecAddress from Sender S, Receipient R where S.SenderID=R.SenderID ;
- SELECT * from Recipient ORDER By RecName;
- SELECT COUNT(*) from Recipient Group By RecCity;

Ans. e)

SenderCity
Mumbai
New Delhi

- f) A.SenderName B.RecName
 R Jain H Singh
 S Jha P K Swamy
- g) RecName RecAddress
 S Mahajan 116, A Vihar
 S Tripathi 13, BID, Mayur Vihar
- h) RecID RecName
 ND08 S Mahajan
 ND48 STripathi

Q5. Write SQL queries for (i) to (iv) and find outputs for SQL queries (v) to (viii), which are based on the tables.

Table : VEHICLE

CODE	VTYPE	PERKM
101	VOLVO BUS	160
102	AC DELUXE BUS	150
103	ORDINARY BUS	90
105	SUV	40
104	CAR	20

Note : PERKM is Freight Charges per kilometer , VTYPE is Vehicle Type

Table : TRAVEL

NO	NAME	TDATE	KM	CODE	NOP
101	Janish Kin	2015-11-13	200	101	32
103	Vedika Sahai	2016-04-21	100	103	45
105	Tarun Ram	2016-03-23	350	102	42
102	John Fen	2016-02-13	90	102	40
107	Ahmed Khan	2015-01-10	75	104	2
104	Raveena	2016-05-28	80	105	4

- NO is Traveller Number
- KM is Kilometer travelled
- NOP is number of travellers travelled in vehicle
- TDATE is Travel Date

- To display NO, NAME, TDATE from the table TRAVEL in descending order of NO.
- To display the NAME of all the travellers from the table TRAVEL who are travelling by vehicle with code 101 or 102.
- To display the NO and NAME of those travellers from the table TRAVEL who travelled between '2015-12-31' and '2015-04-01'.
- To display all the details from table TRAVEL for the travellers, who have travelled distance more than 100 KM in ascending order of NOP.
- Modify the definition of column VTYPE.Increase its size to 20.

- vi. SELECT COUNT (*), CODE FROM TRAVEL GROUP BY CODE HAVING COUNT(*)>1;
- vii. SELECT DISTINCT CODE FROM TRAVEL;
- viii. SELECT A.CODE,NAME,VTTYPE FROM TRAVEL A,VEHICLE B WHERE A.CODE=B.CODE
AND KM<90;

Answer-

- (i) SELECT NO, NAME, TDATE FROM TRAVEL ORDER BY NO DESC;
- (ii) SELECT NAME FROM TRAVEL WHERE CODE='101' OR CODE='102';
OR
SELECT NAME FROM TRAVEL WHERE CODE IN (101,102);
- (iii) SELECT NO, NAME from TRAVEL
WHERE TDATE >= '20150401' AND TDATE <= '20151231';
OR
SELECT NO, NAME from TRAVEL WHERE TDATE BETWEEN '20150401' AND
'20151231';
- (iv) SELECT * FROM TRAVEL WHERE KM > 100 ORDER BY NOP;
- (v) ALTER TABLE VEHICLE MODIFY VTTYPE VARCHAR(20);

(vi)	COUNT(*)	CODE
	2	101
	2	102

(vii) DISTINCT CODE

101
102
103
104
105

(viii)	CODE	NAME	VTTYPE
	104	Ahmed Khan R	CA
	105	Raveena	SUV

INTERFACE PYTHON WITH SQL DATABASE

Contents: Connecting SQL with Python

Creating database connectivity applications

Performing insert, delete, update, delete queries

Display data by using fetchone(), fetchall(), fetchmany (), rowcount()

Database connectivity:

Database connectivity refers to connection and communication between an application and a database system. The term "front-end" refers to the user interface, while "back-end" means the server, application and database that work behind the scenes to deliver information to the user.

MySQL.connector : Library or package to connect from python to MySQL

Before we connect the program with MySQL we need to install connectivity package named mysql-connector- python

- Command to install connectivity package:- pip install mysql-connector-python
- Command to import connector:- import mysql.connector
- Steps for python MySQL connectivity
 1. Install Python
 2. Install MySQL
 3. Open Command prompt
 4. Switch on internet connection
 5. Type pip install mysql-connector-python and execute
 6. Open python IDLE
 7. import mysql.connector

Steps for creating database connectivity applications:

1 Start Python -start python editor to create our own python script.

2 import mysql.connector package

Use the following statement for this.

```
import mysql.connector or
```

```
import mysql.connector as con
```

3. Establishing a connection to Mysql DATABASE.

We need to establish a connection to a mysql database using connect() function of mysql.connector package.

The connect statement creates a connection to the mysql server and returns a MySQL connection object.

Syntax:

```
<connection object>=mysql.connector.connect(host=<hostname>,  
user=<username> , passwd:<password>, database=<dbname>)
```

For eg:

```
import mysql.connector
```

```
con=mysql.connector.connect(host='localhost', user='root', passwd='kvs@123',  
database='school')
```

4. Creating a cursor Object

It is a useful control structure of database connectivity. It will let us execute all the queries we need. Cursor stores all the data as a temporary container of returned data and allows traversal so that we can fetch data one row at a time from cursor. Cursors are created by the `connection.cursor()` method.

Syntax:

```
<cursor object>=<connection object>.cursor()
```

Eg :

```
cursor=con.cursor()
```

5. Execute SQL query:

We can execute SQL query using `execute()` function.

Syntax:

```
<cursor object>.execute(SQL QUERY)
```

Eg: `cursor.execute("select *from data")`

The above code will execute the sql query and store the retrieved records (resultset) in the cursor object(cursor).

Result set refers to a logical set of records that are fetched from the database by executing an sql query and made available in the program.

6. Extract data from Result set:

The records retrieved from the database using SQL select query has to be extracted as record from the result set. We can extract data from the result set using the following fetch () function.

Fetchall()

Fetchone()

Fetchmany()

Multiple ways to retrieve data:

- Fetchall()- Fetches all (remaining) rows of a query result, returning them as a sequence of sequences (e.g. a list of tuples).
- Fetchone()-Fetches the next row of a query result set, returning a single sequence or None when no more data is available
- fetchmany (size)-Fetches the next set of rows of a query result, returning a sequence of sequences. It will return number of rows that matches to the size argument.

Functions to execute SQL queries

TO CREATE DATABASE SCHOOL USING PYTHON INTERFACE

```
import mysql.connector

mydb=mysql.connector.connect(host='localhost', user='root',
passwd='kvs@123', database='school')
mycursor=mydb.cursor()
```



```
mycursor.execute("CREATE DATABASE SCHOOL")
```

SHOW DATABASE

```
import mysql.connector

mydb=mysql.connector.connect(host='localhost', user='root',
passwd='kvs@123',    database='school')
mycursor=mydb.cursor()

mycursor.execute("SHOW DATABASES")

for x in mycursor:

    print (x)
```

TO CREATE A TABLE IN MYSQL USING PYTHON INTERFACE

```
import mysql.connector

mydb=mysql.connector.connect(host='localhost', user='root',
passwd='kvs@123',    database='school')

mycursor=mydb.cursor()

mycursor.execute("CREATETABLE FEES (ROLLNO INT,NAME VARCHAR(20),AMOUNT
INT);")
```

TO SHOW THE TABLES IN MYSQL USING PYTHON INTERFACE

```
import mysql.connector

mydb=mysql.connector.connect(host='localhost', user='root',
passwd='kvs@123',    database='school')
mycursor=mydb.cursor()
mycursor.execute("SHOWTABLES")
for x in mycursor:
    print(x)
```

TO DESCRIBE TABLE STRUCTURE USING PYTHON INTERFACE

```

mydb=mysql.connector.connect(host='localhost', user='root',
passwd='kvs@123',    database='school')
mycursor=mydb.cursor()

mycursor.execute("DESC STUDENT")

for x in mycursor:

    print(x)

```

TO EXECUTE SELECT QUERY USING A PYTHON INTERFACE

```

import mysql.connector
mydb=mysql.connector.connect(host='localhost', user='root',
passwd='kvs@123',    database='school')
c=conn.cursor()
c.execute("select * from student")
r=c.fetchone()
while r is not None:
    print(r)
    r=c.fetchone()

```

TO EXECUTE SELECT QUERYWITH WHERE CLAUSE USING A PYTHON INTERFACE

```

import mysql.connector
mydb=mysql.connector.connect(host='localhost', user='root',
passwd='kvs@123',    database='school')

if conn.is_connected()==False:
    print('Error connecting to MYSQL DATABASE")
c=conn.cursor()
c.execute("select * from student where marks>90")
r=c.fetchall()
count=c.rowcount
print("total no of rows:" count)
for row in r:
    print(row)

```

TO INSERTA RECORD (ROLLNO,NAME,AND MARKS) IN MYSQL TABLE student USING PYTHON INTERFACE

```

import mysql.connector
mydb=mysql.connector.connect(host='localhost', user='root',

```



```
passwd='kvs@123',    database='school')

mycursor=mydb.cursor()

r=int(input("enter the rollno"))
n=input("enter name")
m=int(input("enter marks"))
mycursor.execute("INSERT INTO student(rollno, name, marks)
VALUES({'}',{}).format)")
mydb.commit()
print(mycursor.rowcount/"RECORD INSERTED")
```

TO UPDATE A DATA IN ATABLE USING PYTHON INTERFACE

```
import mysql.connector
mydb=mysql.connector.connect(host='localhost', user='root',

passwd='kvs@123',    database='school')

mycursor=mydb.cursor()
mycursor.execute('UPDATE STUDENT SET MARKS=100 WHERE MARKS=40')
mydb.commit()
print(mycursor.rowcount/"RECORD UPDATED")
```

TO DELETE A RECORD FROMTHETABLE USING PYTHON INTERFACE

```
import mysql.connector
mydb=mysql.connector.connect(host='localhost', user='root',
passwd='kvs@123',    database='school')
mycursor=mydb.cursor()
mycursor.execute("DELETE FROM STUDENTWHERE MARKS<50")
mydb.commit()
print(mycursor.rowcount/"RECORD DELETED")
```

TO DROP AN ENTIRE TABLE FROM MYSQL DATABASE USING PYTHON INTERFACE

```
import mysql.connector
mydb=mysql.connector.connect(host='localhost', user='root',
passwd='kvs@123',    database='school')
mycursor=mydb.cursor()
mycursor.execute("DROPTABLE STUDENT")
```

TO ADD A COLUMN IN THE EXISTING TABLE USING PYTHON INTERFACE

```
import mysql.connector
mydb=mysql.connector.connect(host='localhost', user='root',
passwd='kvs@123',    database='school')
```

```
mycursor=mydb.cursor()
mycursor.execute("ALTER TABLE STUDENT ADD AGE INT")
mydb.commit()
```

TO DROP A COLUMN FROM THE TABLE USING PYTHON INTERFACE

```
import mysql.connector
mydb=mysql.connector.connect(host='localhost', user='root',
passwd='kvs@123', database='school')
mycursor=mydb.cursor()
mycursor.execute("ALTER TABLE DROP AGE")
mydb.commit()
```

TO ALTER THE DATATYPE OF A COLUMN IN A TABLE USING PYTHON INTERFACE

```
import mysql.connector
mydb=mysql.connector.connect(host='localhost', user='root',
passwd='kvs@123', database='school')
mycursor=mydb.cursor()
mycursor.execute("ALTER TABLE STUDENT MODIFY GRADE CHAR(3)")
```

- `commit()`: After executing insert or update query we must commit our transaction using commit method of connection object.
Eg: `mycon.commit()`
- `rollback()`: `mysqlConnection.rollback()` reverts the changes made by the current transaction.
- `Rowcount()`: This attribute returns the number of rows that were affected by an `execute()`

PARAMETERIZED QUERIES

Sometimes we need to access values as per the user's input. The query result is based on the values user has passed. So for that we have this option parameterized queries. There are two ways to use parameterized queries:

1. with % formatting pattern
2. with {}.format pattern

with % formatting pattern

This pattern takes the general form – `f % v`, where `f` is a format and `v` is the value. Consider the following code:

```
import mysql.connector as mysql
import time
mydb=mysql.connect(host='localhost',user='root',passwd='MySQL@123',database='School')

cur=mydb.cursor()
```

```
#display records more than 80%
cur.execute("select * from students where marks >%s" %(80,))

d=cur.fetchall()
for r in d :
    print(r)
```

#display records having B1 grade

```
cur.execute("select * from students where
grade='%s'" %('B1',)) d=cur.fetchall()
for r in d :
    print(r)
```

with {}.format pattern

In this pattern you can write {} where the value is placed followed by .format(values). Consider the following code:

```
import mysql.connector as mysql

import time

mydb=mysql.connect(host='localhost', user='root', passwd='kvs@123',database='School')

cur=mydb.cursor()
cur.execute("select * from students where marks >{}" .format(80))

d=cur.fetchall()
for r in d :
    print(r)

cur.execute("select * from students where grade={}"" .format('B1'))

d=cur.fetchall()
for r in d :
    print(r)
```

Close the connection

Since the database can keep limited number of connections at a time, we must close the connection using

```
cursorobject.close()
Eg: mycursor.close()
```

```
con.close()
```

Multiple Choice Questions

1. Which command is used for counting the number of rows in a database?
a. row (b) rowcount (c) count() (d) row_count
2. A database __ controls the connection to an actual database, established from within a Python program.
(a) database object (b) connection object (c) fetch object (d) query object
- 3 The set of records retrieved after executing an SQL query over an established database connection is called __.
(a) table (b) sqlresult (c) result (d) resultset
4. A database __ is a special control structure that facilitates the row by row processing of records in the resultset.
(a) fetch (b) table (c) cursor (d) query
5. To obtain all the records retrieved, you may use the <cursor>. __ method.
(a) fetchmany() (b) fetchall() (c) fetchone() (d) fetchmultiple
6. To reflect the changes made in the database permanently, you need to run <connection>. _____ method.
(a) done (b) reflect (c) commit (d) final
7. To run an SQL query within Python, you may use the <cursor>. __ method.
(a) query (b) execute (c) run (d) None of the above
8. Which command is used for cleaning up of environment?
(a) my.closed() (b) is.end() (c) con.quit() (d) mycon.close()
9. Name the host name used for signing in the database.
(a) localhost (b) localpost (c) localcost (d) None of the above
10. Identify the correct statement to create cursor:
Import mysql.connector as msq
con=msq.connect()
#connection string
mycursor=.....
(a) con.cursor() (b) con.create_cursor() (c) con.open_cursor() (d) con.get_cursor()

ASSERTIONS AND REASONS

In the following questions, a statement of ASSERTION (A) is followed by statement of REASON(R) based questions. Mark the correct choice as

- (a) Both A and R are true and R is the correct explanation for A
- (b) Both A and R are true and R is not the correct explanation for A
- (c) A is True but R is False
- (d) A is false but R is true

11. Assertion. A database connection object controls the connection to a database.

Reason. A connection object represents a unique session with a database, connected from within a program.

12. Assertion. A database cursor receives all the records retrieved as per the query.

Reason. A resultset refers to the records in the database cursor and allows processing of individual records in it.

13. Assertion. The database cursor and resultset have the same data yet they are different.

Reason. The database cursor is a control structure and the resultset is a logical set of records.

14. Assertion. One by one the records can be fetched from database directly through the database connection.

15. Assertion: The cursor rowcount returns how many rows have been retrieved so far through fetch...() methods.

Reasons: The number of rows in a resultset and rowcount are always equal.

ANSWER

Q.NO.	ANS	Q.NO.	ANS	Q.NO.	ANS
1	B	6	c	11	a
2	B	7	b	12	a
3	D	8	d	13	a
4	C	9	a	14	d
5	B	10	a	15	c

Short Answer Questions

1. What is the significance of using connect()?
2. What are the steps for creating database connectivity applications?
3. What is a resultset?

4. What is a database cursor?
5. How to retrieve data from a table?
6. What is Python's database interface known as?
7. What is the difference in fetchall() and fetchone()?

Short Answer:

Ans 1. connect () function is used to connect or establish a connection with MYSQL database using Python script.

Ans 2. To create database connectivity, follow the given steps:

Step 1: Start Python

Step 2: Import mysql.connector

Step 3: Open a connection to the database

Step 4: Create a cursor instance

Step 5: Execute a query

Step 6: Extract data from result set

Step 7: Clean up the environment

Ans 3. A result set refers to a logical set of records that are fetched from the database by executing a query and made available to the application program.

Ans 4. A database cursor is a special control structure that facilitates row by row processing of records in the result set, i.e., the set of records retrieved as per the query.

Ans 5. There are multiple ways to retrieve data:

- i. fetchall() – fetches all the remaining rows of a query result, current pointer position forwards
- ii. fetchone() – fetches the next row as a sequence; returns None when no more data

Ans 6. DB-API is the standard for python's database interface. Database Application Programming interface is a set of tools used by an Application program to communicate with the Operating System or other programs such as Database Management System.

Ans 7. fetchall() function is used to fetch all the records from the cursor in the form of tuple. fetchone() is used to fetch one record at a time. Subsequent fetchone() will fetch next records. If no more records to fetch, it returns None.

Long Answer Questions

1. How to create a database in MySQL through Python?
2. Write code to connect to MYSQL database namely School and then fetch all those records from table Student where grade is 'A'.
3. How to create a table in MySQL through Python?
4. The code given below inserts the following record in the table Student:

RollNo	Name	Clas	Marks
Integer	String	Integer	Integer

Note the following to establish connectivity between Python and MySQL:

- Username is root
- Password is toor@123
- The table exists in a “stud” database.
- The details (RollNo, Name, Clas and Marks) are to be accepted from the user. Write the following missing statements to complete the code:

Statement 1 – to form the cursor object

Statement 2 – to execute the command that inserts the record in the table Student.

Statement 3 - to add the record permanently in the database

import mysql.connector as mysql

```
def sqlData():
    con1=mysql.connect(host="localhost", user="root", password="toor@123",
        database="stud") mycursor = #Statement 1
    rno=int(input("Enter Roll Number :: "))
    name=input("Enter name :: ")
    clas=int(input("Enter class :: "))
    marks=int(input("Enter Marks :: "))
    query="insert into student values({},'{}',{},{})".format(rno, name, clas, marks)
```

#Statement 2

Statement 3

```
print("Data Added successfully")
```

5. Sumitra wants to write a program to connect to MySQL database using python and increase the age of all the students who are studying in class 11 by 2 years.

Since she had little understanding of the coding, she left a few blank spaces in her code. Now help her to complete the code by suggesting correct coding for statements 1, 2 and 3.

```
import _____ as myc # Statement 1
```

```
con = myc.connect(host="localhost", user="root", passwd="", database="mydb")
mycursor = #Statement 2
```

```
sql = "UPDATE student SET age=age+2 WHERE class='XI'" mycursor.execute(sql)
```

```
sql = "SELECT * FROM student" mycursor=con.execute(sql)
```

```
result = #Statement 3
```

```
for row in result:
```

```
print(row)
```

Statement 1 : The required module to be imported

Statement 2: To initialize the cursor object.

Statement 3: To read all the rows from the cursor object

6. The code given below adds a new column in the table Student, updates the data into it and displays the content of the table.

Student table details are as follows: Rollno – integer

Name – string Age –
integer

Note the following to establish connectivity between Python and MYSQL:

- Username is root
- Password is sys
- The table exists in a MYSQL database named school.

Write the following missing statements to complete the code: Statement 1 – to form the cursor object

Statement 2 – to execute a query that adds a column named “MARKS” of type integer in the table Student.

Statement 3- to update the record permanently in the database

```
import mysql.connector
mydb=mysql.connector.connect(host="localhost", user="root", passwd="sys",
database="myschool")

mycursor = #statement1
#statement2
mycursor.execute("update student set MARKS=9 where Rollno = 1")
#statement3

mycursor.execute("select * from student") for x in
mycursor:
    print(x)
```

Long Answer

Ans 1. import mysql.connector

```
mycon=mysql.connector.connect(host="localhost",user="root",passwd="python")
cursor=mycon.cursor( )
cursor.execute("create database education")
```

Ans 2. import mysql.connector as a

```
mycon=a.connect(host="localhost",user="root",passwd=" ", database="School")
cursor=mycon.cursor( )
run = "select *from Student where grade = 'A' "
```

```
cursor.execute(run)
data = cursor.fetchall()
for i in data :
    print(i)
mycon.close()
```

Ans 3. import mysql.connector

```
mycon=mysql.connector.connect(host="localhost",user="root",passwd="
python")
```

```
cursor=mycon.cursor()
cursor.execute("create table student(admn_no int primary key, sname
varchar(35),gender char(2),DOB date, stream varchar(20), marks float")
```

Ans 4. Statement 1: con1.cursor()

Statement 2: mycursor.execute(quarry)

Statement 3: con1.commit()

Ans 5.

Statement 1: mysql.connector

Statement 2: con.cursor()

Statement 3: mycursor.fetchall()

Ans 6. Statement 1 : mydb.cursor()

Statement 2: mycursor.execute("alter table student add column MARKS int")

Statement 3:
mydb.commit()

LINK OF CBSE QUESTION BANK AND SAMPLE PAPERS

1	QUESTION BANK	https://cbseacademic.nic.in/web_material/QuestionBank/ClassXII/ComputerScienceXII.pdf
2	2021-22 TERM1 QP	https://cbseacademic.nic.in/web_material/SQP/ClassXII_2021_22/ComputerScience-SQP.pdf
3	2021-22 TERM1 MS	https://cbseacademic.nic.in/web_material/SQP/ClassXII_2021_22/ComputerScience-MS.pdf
4	2021-22 TERM2 QP	https://cbseacademic.nic.in/web_material/SQP/ClassXII_2021_22/ComputerScience-SQP_Term2.pdf
5	2021-22 TERM2 MS	https://cbseacademic.nic.in/web_material/SQP/ClassXII_2021_22/ComputerScience-MS_Term2.pdf
6	2022-23 QP	https://cbseacademic.nic.in/web_material/SQP/ClassXII_2022_23/ComputerScience-SQP.pdf
7	2022-23 MS	https://cbseacademic.nic.in/web_material/SQP/ClassXII_2022_23/ComputerScience-MS.pdf
8	2023-24 QP	https://cbseacademic.nic.in/web_material/SQP/ClassXII_2023_24/ComputerScience-SQP.pdf
9	2023-24 MS	https://cbseacademic.nic.in/web_material/SQP/ClassXII_2023_24/ComputerScience-MS.pdf
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11	2024-25 MS	https://cbseacademic.nic.in/web_material/SQP/ClassXII_2024_25/ComputerScience-MS.pdf
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