KENDRIYA VIDYALAYA SANGATHAN

JABALPUR REGION

तत् त्वं पूषन् अपावृणु
केन्द्रीय विद्यालय संगठन

STUDY MATERIAL

CLASS XII

INFORMATICS PRACTICES (065)

SESSION: 2023-24

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Informatics Practices

CLASS XII

Code No. 065

2023-2024

1. **Prerequisite:** Informatics Practices – Class XI

2. **Learning Outcomes**

   At the end of this course, students will be able to:

   ● Create Series, Data frames and apply various operations.

   ● Visualize data using relevant graphs.

   ● Design SQL queries using aggregate functions.

   ● Import/Export data between SQL database and Pandas.

   ● Learn terminology related to networking and internet.

   ● Identify internet security issues and configure browser settings.

   ● Understand the impact of technology on society including gender and disability issues.

3. **Distribution of Marks and Periods**

Unit No	Unit Name	Marks	Periods Theory	Periods Practical	Total Period
1	Data Handling using Pandas and Data Visualization	25	25	25	50
2	Database Query using SQL	25	20	17	37
3	Introduction to Computer Networks	10	12	0	12
4	Societal Impacts	10	14	-	14
	Project	-	-	7	7
	Practical	30	-	-	-
	Total	100	71	49	120

4. Unit Wise syllabus

Unit 1: Data Handling using Pandas -I

Introduction to Python libraries- Pandas, Matplotlib.
Data structures in Pandas - Series and Data Frames.
Series: Creation of Series from – ndarray, dictionary, scalar value; mathematical operations; Head and Tail functions; Selection, Indexing and Slicing.
Data Frames: creation - from dictionary of Series, list of dictionaries, Text/CSV files; display; iteration; Operations on rows and columns: add, select, delete, rename; Head and Tail functions; Indexing using Labels, Boolean Indexing;
Importing/Exporting Data between CSV files and
        Data Frames.

Data Visualization

Purpose of plotting; drawing and saving following types of plots using Matplotlib – line plot, bar graph,histogram

Customizing plots: adding label, title, and legend in plots.

Unit 2: Database Query using SQL

Revision of database concepts and SQL commands covered in class XI
Math functions: POWER (), ROUND (), MOD ().
Text functions: UCASE ()/UPPER (), LCASE ()/LOWER (), MID ()/SUBSTRING ()/ SUBSTR (),LENGTH (), LEFT (), RIGHT (), INSTR (), LTRIM (), RTRIM (), TRIM ().
Date Functions: NOW (), DATE (), MONTH (), MONTHNAME (), YEAR (), DAY (), DAYNAME ().
Aggregate Functions: MAX (), MIN (), AVG (), SUM (), COUNT (); using COUNT (*).
Querying and manipulating data using Group by, Having, Order by.Working with two tables using equi-join

Unit 3: Introduction to Computer Networks

Introduction to networks, Types of network: PAN, LAN, MAN, WAN.
Network Devices: modem, hub, switch, repeater, router, gateway
Network Topologies: Star, Bus, Tree, Mesh.
Introduction to Internet, URL, WWW, and its applications- Web, email, Chat, VoIP.

Website: Introduction, difference between a website and webpage, static vs dynamic web page, web server and hosting of a website.

Web Browsers: Introduction, commonly used browsers, browser settings, add-ons and plug-ins, cookies.

Unit 4: Societal Impacts

Digital footprint, net and communication etiquettes, data protection, intellectual property rights (IPR), plagiarism, licensing and copyright, free and open source software (FOSS), cybercrime and cyber laws, hacking, phishing, cyber bullying, overview of Indian IT Act.

E-waste: hazards and management.

Awareness about health concerns related to the usage of technology.

Project Work

The aim of the class project is to create tangible and useful IT application. The learner may identify a real-world problem by exploring the environment. e.g. Students can visit shops/business places, communities or other organizations in their localities and enquire about the functioning of the organization, and how data are generated, stored, and managed.

The learner can take data stored in csv or database file and analyze using Python libraries and generate appropriate charts to visualize.

Learners can use Python libraries of their choice to develop software for their school or any other social good.

Learners should be sensitized to avoid plagiarism and violation of copyright issues while working on projects. Teachers should take necessary measures for this. Any resources (data, image etc.) used in the project must be suitably referenced.

The project can be done individually or in groups of 2 to 3 students. The project should be started by students at least 6 months before the submission deadline.

Practical Marks Distribution

S. No.	Unit Name	Marks
1	Programs using Pandas and Matplotlib	8
2	SQL Queries	7
3	Practical file (minimum of 15 programs based on Pandas, 4 based on Matplotlib and 15 SQL queries must be included)	5
4	Project Work (using concepts learned in class XI and XII)	5
5	Viva-Voce	5
	TOTAL	30

5. Suggested Practical List

5.1 Data Handling

1. Create a panda's series from a dictionary of values and a ndarray

2. Given a Series, print all the elements that are above the 75th percentile.

3. Create a Data Frame quarterly sales where each row contains the item category, item name, and expenditure. Group the rows by the category and print the total expenditure per category.

4. Create a data frame for examination result and display row labels, column labels data types of each column and the dimensions

5. Filter out rows based on different criteria such as duplicate rows.

6. Importing and exporting data between pandas and CSV file

5.2 Visualization

1. Given the school result data, analyses the performance of the students on different parameters, e.g subject wise or class wise.

2. For the Data frames created above, analyze, and plot appropriate charts with title and legend.

3. Take data of your interest from an open source (e.g. data.gov.in), aggregate and summarize it. Then plot it using different plotting functions of the Matplotlib library.

5.3 Data Management

1. Create a student table with the student id, name, and marks as attributes where the student id is the primary key.

2. Insert the details of a new student in the above table.

3. Delete the details of a student in the above table.

4. Use the select command to get the details of the students with marks more than 80.

5. Find the min, max, sum, and average of the marks in a student marks table.

6. Find the total number of customers from each country in the table (customer ID, customer Name, country) using group by.

7. Write a SQL query to order the (student ID, marks) table in descending order of the marks.

Introduction to Python libraries- Pandas, Matplotlib.
PANDAS (PANel Data) is a high- level data manipulation tool used for analysing data.
Installing Pandas :- Type on command Prompt
pip install pandas

DATA STRUCTURES:-
A data structure is a particular way of storing and organizing data in a computer for a specific purpose.
So that it can be accessed and worked with in appropriate ways

Python Pandas comes with two commonly used Data Structures :-
1. **Series**   2. **DataFrames**

1.1 SERIES :-

Series is like a one-dimensional array like structure with homogeneous data.

Basic feature of series are

➢ Homogeneous data
➢ Size Immutable
➢ Values of Data Mutable

Creation of Series:-

(A) **Create an Empty Series :** This is created just by using Series() with no parameter.

>>>import pandas as pd >>>s = pd.Series() >>>print (s)	**Output** Series[]dtype : int64

(B)   **Creation of Series from Scalar Values**
A Series can be created using scalar values as shown in the example below :

>>> import pandas as pd
>>> series1 = pd.Series([10,20,30])
 >>> print (series1)
	Output :
	0 10
	1 20
	2 30
	dtype : int64

(C) **Creation of Series from NumPy Arrays (**
We can create a series from a one-dimensional (1D) NumPy array, as shown below :

>>> import numpy as np
>>> import pandas as pd
>>> array1 = np.array([1,2,3,4])
>>> series3 = pd.Series(array1)
>>> print (series3)
	Output :
	0 1
	1 2
	2 3
	3 4
	dtype : int32

(D) **Creation of Series from Dictionary**
Dictionary keys can be used to construct an index for a Series, as shown in the following   example.
Here, keys of the dictionary dict1 become indices in the series.

>>> dict1 = {'India' : 'NewDelhi', 'UK' :
'London', 'Japan' : 'Tokyo'}
>>> print (dict1)
>>> series8 = pd.Series (dict1)
>>> print (series8)
	Output :
	{'India' : 'NewDelhi', 'UK' : 'London', 'Japan' : 'Tokyo'}
	
	India NewDelhi
	UK London
	Japan Tokyo
	dtype : object

MATHEMATICAL OPERATIONS:

Consider the following series : seriesA and seriesB for understanding mathematical operations on series in Pandas.

```
>>> seriesA = pd.Series([1,2,3,4,5],index = ['a', 'b', 'c', 'd', 'e'])
>>> seriesB = pd.Series([10,20,-10,-50,100], index = ['z', 'y', 'a', 'c', 'e'])
```

>>> seriesA	>>> seriesB
a 1	z 10
b 2	y 20
c 3	a -10
d 4	c -50
e 5	e 100
dtype int: 64	dtype: int64

(A) Addition of two Series

i) using addition (+) operator	(ii) Using add() method
>>> seriesA + seriesB	
	>>> seriesA.add(seriesB, fill_value=0)
a -9.0	a -9.0
b NaN	b 2.0
c -47.0	c -47.0
d NaN	d 4.0
e 105.0	e 105.0
y NaN	y 20.0
z NaN	z 10.0
dtype: float64	dtype: float64

Note: the output of addition is NaN if one of the elements or both elements have no value.

(B) Subtraction of two Series

(i) using subtraction (-) operator	(ii) Using sub() method
	# using fill value 1000 while making explicit
>>> seriesA - seriesB	>>> seriesA.sub(seriesB, fill_value=1000)
a 11.0	a 11.0
b NaN	b -998.0
c 53.0	c 53.0
d NaN	d -996.0
e -95.0	e -95.0
y NaN	y 980.0
z NaN	z 990.0
dtype: float64	dtype: float64

(C) Multiplication of two Series

(i) #using multiplication operator	ii) Using mul() method : replace the missing values with 0 before multiplication of seriesB with seriesA using explicit multiplication method mul().
	# using fill value 0 while making #explicit call of the method
>>>seriesA * seriesB	>>> seriesA.mul(seriesB, fill_value=0) a -10.0
a -10.0	b 0.0
b NaN	c -150.0
c -150.0	d 0.0
d NaN	e 500.0
e 500.0	y 0.0
y NaN	z 0.0
z NaN	dtype: float64
dtype: float64	

(D)	Division of two Series

(i) using division operator	ii) Using div () method : Let us now replace the missing values with 0 before dividing seriesA by seriesB using explicit division method div () .
	# using fill value 0 while making explicit
	# call of the method
>>> seriesA / seriesB	>>> SeriesA . div (SeriesB, fill_value=0))
a −0.10	a −0.10
b NaN	b inf
c −0.06	c −0.06
d NaN	d inf
e 0.05	e 0.05
y NaN	y 0.00
z NaN	z 0.00
dtype: float64	
	dtype: float64

HEAD () AND TAIL () FUNCTION

Method	Explanation	Example

head (n)	Returns the first n members of the series . If the value for n is not passed, then by default n takes 5 and the first five members are displayed .	>>> seriesTenTwenty . head (2)
		 0 10
		 1 11
		 dtype: int32
		 >>> seriesTenTwenty . head ()
		 0 10
		 1 11
		 2 12
		 3 13
		 4 14
		 dtype: int32

tail (n)	Returns the last n members of the series . If the value for n is not passed, then by default n takes 5 and the last five members are displayed .	>>> seriesTenTwenty . tail (2)
		 8 18
		 9 19
		 dtype: int32
		 >>> seriesTenTwenty . tail ()
		 5 15
		 6 16
		 7 17
		 8 18
		 9 19
		 dtype: int32

SELECTION, INDEXING AND SLICING IN SERIES:-

In Series selection ,Indexing and Slicing can be done through loc () ,iloc () & [] .

Consider the following program :

```
>>>import pandas as pd
>>> seriesA = pd . Series ( [1,2,3,4,5] , index =  ['a', 'b', 'c', 'd', 'e'] )
>>> seriesB = pd . Series ( [10,20,−10,−50,100] , index =  ['z', 'y', 'a', 'c', 'e'] )
>>> print (seriesA ['c'] )
3
>>> print (seriesB ['e'] )
100
>>> print (seriesA [ ['a','b'] ] )
a   1
b   2
dtype:  int64
```

```
>>> print (seriesB [ ['y','c'] ] )
y   20
c  -50
dtype:  int64
```

SELECTION : USNING loc METHOD - loc works on index label

```
>>> print (seriesA . loc [ : 'b'] )
a   1
b   2
dtype:  int64
>>> print (seriesB . loc ['z' : 'a'] )
z   10
y   20
a  -10
dtype:  int64
```

SELECTION : USNING iloc METHOD - iloc works on index position.

```
>>> print (seriesA . iloc [0 : 3] )
a   1
b   2
c   3
dtype:  int64
```

```
>>> print (seriesA . iloc [ : ] )
a   1
b   2
c   3
d   4
e   5
dtype:  int64
>>> print (seriesB . iloc [0 : 3] )
z   10
y   20
a  -10
dtype:  int64
>>> print (seriesB . iloc [ : ] )
z    10
y    20
a   -10
c   -50
e   100
dtype:  int64
```

iloc and loc

- Indexing and accessing can also be done using iloc and loc.
- iloc is used for indexing or selecting based on position.
- loc is used for indexing or selecting based on name.

1.2 DATAFRAMES

- ➢ A DataFrame is a **Two-dimensional** Labelled Data Structure like a Table.
- ➢ A DataFrame consists of 3 principal components. These are row, column, and data.
- ➢ It contains rows and columns, and therefore has both a row and column index.

1.2.1 Properties of DataFrame

- I. Two Dimentional Data Stucture – That is because it has rows and columns
- II. Labeled Indexes – The rows and columns have indices.
- III. Heterogeneous Collection of Homogeneous Columns – Each column will have similar data, however, the entire DataFrame can have multiple columns with Different Datatypes.
- IV. Mutable Data – Data Can be updated at any point in time.
- V. Flexible Size – Rows and Columns can be added or removed after the creation of the DataFrame.
- VI. Ordered – It follows a specific order while displaying.

1.2.2 CREATION OF DATAFRAME

(A) Empty DataFrame

Syntax: pandas.DataFrame()

Example :-
```
>>>import pandas as pd
>>>df = pd.DataFrame()
>>>print(df)
```
Output- Empty DataFrame
Columns: [] Index: []

(B) Using a 2D List

Syntax: pandas.DataFrame(2D List)

Example:-
```
>>>L = [[10,20,30], [40,50,60],[100,200,300], [1000,3000, 6000]]
>>>df_list =   pd.DataFrame(L,columns =['C1','C2','C3'], index =['A','B','C','D'])
>>>print(df_list)
```
Output:-

	C1	C2	C3
A	10	20	30
B	40	50	60
C	100	200	300
D	1000	3000	6000

(C) Using a 2D Numpy Array

Syntax: pandas.DataFrame(2D Numpy Array)
```
import pandas as pd
import numpy as np
array =  np.arange(10,121,10)
array1 =  array.reshape((4,3))
df =   pd.DataFrame(array1,columns =    ['N1','N2','N3'], index =['R1','R2','R3','R4'])
print(array)
print(array1)
print(df)
```
Output:-
```
[ 10  20   30   40   50   60   70   80   90 100 110 120]
[[ 10 20   30]
 [ 40  50   60]
 [ 70  80   90]
 [100 110   120]]
      N1    N2    N3
 R1   10   20   30
 R2   40   50   60
```

R3	70	80	90
R4	100	110	120

(D) **Using Dictionary of Lists**

Syntax : pandas . DataFrame (Dict of List)

Example :

```
import pandas as pd
student = { 'Name' : ['Anshul','Amit','Neha','Riya'] , 'Age' : 15,18,17,16],
              'Marks' : [70,90,85,65] , 'Gender' :    ['M','M','F','F']    }
df_dict = pd . DataFrame (student,index = [1,2,3,4] )
print (df_dict)
```

Output : –

	Name	Age	Marks	Gender
1	Anshul	15	70	M
2	Amit	18	90	M
3	Neha	17	85	F
4	Riya	16	65	F

(E) **Using List of Dictionaries**

Can be Considered like List of each record .

Syntax :   pandas . DataFrame (List of Dict)

Example : –

```
import pandas as pd
student = [ {'Name' : 'Ashish', 'Age' : 15,'Marks' : 70,'Gender' : 'M'},
         {'Name' : 'Aklesh', 'Age' : 18,'Marks' : 90,'Gender' : 'M'},
         {'Name' : 'Suman', 'Age' : 17,'Marks' : 85,'Gender' : 'F'},
         {'Name' : 'Sushma', 'Age' : 16,'Marks' : 65,'Gender' : 'F'} ]
df_list_dict = pd . DataFrame (student)
print ( df_list_dict)
```

Output : –

	Name	Age	Marks	Gender
0	Ashish	15	70	M
1	Aklesh	18	90	M
2	Suman	17	85	F
3	Sushma	16	65	F

(F) **Using Dictionary of Series**

Syntax :   pandas . DataFrame (Dict of Series)

Example : –

```
import pandas as pd
Name_df =   pd . Series ( ['Ashish','Aklesh','Suman','Sushma'] )  Age_df pd . Series ( [15,18,17,16] )
Marks_df = pd . Series ( [70,90,85,65] )  Gender_df =   pd . Series (    ['M','M','F','F'] )
student =   {'Name' :    Name_df, 'Age' : Age_df, 'Marks' : Marks_df,'Gender' : Gender_df}
df_series = pd . DataFrame (student)
print (df_series)
```

OUTPUT : –

	Name	Age	Marks	Gender
0	Ashish	15	70	M
1	Aklesh	18	90	M
2	Suman	17	85	F
3	Sushma	16	65	F

1.2.3 OPERATIONS OF ROWS AND COLUMNS: add, select, delete, rename

(A) Adding a New Column to a DataFrame

```
import pandas as pd
data ={'Name': ['Ajay', 'Neha', 'Gaurav', 'Amit'],'MARKS': [89, 82, 89, 85],'SUBJECT': ['AI','CS','IP', 'DS'] }
df = pd.DataFrame (data)
print (df)
print ("\n After adding City")
city = ['Delhi', 'Bangalore', 'Chennai', 'Patna']
df['city'] = city
print (df)
```

Output:-

```
    Name  MARKS SUBJECT
0   Ajay        89         AI
1   Neha        82         CS
2   Gaurav      89         IP
3   Amit        85         DS
```

After adding City

```
    Name   MARKS   SUBJECT     city
0   Ajay   89      AI          Delhi
1   Neha   82      CS          Bangalore
2   Gaurav 89      IP          Chennai
3   Amit   85      DS          Patna
```

(B) Adding a New Row to a DataFrame

add a new row to a DataFrame using the **DataFrame.loc[ ] method.**

```
import pandas as pd
data = {'Name': ['Ajay', 'Neha', 'Gaurav', 'Amit'],
 'MARKS': [89, 82, 86, 85],
 'SUBJECT': ['AI', 'CS', 'IP', 'DS'] }
df = pd.DataFrame (data)
df.loc [4] = ['Rahul', '85', 'WT']
print (df)
```

(C) Deleting Rows or Columns from a DataFrame

DataFrame.drop() method to delete rows and columns from a DataFrame.

To delete a row, the parameter axis is assigned the value 0 and for deleting a column,the parameter axis is assigned the value 1.

Example : axis=0

```
import pandas as pd
dt= ({'English': [74,79,48,53,68],'acc': [76,78,80,76,73],'bst': [57,74,55,89,70],
    'eco': [76,85,63,68,59], 'IP': [82,93,69,98,79], 'PE': [78,70,67,69,78] })
df=pd.DataFrame (dt, index=['ARJUN','TEJASH','NIKHIL','YASH','DEEP'])
print (df)
print ("\n After deleteing Row")
df=df.drop ('DEEP',axis=0)
print (df)
```

Output:-

	English	acc	bst	eco	IP	PE
ARJUN	74	76	57	76	82	78
TEJASH	79	78	74	85	93	70
NIKHIL	48	80	55	63	69	67
YASH	53	76	89	68	98	69
DEEP	68	73	70	59	79	78

After deleteing Row

	English	acc	bst	eco	IP	PE
ARJUN	74	76	57	76	82	78
TEJASH	79	78	74	85	93	70
NIKHIL	48	80	55	63	69	67
YASH	53	76	89	68	98	69

Example : axis=1

```
import pandas as pd
dt= ({'English' : [74,79,48,53,68],
    'acc' : [76,78,80,76,73],
    'bst' : [57,74,55,89,70],
    'eco' : [76,85,63,68,59],
    'IP' : [82,93,69,98,79],
    'PE' : [78,70,67,69,78] })
df=pd.DataFrame (dt, index= ['ARJUN','TEJASH','NIKHIL','YASH','DEEP'] )
print (df)
print ("\n After deleteing COLUMN")
df=df.drop ('IP', axis=1)
 print (df)
```

Output:-

	English	acc	bst	eco	IP	PE
ARJUN	74	76	57	76	82	78
TEJASH	79	78	74	85	93	70
NIKHIL	48	80	55	63	69	67
YASH	53	76	89	68	98	69
DEEP	68	73	70	59	79	78

After deleteing COLUMN

	English	acc	bst	eco	PE
ARJUN	74	76	57	76	78
TEJASH	79	78	74	85	70
NIKHIL	48	80	55	63	67
YASH	53	76	89	68	69
DEEP	68	73	70	59	78

[D] **Renaming Row Labels of a DataFrame**

RENAME the labels of rows and columns in a DataFrame using the DataFrame.rename() method.

The parameter axis='index' is used to specify that the row label is to be changed.

[E] **Renaming Column Labels of a DataFrame**

The parameter axis='columns' implies we want to change the column labels :

1.2.3 ACCESSING DATAFRAMES ELEMENT THROUGH INDEXING

(A) *Label Based Indexing*

DataFrame.loc[ ] is an important method that is used for label based indexing with DataFrames.

Boolean means a binary variable that can represent either of the two states - True (indicated by 1) or False (indicated by 0).

In Boolean indexing, we can select the subsets of data based on the actual values in the DataFrame rather than their row/column labels.

Example
import pandas as pd
dict = {'NAME': ["Rahul", "Riya", "Pooja", "Anshu"],
'SUB': ["IP", "CS", "AI", "WT"],
'SCORE': [90, 40, 80, 98]}
df = pd.DataFrame(dict, index = [True, False, True, False])
print(df)

OUTPUT:

	NAME	SUB	SCORE
True	Rahul	IP	90
False	Riya	CS	40
True	Pooja	AI	80
False	Anshu	WT	98

1.2.4 HEAD AND TAIL FUNCTIONS

head() and tail() methods or functions are used to view a small sample of a DataFrame object. These functions are described below

(i) head():

This function returns the first n rows for the object based on position. It is useful for quick testing if your object has the right type of data in it.

Syntax: DataFrame.head (n=5)

Parameters: n-is an integer value, number of rows to be returned where

default value is 5.

Return DataFrame with top n rows

Example:

import pandas as pd

Dic={'empno': (101,102,103,104,105,106),'grade': ('a','b','a','c','b','c'), 'dept': ('sales','pur','mar','sales','pur','mar')}

df=pd.DataFrame(Dic)

print(df.head(3))

Output:

	empno	grade	dept
0	101	a	sales
1	102	b	pur
2	103	a	mar

EXAMPLE 2:-

import pandas as pd

Dic={ 'empno' : (101,102,103,104,105,106) ,' grade' : ('a' ,' b' ,' a' ,' c' ,' b' ,' c') ,' dept' : ('sales' ,' pur' ,' mar' ,' sales' ,' pur' ,' mar') }

df=pd . DataFrame (Dic)

print (df . head () [['empno' ,' dept']])

Output:

	empno	dept
0	101	sales
1	102	pur
2	103	mar
3	104	sales
4	105	pur

(ii) tail ( ) :

This function returns last n rows from the object based on position. It is useful for quickly verifying data. e.g. after sorting

Syntax: DataFrame . tail (n=5)

Example :-

import pandas as pd

Dic={ 'empno' : (101,102,103,104,105,106) ,' grade' : ('a' ,' b' ,' a' ,' c' ,' b' ,' c') ,' dept' : ('sales' ,' pur' ,' mar' ,' sales' ,' pur' ,' mar') }

df=pd . DataFrame (Dic)

print (df . tail ())

Output:-

	empno	grade	dept
1	102	b	pur
2	103	a	mar
3	104	c	sales
4	105	b	pur
5	106	c	mar

1.2.5 ITERATING IN PANDAS DATAFRAME

Iteration is a general term for taking each item of something one after another. In Pandas DataFrame, we can iterate an element in two ways:
 Iterating over a dataframe:
 Pandas Dataframe we can iterate an element in two ways:
 Iterating over rows (horizontal subset) -DataFrame . iterrows () :
 Iterating over columns (vertical subset) -DataFrame . iteritems ()

1. DataFrame.iterrows():

The method iterrows() views a dataframe in the form of horizontal subset i.e. row-wise.
For example: We have created a dataframe by using the following coding:

```
import pandas as pd dict={'2019':{'Q1':125,'Q2':230,'Q3':275,'Q4':320},
'2020':{'Q1':105,'Q2':130,'Q3':145,'Q4':210},
'2021':{'Q1':195,'Q2':290,'Q3':105,'Q4':120}}
df=pd.DataFrame(dict)  print(df)
```

The output is:

```
    2019   2020  2021
Q1 125 105    195
Q2 230 130    290
Q3 275 145    105
Q4 320 210    120
```

For making subset row-wise add the following coding in your previous coding.

```
for (c,values)  in df.iterrows():
    print('RowIndex:', c)  print('Contains')  print('\nValues:','\n',values)
```

This will create subset of dataframe df row-wise. And the output will look like:

```
RowIndex: Q1
    Contains Values:  2019    125
    2020    105
    2021    195
    RowIndex:  Q2 Contains Values:
    2019    230
    2020    130
    2021    290
    RowIndex:  Q3 Contains Values:
    2019    275
    2020    145
    2021    105
    RowIndex:  Q4 Contains Values:
    2019    320
    2020    210
    2021    120
```

The iterrows() function is used to iterate over DataFrame rows as (index, Series) pairs.
The syntx is : DataFrame.iterrows()
Important points about Dataframe.iterrows()
• Do not Preserve the data types: As iterrows() returns each row contents as series but it does not preserve dtypes of values in the rows.
• We can not modify something while iterating over the rows using iterrows(). The iterator does not returns a view instead it returns a copy. So, making any modification in returned row contents will have no effect on actual dataframe

2. DataFrame.iteritems()

iteritems() Dataframe class provides a member function iteritems() i.e. It yields an iterator which can be used to iterate over all the columns of a dataframe. For each column in the Dataframe it returns
an iterator to the tuple containing the column name and column contents as series.
Example:

```
import pandas as pd dict={'2019':{'Q1':125,'Q2':230,'Q3':275,'Q4':320},
'2020':{'Q1':105,'Q2':130,'Q3':145,'Q4':210},
'2021':{'Q1':195,'Q2':290,'Q3':105,'Q4':120}}
```

```
    df=pd.DataFrame(dict)   print(df)
for (c,values)  in df.iteritems():  print('RowIndex:', c)  print('Contains')
print('\nValues:','\n',values)
```

```
     2019      2020  2021
Q1  125       105   195
Q2  230       130   290
Q3  275       145   105
Q4  320       210   120
RowIndex:  2019 Contains Values:
Q1     125
Q2     230
Q3     275
Q4     320
Name:  2019, dtype:  int64 RowIndex:  2020 Contains
Values:
Q1     105
Q2     130
Q3     145
Q4     210
Name:  2020, dtype:  int64

RowIndex:  2021 Contains Values:
Q1     195
Q2     290
Q3     105
Q4     120
Name:  2021, dtype:  int64
```

1.2.5 IMPORTING/EXPORTING DATA BETWEEN CSV FILES AND DATAFRAMES

CSV: A Comma- Separated Value (CSV) file is a text file where values are separated by comma.
Each line represents a record (row). Each row consists of one or more fields (columns).
They can be easily handled through a spreadsheet application.
Advantages of CSV file:
1. A simple compact and ubiquitous format for data storage.
2. A common format for data interchange.
3. It can be opened in Ms-Excel, Calc etc.
4. Nearly all spreadsheets and databases support import/export to csv format.

Import a CSV :
read_csv () method used to load the data from the csv file into a DataFrame.

import pandas as pd
df = pd.read_csv (r'Path where the CSV file is stored\File name.csv')
print (df)

To export a Pandas DataFrame to a CSV file, use to_csv function.
This saves a DataFrame as a CSV file.
Syntax:
 to_csv (parameters)

Example:- Write python code to write DataFrame data into "a.csv" file.
Ans.
import pandas as pd
Dic={ 'empno': (101,102,103,104) , 'name' : ('a' , 'b' , 'c' , 'd') ,

```
                    'salary':  (3000,5000,8000,9000) }
df=pd.DataFrame(Dic)
df.to_csv("a.csv")
```

QUESTION ANSWERS FOR PRACTICE

	MULTIPLE CHOICE QUESTIONS
Q 1	Pandas Series can be created from: A. Scalar values B. NumPy arrays C. dictionary D. All of the above
Ans	D. All of the above
Q 2	If a Dataframe is created using a 2D dictionary, then the indexes/row labels are formed from A. dictionary's values B. inner dictionary's keys C. outer dictionary's keys D. none of these
Ans	(B) inner dictionary's keys
Q 3	The empty series object has which of the data type? (A) int64 (B) int32 (C) float32 (D) float64
ANS	(D) float64
Q 4	Pandas supports which of the following types of indexes? (A) Positional and Labelled Indexing (B) Numbered and Valued Indexing (C) Row and Column Indexing (D) Loop Indexing
ANS	(A) Positional and Labelled Indexing
Q 5	Identify the correct statement: (A) Data frames can change their size. (B) Series act in a way similar to that of an array. (C) Both (a) and b) (D) None of the above
Ans	ANS:- (C) Both (A) and B)
	ASSERTION& REASONING
	A. Both A and R are true and R is the correct explanation of A B. Both A and R are true but R is not the correct explanation of A C. A is true but R is false D. A is false but R is true E. Both A and R are false
Q 1	Assertion (A) : pandas is an open source Python library which offers high performance, easy-to-use data structures and data analysis tools. Reason (R) : Professionals and developers are using the pandas library in data science and machine learning.
Ans	A : Both A and R are true and R is the correct explanation of A
Q 2	Assertion (A): CSV files are available to open in any spreadsheet program, including Google Sheets, Open Office, and Microsoft Excel. Reason (R): Using a spreadsheet program can serve a user's needs better since it has cells where data sorted in rows and columns.
Ans.	A : Both A and R are true and R is the correct explanation of A

	01 MARKS QUESTIONS
Q 1:–	State whether True or False a. A series object is size mutable. b. A Dataframe object is value mutable
Ans	a. False b. True

Q 2	Find the output of the following code:
	      import pandas as pd
	      S = pd.Series(10, index = ['a', 'b', 'c', 'd'])
	      print(S.size)
	      print(S.ndim)
	      print(S.hasnans)

Ans	4
	  1
	  False

Q 3	In Pandas, S is a series with the following result: S = pd.Series ([5, 10, 15, 20, 25]) The series object is automatically indexed as 0, 1, 2, 3, 4. Write a statement to assign the series as a, b, c, d, e explicitly.
Ans	Answer :– S.index = ['a', 'b', 'e', 'd', 'e']
Q 4	Fill in the blanks:– (a) .... is used to check the Null values in a Data Frame. (b) .... used to replace Null values in a Data Frame?
An	(a) isnull ( ) (b) fillna
Q 5	Consider the following Python code and write the output for statement. import pandas as pd values=["India", "Canada"] code=["IND", "CAN"] df=pd.DataFrame(values,Index=Code,columns=['Country']
Ans	Code Country IND India CAN Canada
	02 MARK QUESTIONS
Q 1	Consider the following Series : Subject Write a program in Python Pandas to create a Series.
Ans	import pandas as pd subject=pd.Series ([75,78,82,86],index= ['ENGLISH','HINDI','MATHS','SCIENCE'])

Q 2	Consider the following Series object, "company" and its profit in Crores
	    TCS 350
	     Reliance 200

Table within Q 1:

INDEX	MARK
ENGLISH	75
HINDI	78
MATHS	82
SCIENCE	86

	L&T 800 Wipro 150 i. Write the command which will display the name of the company having profit>250. ii. Write the command to name the series as Profit.
Ans	import pandas as pd profit=[350,200,800,150] idx=['TCS','Reliance','L & T','Wipro'] company=pd.Series(profit,index=idx) print(company[company>250]) company.name="Profit" print(company)
Q 3	What will be the output of the following: import pandas as pd Data={'IP':33,'CS':40,'AI':45} S=pd.Series(Data,index=['IP','CS','DS','AI']) print(S)
Ans	IP 33.0 CS 40.0 DS NaN AI 45.0 dtype: float64
Q4	Write a Python code to create a DataFrame stock with appropriate column headings from the list given below: [[101,'Gurman',98], [102,'Rajveer',95], [103,'Samar' ,96], [104,'Yuvraj',88]]
Ans	import pandas as pd data=[[101,'Gurman',98],[102,'Rajveer',95],[103,'Samar' ,96], [104,'Yuvraj',88]] df=pd.DataFrame(data,columns=['Rno','Name', 'Marks'])
Q 5	Define the following terms (i) .loc[ ] (ii) .iloc [ ]
	.loc [ ] :This attribute is used to access a group of rows and columns by label(s) or a Boolean array in the given series object. Syntax : Series.loc .iloc[ ] : This attributes enables purely integer location based indexing for selection by position over the given series object. Syntax : Series.iloc
	03 MARKS QUESTIONS
Q 1.	A dictionary 'toys' contains the following: toys={ 'Name':['Talking Tom', 'Blocks','Number game', 'ludo'], 'Price' : [400,250, 300,150] } Write statements for the following: (i) Create a Dataframe named "stock" (ii) Add a column called 'discount' with the following data: [30, 40, 15, 25] (iii) Delete column discount with all values.
Ans.	(i) stock = pd.DataFrame(toys) (ii) stock['discount']=[30,40,15,25] (iii) del stock['discount']
Q2.	What will be the output of the following code: import pandas as pd1

	marks = pd1.Series([23,19,33,29,37],index = ['a','b','c','d','e']) print(marks.head(3)) print(marks.tail(3)) print(marks[marks>25]) print(marks>25)
Ans	a 23 b 19 c 33 dtype: int64 c 33 d 29 e 37 dtype: int64 c 33 d 29 e 37 dtype: int64 a False b False c True d True e True dtype: bool
Q 3.	Given a DataFrame namely aid that stores the aid by NGOs for different states: <table><tr><td></td><td>Toys</td><td>Books</td><td>Uniform</td><td>Shoes</td></tr><tr><td>Andhra</td><td>7916</td><td>6189</td><td>610</td><td>8810</td></tr><tr><td>Odisha</td><td>8508</td><td>8208</td><td>508</td><td>6798</td></tr><tr><td>M.P.</td><td>7226</td><td>6149</td><td>611</td><td>9611</td></tr><tr><td>U.P.</td><td>7617</td><td>6157</td><td>457</td><td>6457</td></tr></table> Write statement to display the aid for (i) Books and uniform only (ii) Shoes only (iii) states Andhra and Odisha for books and uniform only
Ans.	(i) print(aid['Books','Uniform']) (ii) print(aids.shoes) (iii) print(aids.loc['Andhra','Odisha':['Books', 'Uniform']]
Q 4.	Given a data frame namely Fruits is given below (fruit names are row labels) Color Count Price Apple Red 3 120 Apple Green 9 110 Pear Red 25 125 Pear Green 26 150 Lime Green 99 70

	Write code statement to (a) Find all rows with label "Apple". Extract all columns (b) List only the columns Count and Price using loc (c) List only rows with labels 'Apple' and 'Pear' using loc
Ans.	(a) data.loc['Apple',:] (b) data.loc[:,['Count','Price']] (c.) data.loc[['Apple','Pear']]

Q 5.	Consider the following DataFrame and do as directed:
	
	     import pandas as pd
	
	    d={'Mouse':[150,200,300,400],'Keyboard':[180,200,190,300],
	
	               'Scanner':[200,280,330,450]}
	
	    df=pd.DataFrame(d,index=['Jan','Feb','March','April'])
	
	a) Write code to access data of Mouse and Scanner columns
	
	b) Write code to access data of all columns where mouse data is more than 200
	
	c) Write code to access columns using 0 and 2

Ans.	a) print(df[['Mouse','Scanner']]) b) print(df[df['Mouse']>200]) c) print(df.iloc[:,[0,2]])

04 MARKS QUESTIONS

Q 1.	Write the code in Pandas to create the following Data Frames.

	Df1			Df2	
	Mark1	Mark2		Mark1	Mark2
0	10	20	0	10	15
1	40	45	1	20	25
2	15	30	2	25	30
3	40	70	3	50	30

Write the commands to do the following operations on the DataFrames given below :
- (i) To add DataFrames Df1 and Df2
- (ii) To subtract Df2 from Df1
- (iii) To Rename column Mark1 as Marks1 in both the DataFrame Df1 and Df2
- (iv) To Change index label of Df1 from 0 to zero and from 1 to one.

Ans.	import numpy as np import pandas as pd Df1=pd.DataFrame({'Mark1':[10,40,15,40],'Mark2':[20,45,30,70]}) Df2=pd.DataFrame({'Mark1':[10,20,25,50],'Mark2':[15,25,30,30]}) print(Df1) print(Df2) (i) print(Df1.add(Df2)) (ii) print(Df1.sub(Df2)) (iii) Df1.rename(columns={'Mark1':'Marks1'}, inplace =True) print(Df1)

	(iv) Df1.rename(columns={0: 'zero',1: 'one'}, inplace =True) print(Df1)
Q 2.	Given a dataframe namely data as shown in adjacent figure (fruit names are row labels).

	Color	Count	Price
Apple	Red	3	120
Apple	Green	9	110
Pear	Red	25	125
Pear	Green	26	150
Lime	Green	99	70

a) Find all rows with the label "Apple". Extract all columns.

b) List fruits with count more than 25.

c) List single true or false to signify if all prices are more than 100 or not.

d) List 2nd, 3rd and 4th rows

Ans.	(a) data.loc['Apple', :] (b) data[data['Count'] >25] (c) (data['Price'] > 100).all() (d) data.iloc[0:3, :]

Q 3. Given a dataframe df as shown below:

```
  A  B  C
0 15 17 19
1 16 18 20
2 20 21 22
```

What will be the result of the following code statements?

(a) df['C'] = np.NaN (b) df['C'] = [2,5] (c) df['C'] = [12,15,27]

(d) df.loc['A']=23

Ans.

a)

```
       A      B      D      C
  0    15     17     19     NaN
  1    16     18     20     NaN
  2    20     21     22     NaN
```

b) Will produce Error

c)

```
       A      B      D      C
  0    15     17     19     12
  1    16     18     20     15
      2    20     21     22     16
```

Q 4. (i) Find the Error:

```
data= np.array([ 'a','b','c','d','e','f'])
s= pd.Series(data,index=[100,101,102,103,104,105])
print(s[102,103,104])
```

(ii) Why does the following code cause error?

```
S1= pd.Series(range(1,16,3), index = list("ababa"))
print(s1["ab"])
```

(iii) Given a DataFrame as:

```
  a b c
0 13 15 17
1 21 23 27
```

Will the statement D1('d') = [18,20] cause error? Why or why not?

Ans.	i) error :- 3 index given at same time

	ii) print (S1['ab']) KeyError -> 'ab' index is not available
Q 5.	Consider the following series CapCntry = pd.Series (['NewDelhi', 'WashingtonDC', 'London', 'Paris', 'Tokyo', 'Beijing'], index=['India', 'USA', 'UK', 'France', 'Japan', 'China']) Write the output of the following statements: i) CapCntry [: : 2] ii) CapCntry [5:1:-1] iii) CapCntry [: :-1] iv) CapCntry [3:]
Ans.	(i) CapCntry [: : 2] India NewDelhi UK London Japan Tokyo dtype: object (ii) CapCntry [5:1:-1] China Beijing Japan Tokyo France Paris UK London dtype: object (iii) CapCntry [: :-1] China Beijing Japan Tokyo France Paris UK London USA WashingtonDC India NewDelhi dtype: object (iv) CapCntry [3:] France Paris Japan Tokyo China Beijing dtype: object
	05 MARKS QUESTIONS
Q 1.	(A) What will be the output of the following code: import pandas as pd L= [9,10,12] S=pd.Series (L) Dbl=pd.Series (data = S*2) print ("New Series: ") print (Dbl) (B) What will be the output of the following code: >>>import pandas as pd >>>A=pd.Series (data=[35,45,55,40]) >>>print ([A>45])

	(C) What will be the output of the following code : >>>import pandas as pd >>>A=pd.Series(data=[35,45,55,40]) >>>A[2:5]=25 >>>print(A)
Ans.	(A)　　New Series : 　0　18 　1　20 　2　24 　dtype : int64 (B) [0　False 1　False 2　True 3　False dtype : bool] (C) 0　35 1　45 2　25 3　25 dtype : int64
Q 2.	A dictionary Grade contains the following data : Grade = {'Name' : ['Rashmi', 'Harsh', 'Ganesh', 'Priya', 'Vivek', 'Anita', 'Karthik'], 'Grade' : ['A1', 'A2', 'B1', 'A1', 'B2', 'A2', 'A1']} Write statements for the following : (a) Create a dataframe called Gr. (b) Find the output of Gr.iloc[0:5] and Gr[0:5] (c) Add a column called Percentage with the following data : [92, 89, None, 95, 68, None, 93]. (d) Rearrange the columns as Name, Percentage and Grade. (e) Drop the column (i.e., Grade) by name. OR (e) Delete the 3rd and 5th rows.
Ans.	(a) Gr = pd.DataFrame(Grade) (b) Output for both the commands is the same : 　Name　Grade 0　Rashmi　A1 1　Harsh　A2 2　Ganesh　B1 3　Priya　A1 4　Vivek　B2 (c) Gr["Percentage"] = [92, 89, None, 95, 68, None, 93] (d) Gr = Gr[['Name', 'Percentage', 'Grade']] (e) Gr.drop('Grade', axis = 1) OR (e) Gr.drop([2, 4])
Q 3.	(i) Mr. Som, a data analyst has designed the DataFrame **df** that contains data about Computer Olympiad with 'CO1', 'CO2', 'CO3', 'CO4', 'CO5' as indexes shown below. Answer the following questions :

	School	Tot_students	Topper	First_Runnerup
CO1	PPS	40	32	8

CO2	JPS	30	18	12
CO3	GPS	20	18	2
CO4	MPS	18	10	8
CO5	BPS	28	20	8

A. Predict the output of the following python statement:
   i.   df.shape
   ii. df[2:4]
B. Write Python statement to display the data of Topper column of indexes CO2 to CO4.
   OR
   Write Python statement to compute and display the difference of data of

   Tot_students column and First_Runnerup column of the above given
                    DataFrame.

(ii) Consider the following DataFrame, df

NAME	TMARKS	CITY
AMIT KUMAR	450	NEW DELHI
ASHA GOEL	426	BENGLURU
KAVITA	476	CHENNAI
RIYA	446	JAIPUR
PIRYUSG	464	MUMBAI

Write commands to :
i.   Add a new column 'Course' to the Dataframe with the value "computer science".
ii. Add a new row with values (Sam,456,Chennai,Data Science)?

Ans.

A. (i) (5,4)

(ii)

	School	Tot_students	Topper	First_Runnerup
CO3	GPS	20	18	2
CO4	MPS	18	10	8

(B) print(df.loc['C02':'CO4', 'Topper'])
OR
print(df. Tot_students-df.First_ Runnerup

(ii) df['Course']=['Computer Science']
df.loc[5]=['Sam',456, 'Bangalore', 'Data Science']

Q 4.

Assume a dataframe df that contains data about IT Quiz Contest with
'SC1','SC2','SC3','SC4','SC5' as indexes shown below. Give the output of any four questions from (i) to (v).

	School	Total_Students	Winner	Runner-up
SC1	APS	40	32	8
SC2	KPS	30	18	12
SC3	KKPS	20	18	2
SC4	MMPS	18	10	8
SC5	TPS	28	20	8

(i) >>>df.shape

			(ii) >>>df1[2:4]

(ii) >>>df1[2:4]

(iii) >>>df.loc['SC2':'SC4','Winner']

(iv) >>>df.iloc[2:4]

(v) >>>df.Total_Students

Ans.	(i) >>>df.shape (1)

Ans.

(i) >>>df.shape (1)

Ans. (5,4)

(ii) >>>df1[2:4] (1)

Ans. School Total_Students Winner Runner-up

SC3 KKPS 20 18 2

SC4 MMPS 18 10 8

(iii) >>>df.loc['SC2':'SC4','Winner'] (1)

Ans. SC2 18

SC3 18

SC4 18

Name: Winner,

dtype= int64

(iv) >>>df.iloc[2:4] (1)

Ans. School Total_Students Winner Runner-up

SC3 KKPS 20 18 2

SC4 MMPS 18 10 8

(v) >>>df.Total_Students (1)

Ans. 40

30

20

18

28

Name: Total_Students,

dtype=int64

Q 5. (A) Consider the following DataFrame, classframe

	RNO	NAME	CLASS	SECTION	CGPA	STREAM
ST1	1	RAHUL	IX	A	8.7	SCIENCE
ST2	2	RIYA	X	B	8.9	HUMINITIES
ST3	3	NEHA	IX	D	9.2	SCIENCE
ST4	4	AMIT	X	C	9.4	COMMERCE

Write commands to :

i. Add a new column 'Activity' to the Dataframe 80

ii. Add a new row with values (5 , Mridula ,X, F , 9.8, Science)

(B) A dictionary 'toys' contains the following:

toys={ 'Name' : ['Talking Tom', 'Blocks', 'Number game', 'ludo'],
           'Price' : [400,250, 300,150]

Write statements for the following:

(i) Create a Dataframe named "stock"

(ii) Add a column called 'discount' with the following data: [30, 40, 15, 25]

(iii) Delete column discount with all values.

Ans.

(A)

i. classframe ['Activity'] = ['Swimming' ,'Dancing ','Cricket', 'Singing']

	Ii. classframe.loc['St5']=[1,'Mridula', 'X', 'F',9.8, 'Science'] (B) (i) stock= pd.DataFrame(toys) (ii) stock["discount"]=[30,40,15,25] (iii) stock.drop("discount", axis=1)
	CSV
Q 1.	Write a program in Python Pandas to create the following DataFrame Stationary from Series: Perform the following operations on the DataFrame : a. Transfer the Dataframe to a csv file named "final.csv". b. Add a column discount with value of 5% for all items in the DataFrame at the Position 1. c. Display the final Dataframe updated.

Ans.	import pandas as pd
	data={ 'P_ID':['P01', 'P02', 'P03', 'P04'], 'PROD_NAME': ['Notebook', 'Pencil Box','Water Bottle', 'School Bag'], 'PROD_PRICE' : [85,76,129,739],'PROD_QTY': [500,200,50,70] }
	df=pd.DataFrame(data, columns=['P_ID', 'PROD_NAME', 'PROD_PRICE','PROD_QTY'])
	print(df)
	a. df.to_csv (r'final.csv', index = False, header=True)
	b. df.insert (0,'DISCOUNT',5)
	   or
	   x=[5,5,5,5]
	   df['DISCOUNT']=x
	c. print(df)

Q2.	Write a program in Python to create the following DataFrame "stud" from a Dictionary:
	<table><tr><td>S_ID</td><td>Name</td><td>Mark1</td><td>Mark2</td></tr><tr><td>1</td><td>Lily</td><td>20</td><td>35</td></tr><tr><td>2</td><td>Maan</td><td>34</td><td>43</td></tr><tr><td>3</td><td>Diya</td><td>23</td><td>42</td></tr></table> Perform the following operations on dataframe. b) Add both marks an assign to column "Total". c) Save this dataframe to data.csv file. d) Display details of first 2 students.
Ans.	a) import pandas as pd d1={'S_ID':[1,2,3], 'Name':["Lily","Maan","Diya"],'Mark1':[20,34,23], 'Mark2':[35,43,42] } stud=pd.DataFrame(d1) print(stud) b) stud['Total'] = stud['Mark1'], stud['Mark2'] print(stud) c) stud.to_csv('data.csv') d) stud.head(2)

CASE STUDY BASED QUESTIONS

Q 1. Consider the following DataFrame df and answer any four questions from (i) to (v)

	PEN	ERASER	BOX
SHOPA	50	20	15
SHOPB	60	40	20
SHOPC	70	80	35
SHOPD	80	70	45

(i) Identify the command that will give the following output :
PEN   260
ERASER 210
BOX   115
dtype : int64
 (a) print (df.sum)   (b) print (df.sum ())
 (c) print (df.sum axis=1)   (d) print (df.sum, axis=1)

 (ii) The supplier needs to know the minimum quantity of pens and boxes supplied to a shop. Help him choose the correct statement (s) from the following :
 (a) print (df [['PEN','BOX']].min (0))
 (b) print (df [['PEN','BOX']].min (1))
 (c) print (df [['PEN','BOX']].min ())
 (d) print (df [['PEN','BOX'].min (1)])
Choose the correct option :
 (i) Only b (ii) both a and d
 (iii) both a and c (iv) a,b and d

(iii) Which of the following statements will give the exact number of values in each column of the DataFrame?
 (a) print (df.count ())
 (b) print (df.count (0))
 (c) print (df.count)
 (d) print (df.count (axis='index'))

Choose the correct option :
 (i) **both a and b**   (ii) only b
  (iii) a, b and c   (iv) a,b and d

(iv) Which of the following command will display the column labels of the DataFrame?
 (a) print (df.columns ())
 (b) print (df.column ())
 (c) print (df.column)
 (d) print (df.columns)

(v) Ms. Pathak, the supplier wants to add a new item 'PENCIL' with values (28,45,65,75) in the DataFrame. Help him choose the command from the following :
 (a) df.column= [28,45,65,75]
 (b) df ['PENCIL'] = [28,45,65,75]
 (c) df.loc ['PENCIL'] = [28,45,65,75]
 (d) Both b and c are correct

Ans. :–
(i) (b) print (df.sum ())
(ii)   (iii) both a and c
(iii)   (i) **both a and b**
(iv) (d) print (df.columns)
(v) (b) df ['PENCIL'] = [28,45,65,75]

Q 2.	Mr. Ankit is working in an organisation as data analyst. He uses Python Pandas. He got a dataset of the passengers for the year 2010 to 2012 for January, March and December. His manager wants certain information from him, but he is facing some problems. Help him by answering few questions given below:
	
	import pandas as _____ #Statement 1
	data={"Year":[2010,2010,2012,2010,2012],"Month":["Jan","Mar","Jan","Dec","Dec"] ,"Passengers":[25,50,35,55,65]}
	df=pd._____(data) #Statement 2
	print(df)
	
	i. Help him to fill the blank of statement1.
	ii. Help him to fill the blank of statement2.
	iii. He wants to print the number of passengers in "jan".
	
	OR
	iii..Mr. Ankit wants to change the index of the Data Frame with ['Air India', 'Indigo', 'Spicejet', 'Jet', 'Emirates']. Write the correct statement to change the index.

Ans.	(i) pd (ii) Data Frame (iii) df.shape iv. (ii) df[['Month','Passengers']][df['Month']=='Jan'] OR (iii) df.index=["Air India","Indigo","Spicejet","Jet","Emirates"]

DATA VISUALISATION

Data visualization is the presentation of data in graphical format. It helps people understand the significance of data by summarizing and presenting a huge amount of data in a simple and easy to understand format and helps communicate information clearly and effectively

Matplotlib

It is an amazing visualization library in Python that used for 2D plots of arrays. It is a multi-platform data visualization library which build NumPy arrays. Matplotlib produces publication-quality figures in a variety of hardcopy formats and interactive environments across platforms. Matplotlib can be used in Python scripts, the Python and IPython shell, web application servers and various graphical user interface toolkits.

To get matplotlib up and running in our environment, we need to import it.

Import matplotlib.pyplot as plt

Data visualization basically refers to the graphical or visual representation of information and data using charts, graphs, maps

Data visualization helps for better understanding of the meaning of data.

pyplot is a collection of methods which exists in matplotlib library.

Pyplot allow user to construct 2D plots easily and interactively.

To install the matplotlib:

pip install matplotlib

• **Types of Plots/charts (to be studied as per syllabus):**

- ➢ Line Chart
- ➢ Bar Graph
- ➢ Histogram

- ➢ The most common options used to customize the plot are as following:

    - o **title()** – Applies titles for graphs with font size and color

    - o **grid()** – Show/Hide the gridlines on plot

    - o **legend()**: Represents the data displayed in the graph's Y-axis

    - o **loc**– Specify the location of the legend as "upper left" or "upper right", "lower left","lower right"

    - o **plot():** Allows changing the linestyle, linewidth, color, marker ,marker size etc.

- o **xlabel(), ylabel():** Specify the x and the y titles respectively you can change the fontsize and color

- o **show()**: displays the plot

- o **savefig():** saves the plot at the specified location

Some of the major components of any graphs or plot are:

- o Plot Area or Figure or Chart Area

- o Legend

- o X Axis

- o Y Axis

- o Plot Title

- o Ticks

Parts of a Figure/Plot
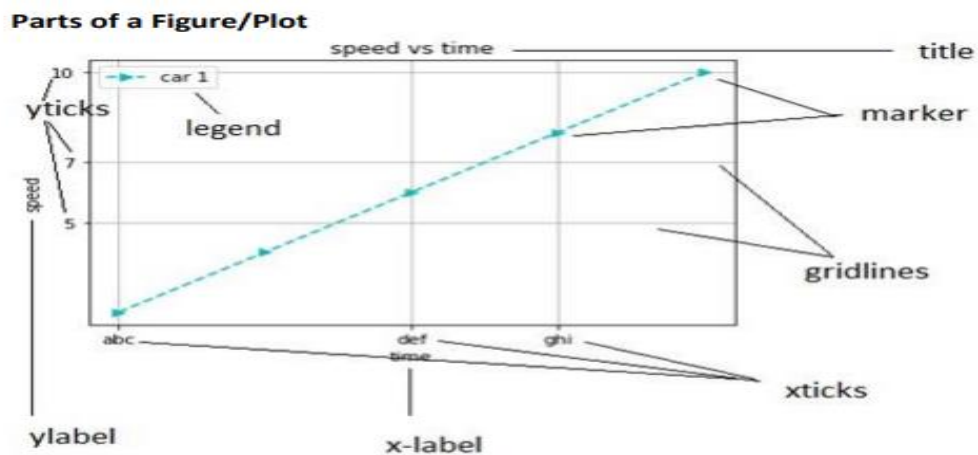
Pyplot′s plot () is used to create line chart

Pyplot′s bar () is used to create bar chart

Pyplot′s hist () is used to create histogram

Pyplot′s barh () is used to create horizontal bar chart

savefig is the function to save the graph

MULTIPLE CHOICE QUESTIONS

1. Which method is used to save the output of pyplot in the form of image file?

      A．savefig(`filename`)   B．save_fig(`filename)

      C．save_figure(`filename`)   D．save_img(`filename`)

Answer: A

2. The command used to give a heading to a graph is

      A. plt.show()   B. plt.plot()

      C. plt.xlabel()   D. plt.title()

Answer: D

3. Which is a python package used for 2D graphics?

      A. matplotlib.pyplot   B. matplotlib.pip

      C. matplotlib.numpy   D. matplotlib.plt

Answer : A

4. Which method is used to plot horizontal bar graph in pyplot?

      A. horizontal_bar()   B. barh()

      C. hbar()   D. bar()

Answer: B

5. What is true about Data Visualization?
   A. Data Visualization is used to communicate information clearly and efficiently to users by the usage of information graphics such as tables and charts.
   B. Data Visualization helps users in analyzing a large amount of data in a simpler way.
   C. Data Visualization makes complex data more accessible, understandable, and usable.
   D. All of the above

Answer: D

ASSERTION & REASONING

1) Assertion (A): Pandas offer a single and convenient place to plot graph i.e. matplotlib for visualisation and data analysis through graph.

Reason (R): Matplotlib is a 2-D plotting library that helps in visualising figures.

    A．Both Assertion (A) and reason (R) are true and reason (R) is the correct explanation of Assertion (A).

    B．Both Assertion (A) and reason (R) are true but reason (R) is not the correct explanation of Assertion (A).

    C．Assertion (A) is true but reason (R) is false.

    D．Assertion (A) is false but reason (R) is true.

Answer: A

2) Assertion (A): Pyplot plot () function is used to create line charts. +

Reason (R): Pyplot's barh () function is used to create horizontal bar graph.

A. both (A) and (R) are true, and (R) is the correct explanation of (A)

B. both (A) and (R) are true, but (R) is not correct explanation of (A)

C. (A) is true but (R) is false.

D. (A) is false but (R) is true.

Answer : B

01 MARK QUESTIONS

01. The best suitable chart to display data trend is ……
    Ans: Line
                    OR
    To view changes in data over a period of time we can use …… chart
    Ans: Line

02. A _____ is a tool that summarize discrete or continuous data.
    Ans: Histogram

03. In histogram, it describes the no of data points that falls within a range of given values.
    Ans: bins

02. Name the function which is used to save the plot.
    Ans: savefig()

05. Pyplot interface is a collection of methods within …………... library of python
    Ans: Matplotlib library

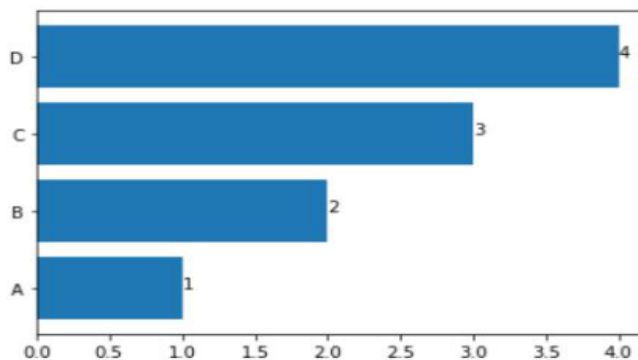## 02 MARKS QUESTIONS

01.   **Draw the output of the following python code :**

       import matplotlib.pyplot as plt
                    x = ["A", "B", "C", "D"]
                    y = [1, 2, 3, 4]
                    plt.barh (x, y)
       plt.show()

       Output:

Answer:

02.   Plot following data on histogram:

```
import matplotlib.pyplot as mp
I= [24,17,14,22,25,26,38,42,24,12,28,19,32,21,35,28,21,31,18,19]
mp.hist(1)
mp.show()
```
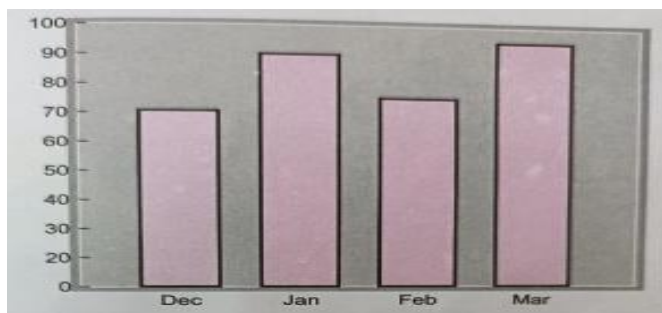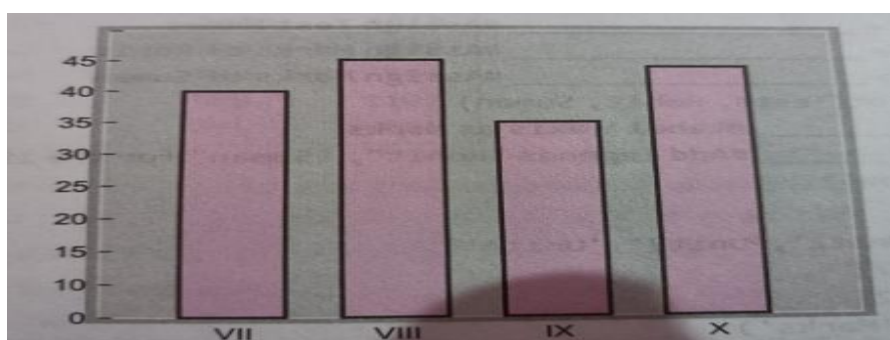
Answer:
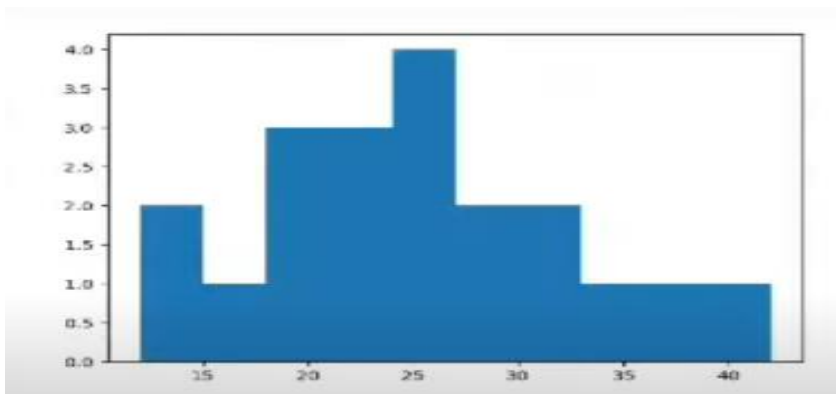
03. Draw the bar graph of following code :

```
import matplotlib.pyplot as plt
Months = ["Dec", "Jan", "Feb", "Mar"]
Attendance = [70, 90, 75, 95]
plt.bar(Months, Attendance)
plt.show()
```

Answer:

04. Write the code for the following graph

Answer: import matplotlib . pyplot as plt

        Classes = ['VII', 'VIII', 'IX', 'x']
        Students = [40, 45, 35, 44]
        plt . bar (classes, students)
        plt . show ( )

05. Write a code to plot the Monthly Attendance of students in class as shown in the figure given below:
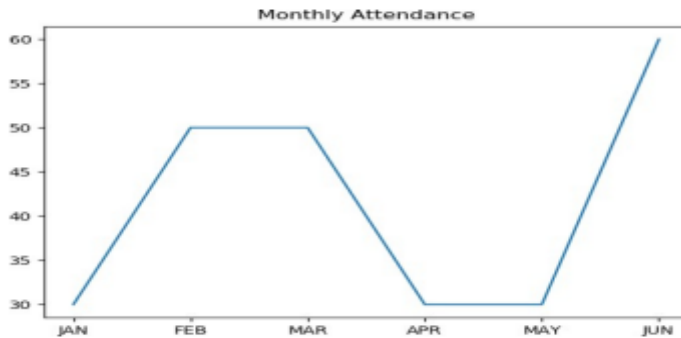
Answer: refer Q. no. 3

03 MARKS QUESTIONS

01.   Look at the following graph and write the appropriate code to obtain this output (Please assume that   pandas and matplotlib is already imported)
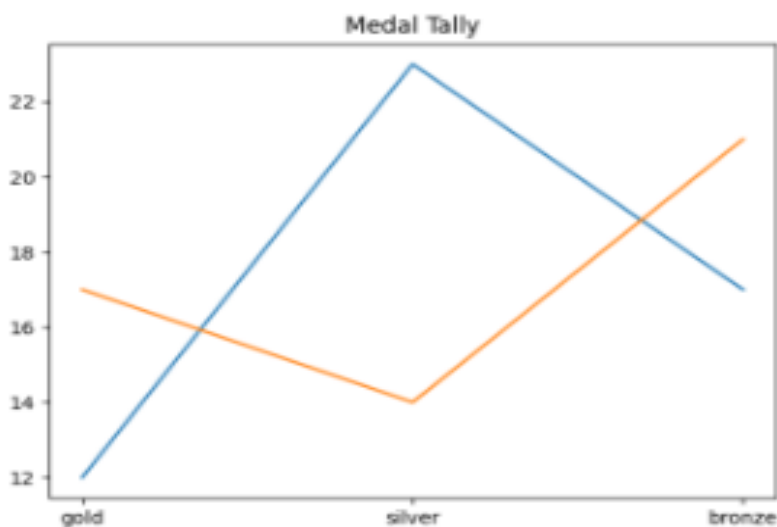
Answer:

        medal = ['gold', 'silver','bronze']
        delhi= [12,23,17]
        mumbai = [13,14,21]
        plt.plot(medal,delhi)
        plt.plot(medal,mumbai)
        plt.title("Medal Tally")
        plt.show()

02. Write python code to create histogram based on given data:

        rcb: 78,63,49,41,68,101,56,79,68,96
        mi: 45,85,98,102,42,50,43,48,63,39

Answer   :   import matplotlib.pyplot as m
        rcb=[78,63,49,41,68,101,56,79,68,96]
        mi=[45,85,98,102,42,50,43,48,63,39]
        m.hist([rcb,mi],cumulative='true')
        m.show()

03. Write the code for the following graph :
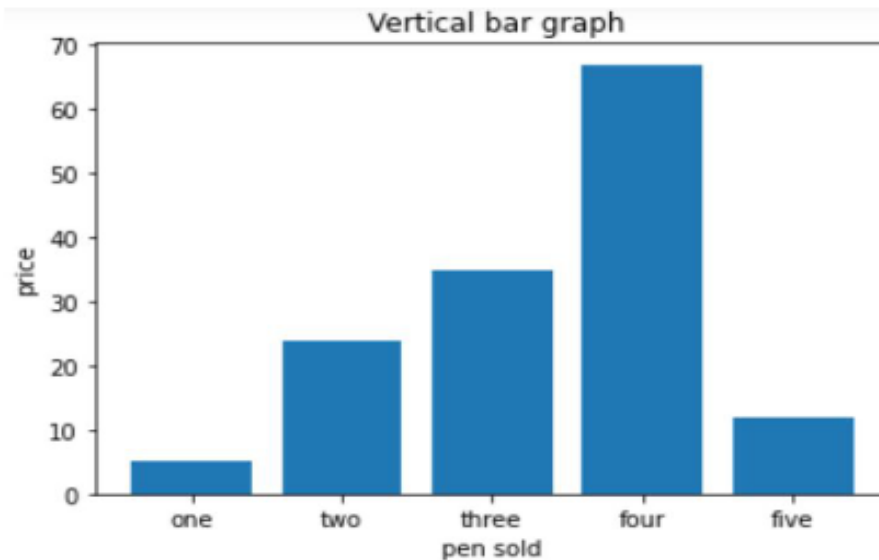
Answer :   import matplotlib.pyplot as plt
        x=['one', 'two', 'three', 'four', 'five']
        y=[5, 24, 35, 67, 12]
        plt.bar(x, y)
        plt.xlabel("pen sold")
        plt.ylabel("price")
        plt.title(" Vertical bar graph")
        plt.show()

04.   Plot following data on bar graph :

        English : 56,78,90,34
        Science : 65,77,54,32
        Maths : 45,67,43,41

   Answer :

        import matplotlib.pyplot as pp
        eng = [56,78,90,34]
        sci = [65,77,54,32]
        maths=[45,67,43,41]
        pp.bar(eng,sci,maths)
        pp.xlabel('Marks')
        pp.ylabel('Subjects')
        pp.show()

05 . **Write code to plot a line chart to depict the run rate of T20 match from given data :**

Overs	Runs
5	45
10	79
15	145
20	234

Answer :

```
import matplotlib as pp
overs = [5,10,15,20]
runs = [54,79,145,234]
pp.plot(overs,runs)
pp.xlabel('Overs')
pp.ylabel('Runs')
pp.show()
```

04 MARKS QUESTIONS

01. **Observe the following figure**. **Write code for same**:
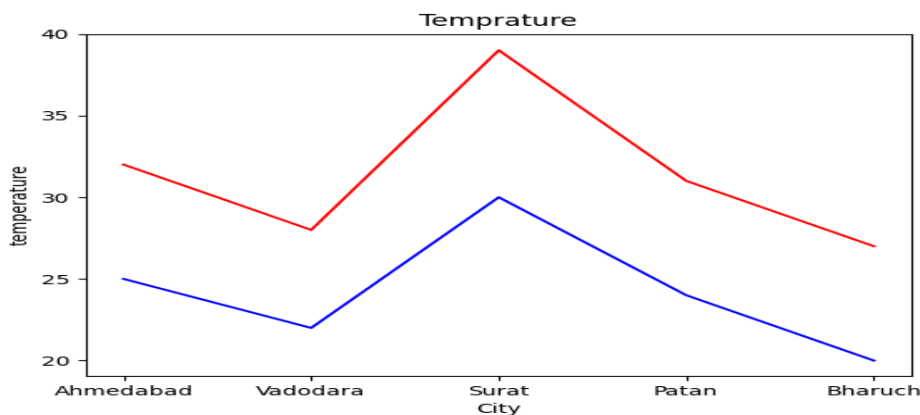
Answer :

```
import matplotlib.pyplot as plt

city=['Ahmedabad','Vadodara','Surat','Patan','Bharuch']

max_temp=[32,28,39,31,27]

min_temp=[25,22,30,24,20]   plt.plot(city,max_temp,color='red')

plt.plot(city,min_temp,color='blue')

plt.xlabel("City")

plt.ylabel("temperature")

plt.title("Temprature")

plt.yticks([20,25,30,35,40])

plt.show()
```

2. Write python code to plot a bar chart for India's runs in T20 World cup as shown below:

India's T20W Cup - 2022
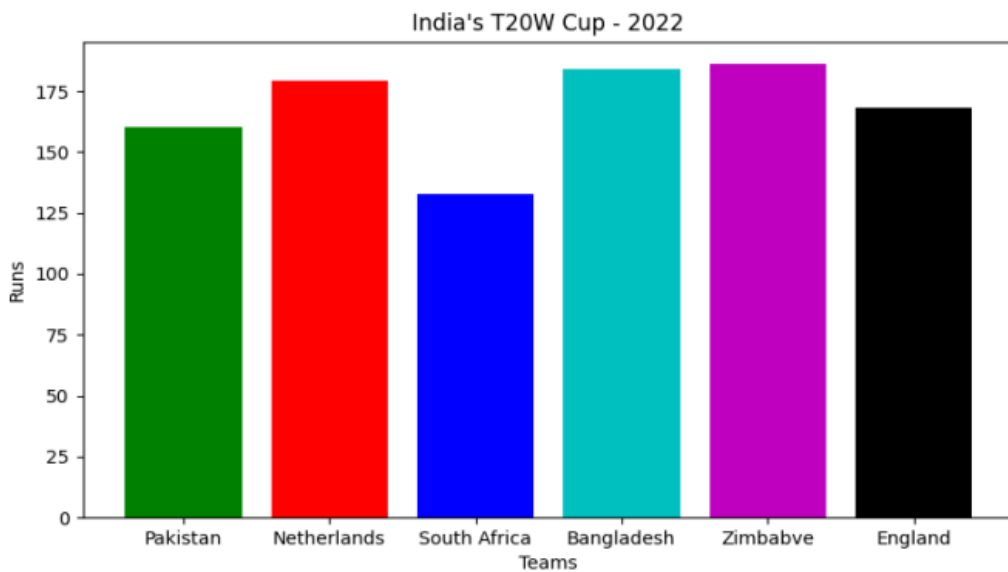
Colours: Pakistan – Green, Netherlands – red, South Africa – Blue, Bangladesh – Cyan, Zimbabve – Magenta,

Apply appropriate labels to the chart and x and y axis.

Answer :

```python
import matplotlib.pyplot as plt
teams=[ "Pakistan","Netherlands","SouthAfrica","Bangladesh","Zimbabwe","England" ]
runs=[160,179,137,184,186,168]
plt.bar(teams, runs, color=['r','g','b','c','m','k'])
plt.title("India's T20W Cup 2022")
plt.xlabel("Teams")
plt.ylabel("Runs")
plt.show()
```

3. Mrs. Namrata is a coordinator in the senior section school. She represented data on number of students who passed the exam on line chart as follows :

Anwser :
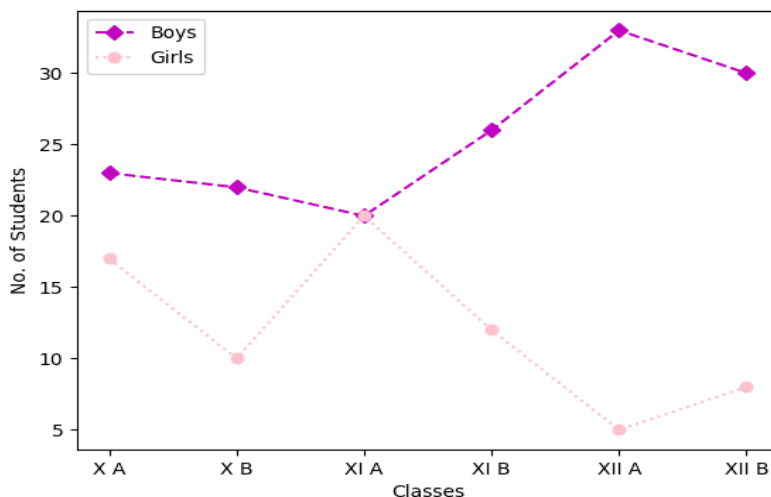
Import matplotlib.pyplot as plt

classes=["X A","X B","XI A","XI B","XII A","XII B"]

no_of_boys=[23,22,20,26,33,30]

no_of_girls=[17,10,20,12,5,8]

plt.line(classes,no_of_boys) #Statement

plt.line(classes,no_of_girls) #Statement 2

plt.xtitle("No of Stduents") #Statement 3

plt.ytitle("Classes") #Statement 4

plt.show()

i) What will be the correct code for Statement 1 and Statement 2?

ii) What is the correct function name for Statement 3 and Statement 4?

iii) Write a method and parameter required to display legends?

iv) Write to save the figure as image.

Ans: i) The code for statement 1 and statement 2 is as follows:

1. Statement 1: plt.plot(classes,no_of_boys)
2. Statement 2:plt.plot(classes,no_of_girls)

ii) The correct code for statement 3 and statement 4 is as follows:

1. plt.xlabel('classes')
2. plt.ylabel('No of stduents')

iii) To display the legend she need to add label parameter in the plot method as following:

1. plt.plot(classes,no_of_boys, label='Boys')
2. plt.plot(classes,no_of_girls , label='Girls')

To display legend she need to write this function:
        plt.legend()
iv) To save the figure as image she needs to use savefig() method as follows:
      plt.savefig("boygirlsspass.jpg')

03. Write a program to create a horizontal bar chart for India's medal tally.

Country	Gold	Silver	Bronze	Total
Australia	80	59	59	198
England	45	45	46	136
India	26	20	20	66
Canada	15	40	27	82

Answer:

```
import matplotlib.pyplot as plt
Info = ['Gold', 'Silver', 'Bronze', 'Total']
India = [26, 20, 20, 66]
plt.ylabel("Medal type")
plt.xlabel("Medal count")
plt.title("India's Medal Tally in Commonwealth 2018")
X = range (len (Info))
plt.barh(X, India, color = ['gold', 'silver', 'brown', 'black'])
plt.show()
```

Output
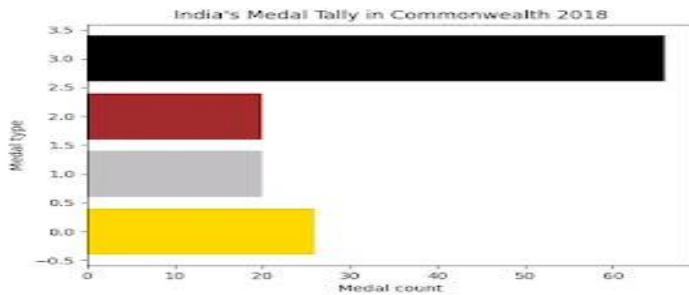
5. Consider the following program and answer any four question from (i) to (iv):

```
import _____ as plt                              #line 1
plt.bar ([2,3,4,8,1],[2,4,7,3,5], label= _____ )   #line 2
plt.legend( )                                       #line 3
plt.xlabel(____ )                                   #line 4
plt.ylabel('Height')                               #line 5
plt._____ ('Vertical Bar Chart')                 #line 6
_____                                    #line 7
```

i) Which Module will be imported in Line 1 for above code?
        a) matplotlib   b) matplotlib.pyplot
        c) plotlib   d) None of these

ii) Name the label that can be used to represent the bar chart in Line 2.
        a) Data   b) Data Values
        c) Values for X axis   (d) All of these

iii) Which message is best suited for xlabel?
        a) X values   (b) Y values
        b) Legend   (d) Vertical

iv) Which method will take place at Line 6 for setting heading on the top of Chart?
        (a) Title()   (b) title()
        (c) Head()   (d) All of these.

Answer:
i)   matplotlib.pyplot
ii)   All of these
iii)   X values
iv)   title()

UNIT 2. Database Query using SQL

(Revision of database concepts and SQL commands covered in class XI)

Database : A database is an organised collection of interrelated data.

DBMS : The software used to manage databases is called Database Management System (DBMS).

Relational Database : A database in which the data is stored in the form of relations or tables is called a Relational Database. A relational database is a collection of one or more tables.

RDBMS : A DBMS used to manage Relational Databases is called Relational Database Management System (RDBMS).

Benefits of using DBMS :
1. Redundancy can be controlled.
2. Inconsistency can be avoided.
3. Data can be shared.
4. Security restrictions can be applied.

Relation/Table : A table/relation is a two dimensional representation of data arranged in columns (also called fields or attributes) and rows (also called records or tuples).

Primary Key : The group of one or more columns used to uniquely identify each row of a relation is called its Primary key. A table can have only one Primary key.

Candidate key : A column or a group of columns which can be used as a primary key of a relation is called a candidate key. There can be many candidate keys for a table.

Alternate key : A candidate key of a table which is not made its primary key is called its Alternate key.

Degree of a Table : The number of columns in the table is called the degree of a table. **Cardinality of a**

Table : The number of rows in a table is called its cardinality.

SQL (Structured Query Language) : SQL is the language used to manipulate and manage databases and tables within an RDBMS.
The SQL Language is comprised of the following kinds of statements :

(a) **DDL (Data Definition Language) :** It is a category of SQL commands that are used to create, destroy, or restructure databases and tables. Eg. CREATE, DROP, AND ALTER.

(b) **DML (Data Manipulation Language) :** It is a category of SQL commands that are used to manipulate data within tables. Eg. INSERT, UPDATE, DELETE.

(c) **DQL (Data Query Language) :** It is a category of SQL commands that are used only to view the data / information present in a table / database. Eg. SELECT command comes under DQL (d) **DCL (Data Control Language) :** It is a category of SQL commands that control access to the databases and tables. Eg. GRANT, REVOKE.

MySQL

MySQL is an open source relational database management system. MySQL was created by the company MySQL AB, founded by David Axmark, Allan Larsson and Michael Widenius. MySQL was bought by Sun Microsystems which is now owned by Oracle Corporation.

SQL

SQL Data Types:

S.No.	Data Type	Explanation	Example
1.	CHAR	Stores character data. All data have exactly the same size specified in the definition even if user is entering less number of characters in input.	NAME CHAR (20)
2.	VARCHAR	Stores variable length character. It stores only the number of characters that the user has specified.	ADDRESS VARCHAR (20)
3.	FLOAT, REAL, DOUBLE	Stores number having decimal value. Precision after the decimal point is not guaranteed.	Salesamt FLOAT, Cost REAL, Totalsales DOUBLE,
4.	DEC, DECIMAL, NUMERIC	Stores numbers having decimal value. Precision of the numbers after decimal point is guaranteed	Int_rate DEC (5,2), Int_rate DECIMAL (5,2), Int_rate NUMERIC (5,2), { 5 is the maximum digits of the number and 2 is the number of digits after decimal point DEC (5,2) will store maximum number as 999.99 ie max 5 digits out of which 2 digits can be after decimal point}
5.	INT INTEGER	Stores integer values	Age int, Age integer
6.	DATE	Stores the date. Standard dates are expressed in "yyyy-mm-dd" format in SQL.	Dateofbirth DATE,
7.	TIME	Stores time expressed in "HH:MM:SS"	Starttime TIME,

Basic MySQL Commands:

1. **Show databases;**
It shows all the databases present in mysql
2. **Create database** *databasename*;
It creates a new database named *databasename* in mysql.
3. **Use** *databasename*;
The current database on which we are working is changed to *databasename*.
4. **Show tables;**
It shows the list of all tables present in the current database.

1. CREATE TABLE:

It is used to create a new table in RDBMS.

Syntax:

CREATE TABLE <tablename>

(<column_name> <data_type> <column_constraint>,

<column_name> <data_type> <column_constraint>,

. . . .

....

<column_name> <data_type> <column_constraint>

);

Example:-

create table students

(

rollno   integer Primary Key,

name   varchar (20)   not null,

age   integer,

class   varchar (8),

fee   integer,

dob   date,

sex   char (1),

per integer,

city varchar (20)

);

INSERT statement: Insert statement is used for adding rows to a table.

The following point must be followed while writing insert statement:

Any data that is a number (int, float, and dec, numeric) is entered without quotes and any data that is not a number (char, varchar, and date, time) must be enclosed either in single quotes or double quotes.

SQL> insert   into   <table name>   values (value1, value2, value3, value4, value5 …);
Example

SQL> insert into students values (11101, 'Bhim', 18, 'XI-A', 3000, '2002-04-08', 'M', 86, 'satna') ;

rollno	name	age	class	fee	dob	sex	Per	city
11101	Bhim	18	XI-A	3000	2002-04-08	M	86	Satna
11102	Rani	18	XI-A	1800	2002-05-07	F	75	Rewa
11103	Bharat	18	XI-A	3000	2002-04-18	M	86	Katni
11104	Laxmi	17	XI-A	1800	2003-10-09	F	73	Rewa
11201	Vijay	18	XI-B	1800	2002-04-08	M	71	Satna
11202	Ramesh	18	XI-B	2700	2002-08-09	M	65	Rewa
11203	Pooja	18	XI-B	1800	2002-10-09	F	65	Rewa
11204	Prachi	17	XI-B	1950	2003-07-19	F	60	satna
12101	Ajay	19	XII-A	3000	2001-03-20	M	80	satna
12103	Laxman	20	XII-A	3150	2000-04-06	M	81	Katni
12104	Rajni	19	XII-A	3000	2001-06-06	F	79	Katni
12105	Ram	19	XII-A	3150	2001-07-24	M	71	Rewa
12106	Sachin	19	XII-A	3000	2001-08-10	M	73	satna
12107	Savita	20	XII-A	3150	2000-04-21	F	80	satna
12202	Ram	19	XII-B	2700	2001-05-05	M	65	rewa
12203	Sanjay	20	XII-B	2750	2000-02-03	M	72	Rewa
12204	Arti	20	XII-B	2700	2000-05-25	F	62	Katni
10101	Abha	16	X-A	2700	2004-05-25	F	62	satna
10102	Abhay	16	X-A	2700	2004-06-20	M	62	katni
10103	Priti	15	X-A	2700	2005-05-25	F	74	rewa
10104	Gopal	16	X-A	2700	2004-01-20	M	76	satna
10201	Asha	16	X-B	2700	2004-04-25	F	81	satna
10202	Sateesh	16	X-B	2700	2004-07-21	M	80	katni
10203	Arti	15	X-B	2700	2005-02-12	F	72	rewa

When we don't have all columns value then

rollno	name	age	class	fee	sex	dob	percentage	city
12110	Ramesh	18	XII-A	3000	M			

We have 2 following methods

Method 1.   (we write null explicitly)

SQL> insert into students values (12110, 'Ramesh', 18,' XII-A' , 3000,'M' , null, null, null) ;

Method 2.   (we give column names with table name and gives the values for same columns.   In this method column sequence can be changed)

SQL> insert into students (rollno, name, age, class, fee, sex)   values (12110, 'Ramesh', 18,' XII-A' , 3000,'M') ;

SQL> insert into students (rollno, name, class, sex, age, fee)   values (12110, 'Ramesh','XII-A' , 'M' , 18, 3000) ;

Both insert command will insert the same values.

To see values from table :-   we use select command.

SQL> select * from <table name>;

SQL> select * from students;

It will show all data from table.

To see some selected columns from table we use following method .

SQL> select <col1, col2, col3 . . . . . .> from <table name>;

//in this statement col1, col2 …. . **are the names of selected columns of table .**

SQL> Select rollno, name, age, class from students;

// only two columns will be displayed .

We can give any sequence of column names of table .

SQL> select name, rollno, class, age from students;

To find some specific values from table: - we use **where clause**

SQL> select * from students
     Where age >=17;

SQL> select name, age from students
     Where age>=17;

To create a condition we can use **and** operator (when we use 'and', result will come when all conditions that are written must be true)

SQL> select name, age from students
     Where age>=16 and age<=19 ;

SQL> select name, age from students
     Where name=' Vijay'   and age<=19 ;

SQL> select name, age from students
     Where name=' Vijay'   and age >=19 ;

For some specific condition we can use **or operator** (when we use 'or', result will come when any condition is true)

SQL> select name, class, fee from students
        Where fee=3000 or fee=2700 ;

SQL> select name, class, fee from students
     Where name=' Sachin'   or name='Sourav';

SQL> select name, class, fee from students
     Where name=' Sachin'   or name='Sanjay';

Use of between in place of and (when we use same column for creating a range using 'and' condition then we can use 'between' in place of 'and' . When we use 'between' both values are included in the range)
In following both query we are finding age from 16 to 20

SQL> select name, age from students
     Where age>= 16 and age<= 20 ;

SQL> select name, age from students
     Where age between 16 and 20 ;

SQL> select name, age, fee from students
     Where fee between 1800 and 3000 ;

Use of <u>in</u> in place of <u>or</u> (when we use same column for creating a condition using **'or'** then we can use **'in'** in place of **'or'** .

In following both query we are finding age from 16 to 20

SQL> select name, age from students
     Where age= 16 or age= 20;
SQL> select name, age from students
     Where age in (16, 20);
SQL> select name, class, fee from students
    Where name='Sachin' or name='Sanjay';
SQL> select name, class, fee from students
    Where name in ('Sachin','Sanjay');

Use of 'like' for character type columns . We use 'like' to fine some specific value in character column . We use '%' with like, '%' indicates any character any number of times . And '_' (underscore) indicates one character .

SQL> select name, fee from students
    Where name='Sachin' ;
[name starting with 's']
SQL> select name, fee from students
    Where name like 'S%' ;
[name ending with 'a']
SQL> select name, fee from students
    Where name like '%a' ;
[name ending with 'i']
SQL> select name, fee from students
    Where name like '%i' ;
[third char in name is 'a' , two underscore without space and 'a']
SQL> select name, fee from students
    Where name like '_ _a%' ;
[Second char in name is 'a' , one underscore without space 'a']
SQL> select name, fee from students
    Where name like '_a%' ;
[Name has only four character, four underscore without space]
SQL> select name, fee from students
    Where name like '_ _ _ _' ;
[Name has only three character, three underscore without space]
SQL> select name, fee from students
    Where name like '_ _ _' ;
[Name has 'a' in any place]

SQL> select name, fee from students
    Where name like '%a%';

[we can display any calculation from integer column , 10% of fee column]
SQL> select name, fee, fee*0.1 from students;
[we can display any calculation from integer column, 10% of fee column of class 'XII-A']
SQL> select name, fee, fee*0.1 from students
Where class='XII-A' ;
[we can change any column name only for display purpose, using ' new column name' method]
SQL> select name 'students name', fee, fee*0.1 'discount' from students;

Order By clause [used to display data in any order ascending or descending order]   (by default ascending order for descending order we have to write 'desc' with column name)

SQL> select name, age from students
        Order by age ;
SQL> select name, age from students
        Order by age desc ;
SQL> select name, age, fee from students
        Order by fee ;
SQL> select name, age, fee from students
        Order by fee desc ;
SQL> select name, age, class from students
        Order by class ;
SQL> select name, age, class from students
        Order by class desc;

[when values are same in any column then we can use any other column for further sorting]

[class and age is in ascending]
SQL> select name, age, class from students
        Order by class, age;
[class is in ascending order and age is in descending order]
SQL> select name, age, class from students
        Order by class, age desc;
[class is in descending order and age is in ascending order]
SQL> select name, age, class from students
        Order by class desc, age ;
[class and age is in descending]
SQL> select name, age, class from students
        Order by class desc, age desc;
[class and age is in ascending]
SQL> select name, age, class from students
        Where fee > 2700
        Order by class, age;
[class is in ascending order and age is in descending order]
SQL> select name, age, class from students
        Where fee > 2700
          Order by class, age desc;
[class is in descending order and age is in ascending order]
SQL> select name, age, class from students
        Where fee > 2700
        Order by class desc, age;
[class and age is in descending]
SQL> select name, age, class from students
        Where fee > 2700
        Order by class desc, age desc;

Working with NULL （ if we want to use NULL as filter condition then we use is in place of = ）

selecte name from students
where age is null;
Built-In Functions
Mathematical Functions
• There are various built-in functions available in MySQL for mathematical calculations . These mathematical functions accept numeric value, perform some operations on it and also return numeric value in result .
• Some mathematical functions used in MySQL are as follows :

1. POWER ( ) : This function is used to get the power of the given values.

Syntax : POWER (m, n)

Parameter :

m : It is a base value in the calculation

n : It is exponent value in the calculation

This function returns m raised to the nth power

2. ROUND ( ) : This function is used to round up the number to the upwards or downwards whichever the nearest whole number.

Syntax : ROUND (number)

If you want to get number with certain number of decimal places, you can also pass that number, and use following syntax.

ROUND (number, decimal place)

3. MOD ( ) : This function is used to return the remainder of one expression by dividing it to another expression.

Syntax : MOD (n, m)

Parameter :

n : number to be divided by m

m : number that will divide n

Mod () %	Select Mod (7,3) ; Select 7%3; Select 7 Mod 3 ; **ANSWER : 1**
Pow () / Power ()	Select Pow (3,2) ; / Select Power (3,2) ; **ANSWER : 9**
Round ()	**QUERY ANSWER** Select round (54.279,1) ; 54.3 Select round (54.279,2) ; 54.28 Select round (54.279) ; 54 Select round (54.279,0) ; 54 Select round (54.679) ; 55 Select round (54.679,0) ; 55 Select round (54.279,-1) ; 50 Select round (324.279,-1) ; 320 Select round (354.279,-2) ; 400 Select round (754.279,-1) ; 750 Select round (754.279,-2) ; 800

Text Functions

MySQL text functions manipulate the character string data effectively. Some text functions used in MySQL are as follows:

1. UCASE()/UPPER(): This function is used to convert the string argument into upper case characters.
Syntax:
UCASE (str)
OR
UPPER (str)

2. LCASE( )/LOWER(): This function is used to convert the characters of an argument string to the lowercase characters.
Syntax:
LCASE (str)
OR
LOWER (Str)

3. MID( ): This function extracts a substring from a string and returns a string with given length and position.
Syntax:
MID (str, pos, len)

4. SUBSTRING( )/SUBSTR( ): These functions are same as MID ( ) function.
Syntax:
SUBSTRTING (str, pos, len)

5. LENGTH( ): This function is used to return the length of the specified string. It returns the length in bytes. This function also includes all the blanks spaces which are include in string.
Syntax:
LENGTH (str)

6. LEFT( ): This function is used to return a specified number of characters from the left of the string. The number of characters returned is determined by the second argument.
Syntax :
LEFT (str, len)

7. RIGHT( ): This function is just opposite of LEFT ( ) function. It is used to return a specified number of characters from the right of the string. The number of characters returned is determined by the second argument.
Syntax:
RIGHT (str, len)

8. INSTR( ): This function takes two arguments as str (string) and sub_str (sub string) and returns the position of the first occurrence of a specified sub_str from a given str.
Syntax:
INSTR (str, sub_str)

9. LTRIM( ): This function takes a string argument and returns a new string with all the leading space characters removed. Spaces in the middle or trailing spaces are not removed.
Syntax:
LTRIM (str)

10. RTRIM( ): This function takes a string argument and returns a new string with all the trailing space characters removed. Spaces in the middle or leading space are not removed.
Syntax:
RTRIM (str)

11. TRIM( ): This functions enables you to remove leading and trailing white space from string.
Syntax :
TRIM (str)

Example : –

Lower () / Lcase ()	Select Lower ("KV1satna") ; / Select LCase ("KV1satna") ; **ANSWER :** **kv1satna**
Upper () / Ucase ()	Select Upper ("KV1satna") ; / Select UCase ("KV1 satna") ; **ANSWER :** **KV1SATNA**
Length ()	Select Length ("Jai Hind !") ; **ANSWER : 9**
Rtrim ()	Select Rtrim (" India ") ; **ANSWER :** India
LTrim ()	Select Ltrim (" India ") ; **ANSWER :** India
Trim ()	Select Trim (" India ") ; **ANSWER :** India
Right ()	Select Right ("Bharat", 2) ; **ANSWER :** **at**
Left ()	Select Left ("Bharat", 3) ; **ANSWER :** **Bha**
Mid () / **Substr () /** **Substring ()** **(All the above 3 functions are same)**	Select mid ("Kend**riya Vidya**laya,5,10) ; Select Substr ("Kend**riya Vidya**laya,5,10) ; Select Substring ("Kend**riya Vidya**laya,5,10) ; **ANSWER :** **riya Vidya** **NOTE :** Here, 5 is the starting index, 10 is the no. of characters to be extracted (taken)
Instr ()	Select instr ("Bh**a**rat", "a") ; **ANSWER :** **3**

Date Functions

• The date functions are used to perform some operations on date that is stored in the database. Some common date functions are as follows:

1. **NOW ( )** : This function returns the current date and time in the configured time zone as a string, or a number in the `YYYY-MM-DD HH : MM : SS'` or `YYYYMMDDHHMMSS` format.
Syntax:
NOW ( )

2. **DATE ( )** : This function extracts the date value from a date.
Syntax:
DATE ( )

3. **MONTH (**) : This function returns the month for date, in the range 1 to 12 for January to December. If it returns 0 then month part of the given date contains NULL.
Syntax:
MONTH (date)

4. **MONTHNAME ( )** : This function returns the full name of the month for given date.
Syntax:
MONTHNAME (date)

5. **YEAR ( )** : This function returns the year of the given date. It returns a year value in the range 1000 to 9999. If the date is zero, it returns 0.
Syntax :
YEAR (date)

6. **DAY (**) : This function returns the day of the month of a given date. If the date argument is zero, it returns 0. In case, the date in NULL, this function returns NULL.
Syntax :
DAY (date)

Now ()	Select now ( ) ; **ANSWER:→ 2023-09-17 13:57:45**
Date ()	Select Date ("2023-09-17 13:57:45") ; **ANSWER:→ 2023-09-17**
Month ()	Select Month ("2023-09-17 ") ; **ANSWER:→ 09**
MonthName ()	Select Monthname ("2023-09-17 ") ; **ANSWER:→ September**
Year ()	Select Year ("2023-09-17 ") ; **ANSWER:→ 2023**
Day ()	Select Day ("2023-09-17 ") ; **ANSWER:→ 17**
DayName ()	Select DayName ("2023-09-17 ") ; **ANSWER:→ Sunday**

Aggregate Functions

An aggregate function performs a calculation on one or more values and returns a single value.

We often use aggregate functions with the GROUP By and HAVING clauses of the SELECT statement.

Except for count (*), aggregate functions totally ignore NULL values and consider all values present in a column.

Some aggregate functions are as follows:

- **MAX()** : This function returns the maximum value in selected columns. MAX () function ignores NULL values and considers all values in the calculation.

Syntax:

SELECT MAX (Column_Name) FROM Table_Name;

- **MIN()** : This function returns the minimum value in the selected columns. MIN () function ignores NULL values

Syntax:

SELECT MIN (Column_Name) FROM Table_Name;

- **AVG()** : This function calculates the average of specified column (s). It ignores NULL values.

Syntax:

SELECT AVG (Column_Name) FROM Table_Name;

- **SUM()** : This function calculates the sum of all values in the specified columns. It accepts only the expression that evaluates to numeric values also.

Syntax:

SELECT SUM (Column_Name) FROM Table_Name;

- **COUNT()** : This function returns the number of items found in a set.

COUNT (*) function returns a number of rows in a specified table or view that includes the number of duplicates and NULL values.

Syntax:

SELECT COUNT (*) FROM Table_Name;

GROUP BY Clause

- GROUP BY clause is used to group rows returned by SELECT statement into a specified rows or columns.

Syntax:

SELECT column 1, column 2... Aggregate_function (exp)

FROM Table_Name

WHERE condition

GROUP BY Column_Name;

ORDER BY Clause

- ORDER BY clause is used to sort a result set returned by a SELECT statement.
- To sort a result set in ascending order, use ASC keyword and in descending order, use DESC keyword.
- The ORDER BY clause sorts the result set in ascending order by default.

Syntax:

SELECT column 1, column 2...

FROM Table_Name

ORDER BY Column_Name <ASC/DESC>;

HAVING Clause

• The HAVING clause is often used with the GROUP BY clause in the SELECT statement to filter group of rows based on a specified condition.

Syntax:

SELECT column 1, column 2... Aggregate_function (Exp)

FROM Table_Name

GROUP BY Column_Name

HAVING condition;

EQUI JOIN:-

The EQUI JOIN in SQL performs a JOIN against a column of equality or the matching column (s) values that have the associated tables. Here, we use an equal sign (=) as a comparison operator in our 'where' clause to refer to equality.

We can also perform EQUI JOIN by when we use the JOIN keyword followed by the ON keyword and then by specifying the names of the columns and their associated tables in order to check equality.

The Syntax would be as follows:

SELECT column_list FROM table_x, table_y....

WHERE table_x.column_name = table_y.column_name;

or

SELECT * FROM table_x JOIN table_y

[ON (join_condition)]

Example

Table – Student

Rollno	Name	Class
12101	Amit	XII-A
12102	Pramod	XII-A
12103	Ravita	XII-B

Table – Exam

Rollno	PT1	PT2
12101	35	34
12102	36	37
12103	37	37

SQL> Select student.rollno, name, PT1, PT2 from student, exam

Where student.rollno= exam.rollno;

SQL> Select student.rollno, name, PT1, PT2 from student join exam

on student.rollno= exam.rollno;

QUESTIONS

MULTIPLE CHOICE QUESTIONS

Q1　The count ()　function in MySql is an example of _____ .
   a. Math function
   b. Text function
   c. Date Function
   d. Aggregate Function

Ans– Aggregate Function

Q2　Which of the following SQL function will display the current time and date .
   a. now ()
   b. year ()
   c. day ()
   d. All of the above

Ans– a) Now ()

Q3　The _____ function is used in SQL to find one string into another .
   a. substr ()
   b. mid ()
   c. instr ()
   d. left ()

Ans–　c) Instr ()

Q4　NULL value means :
   a. 0 value
   b. 1 value
   c. None value
   d. None of the above

Ans- c. None value

Q5　Write the output for the following SQL commands:
Select round(15.193 , -1);
   a. 11
   b. 10
   c. 15
   d. 14

Ans–a.10

01 MARKS QUESTIONS

Q1　What is a database?

Ans　A database is a collection of interrelated data

Q2　What do you mean by degree and cardinality of a table?

Ans　Degree: - No.　of columns with in a table .

Cardinality: - No.　of rows within a table .

Q3　What is tuple?

Ans　Rows in a table are called tuple

Q4　What is domain?

Ans　Domain is the pool of values from which actual values appearing in a column are taken

Q5　Full form of DDL .

Ans　Data Definition Language

Q1   Pramod has recently started working in MySQL． Help him in understanding the difference between the following：
count（column_name） and count（＊）

Ans The function COUNT（column_name） counts the number of records in a particular column but not includes null value
While COUNT（＊） will count total no of rows in a table，null value doesn't affect the result．

Q2   Susheel, a database administrator, has grouped records of a table with the help of group by clause． He needs to further filter groups of records generated through group by clause． Suggest suitable clause for it and properly explain its usage with the help of an example．

Ans With group by clause for more filter Having clause is used．
Example：
SELECT DEPTNO, COUNT（＊） FROM EMP
GROUP BY DEPTNO
HAVING COUNT（＊）＞3;

Q3   Briefly explain the purpose of the following SQL functions：
  a. power（）
  b. mod（）

Ans pow（m,n） returns the value m raise to power n
mod（a,b） returns the remainder after a divide by b

Q4   Consider the following SQL string： "kvsjabalpur" Write commands to display：

  a. "jabalpur"
  b. "kvs"

Ans a. select substr（"kvsjabalpur", 4）;
      or
      select substring（"kvsjabalpur", 4）;
      or
      select mid（"kvsjabalpur",4）;
      or
      select right（（"kvsjabalpur", 8）;
  b. select substr（"kvsjabalpur",1,3）;
      or
      select substring"kvsjabalpur",1,3）;
      or
      select mid（（"kvsjabalpur",1,3）;

Q5   Differentiate between Order By and Group By clause．
Ans **Order by** clause is used to sort data in ascending or descending order based on one or more column．
Group by clause can be used in a SELECT statement to collect data across multiple records and group the result by one or more columns．

Q1   What is aggregate function? Write its names.

Ans   Aggregate function is a function where the values of multiple rows are grouped together as input based on a certain criterion to form a single value of more significant meaning. Different aggregate functions are : SUM(), AVG(), MAX(), MIN(), COUNT()

Q2   Write outputs for SQL queries (i) to (iii) which are based on the given table PURCHASE.

Table : PURCHASE

CNO	CNAME	CITY	QUANTITY	DOP
C01	GURPREET	NEW DELHI	150	2022-06-11
C02	MALIKA	HYDERABAD	10	2022-02-19
C03	NADAR	DALHOUSIE	100	2021-12-04
C04	SAHIB	CHANDIGARH	50	2021-10-10
C05	MEHAK	CHANDIGARH	15	2021-10-20

1. SELECT LENGTH(CNAME) FROM PURCHASE WHERE QUANTITY>100;
2. SELECT CNAME FROM PURCHASE WHERE MONTH(DOP)=3;
3. SELECT MOD(QUANTITY,DAY(DOP)) FROM PURCHASE WHERE CITY = 'CHANDIGARH';

Ans   I.   8
       II.   NO OUTPUT
       III.   0
              15

Q3   Predict the output of the following SQL queries

1. SELECT TRIM("   KVS RO JABALPUR   ");
2. SELECT LEFT ('INFORMATICS',5);
3. SELECT UPPER (MID("I love my india",11));

Ans   1. "KVS RO JABALPUR"
       2. INFOR
       3. India

Q4   Predict the output of the following queries:

1. select instr('exams@cbse.nic.in','.');
2. select substr('exams@cbse.nic.in',7,4);
3. select left('exams@cbse.nic.in',5);

Ans   1. 11
       2. cbse
       3. exams

Q5   Abhilasha is working with functions of MySQL. Explain her following:

i.   What is the purpose of now() function?
ii. How many parameters does it accept?
iii. What is the general format of its return type?

Ans   i.   Now() returns system date and time
       ii.   No parameter

iii.   yyyy-mm-dd hh:mm:ss

04 MARKS QUESTIONS

Q1   Write suitable SQL query for the following:

i.   Display 7 characters extracted from 7th left character onwards from the string 'INDIA SHINING'
ii.   Display the position of occurrence of string 'COME' in the string 'WELCOME WORLD'.
iii.   Round off the value 23.78 to one decimal place.
iv.   Display the remainder of 100 divided by 9.

Ans

i.   SELECT MID ('INDIA SHINING',7,7);
ii.   SELECT INSTR ('WELCOME WORLD','COME');
iii.   SELECT ROUND (23.78,1);
iv.   SELECT MOD (100,9);

Q2   Write suitable SQL query for the following:

i.   Display name of the Month from your date of birth.
ii.   Convert email-id to lowercase.
iii.   Count the number of characters in your name.
iv.   To remove leading spaces from the '   VANDE BHARAT'   '.
Ans
i.   SELECT MONTHNAME ('2022-10-12');
ii.   SELECT LOWER ('abc@gmail.com');
iii.   SELECT COUNT ('ROMIL');
iv.   SELECT LTRIM ('   VANDE BHARAT   ');

Q3   Consider the following table STOCK and DEALERS and answer the following parts of this question:

Table : STOCK

ItemNo	Item	Dcode	Qty	UnitPrice	StockDate
5005	Ball Pen 0.5	102	100	16	2010-03-31
5003	Bal Pen 0.25	102	150	20	2010-01-10
5002	Gel Pen Premium	101	125	14	2010-02-14
5006	Gel Pen Classis	101	200	22	2009-01-01
5001	Eraser Small	102	210	5	2009-03-19
5004	Eraser Big	102	60	10	2009-12-12
5009	Sharpener Classis	103	160	8	200-01-23

Table :DEALERS

Dcode	Dname
101	Reliable Stationers
103	Classis Plastics
102	Clear Deals

Give the output of the following SQL queries:
1. SELECT COUNT (DISTINCT Dcode) FROM STOCK;
2. SELECT QTY*UnitPrice FROM STOCK WHERE ItemNo=5006;
3. SELECT Item, Dname FROM STOCK S DEALERS D WHERE
   S.Dcode=D.Dcode AND ItemNo=5004;
4. SELECT MIN (StockDate) FROM STOCK;

(i) COUNT (DISTINCT Dcode)

               3
(ii) QTY*UnitPrice

            4400
(iii) Item Dname

Eraser Big Clear Deals

(iv) MIN (StockDate)

2009-01-01

Q4   Write SQL queries using SQL functions to perform the following operations:
Note: The table EMPLOYEE (EMPNO,ENAME, DESG, SALARY, BONUS, DOJ)
a. Display employee name and bonus after rounding off to zero decimal places.
b. Display the position of occurrence of the string "an" in employee name.
c. Display the 3 characters from employee name starting from second character.
d. Display the month name for the DOJ of employees.
 Ans
    a. SELECT ENAME, ROUND (BONUS) FROM EMPLOYEE;
    b. SELECT INSTR (ENAME,'AN') FROM EMPLOYEE;
    c. SELECT SUBSTR (ENAME,2,3) FROM EMPLOYEE;
    d. SELECT MONTHNAME (DOJ) FROM EMPLOYEE;

Q5   Explain the following SQL functions using suitable examples.

(i) UCASE()

(ii) TRIM()

(iii) MID()

(iv) DAYNAME()

Ans

1. UCASE(): It converts the string into uppercase.

Example:

SELECT UCASE ('welcome world');

Output:

WELCOME WORLD

2. TRIM(): It removes the leading and trailing

spaces from the given string.

Example:

SELECT TRIM (' Welcome world ');

Output：

Welcome world

3．MID()：It extracts the specified number of

characters from given string．

Example：

SELECT MID（' Welcome world,4,,4）；

Output：

Come

4．DAYNAME()：It returns the weekday name

for a given date

Example：

SELECT DAYNAME（'2023-09-17'）；

Output：

Sunday

05 MARKS QUESTIONS

Q1 Write a output for SQL queries（i）to（ii）and write SQL Query for（iii）to（vi）
,which are based on the table：ACTIVITY given below：

Table：ACTIVITY

ACode	ActivityName	ParticipantsNum	PrizeMoney	ScheduleDate
1001	Relay100x4	16	10000	23-Jan-2004
1002	Highjump	10	12000	12-Dec-2003
1003	ShotPut	12	8000	14-Feb-2004
1005	LongJump	12	9000	01-Jan-2004
1008	DiscussThrow	10	15000	19-Mar-2004

- i. select count（distinct participantsnum）from activity;
- ii. select max（scheduledate）,min（scheduledate）from activity;
- iii. To display the name of all activities with their Acodes in descending order．
- iv. To display sum of Prize Money for each of the Number of Participants groupings
 （as shown in column <u>ParticipantsNum</u> 10,12,16）．
- v. To display the Schedule Date and Participants Number for the activity
 Relay100x4
- vi. To increase PrizeMoney by 500 for High jump activity

Ans：

- i. 3
- ii. 19-Mar-2004 12-Dec-2003
- iii. select ActivityName,Acodes from ACTIVITY order by Acodes desc;
- iv. SELECT SUM（PrizeMoney）,ParticipantsNum FROM ACTIVITY
 GROUP BY ParticipantsNum;
- v. select ScheduleDate,ParticipantsNum FROM ACTIVITY
 where ActivityName='Relay100x4'
- vi. Update ACTIVITY set PrizeMoney = PrizeMoney + 500
 where ActivityName='High jump'

Q2 Write SQL queries for (i) to (iv) and output for SQL queries (v) to (vi), which are based on the tables given below:

Table: TRAVEL.

NO	NAME	TDATE	KM	CODE	NOP
101	Janish	2015-02-18	100	101	32
102	Vedika	2014-06-06	65	101	45
103	Tarun	2012-10-09	32	104	42
104	John	2015-10-30	55	105	40
105	Ahmed	2015-12-15	47	103	16
106	Raveena	2016-02-26	82	103	9

Table: VEHICLE

CODE	VTYPE	PERKM
101	VOLVO BUS	160
102	AC BUS	150
104	ORDINARY BUS	80
103	CAR	25
105	SUV	40

(i) To display NO, NAME, TDATE from the table Travel in the descending order of NO.

(ii) To display the NAME of all the travellers from the table TRAVEL who are travelling by vehicle with code 101 or 102.

(iii) To display the NO and NAME of those travellers from the table TRAVEL who travelled between 2015-12-31 and 2015-04-01.

(iv) Display maximum and minimum kilometers travelled by passengers.

(v) SELECT COUNT (*), CODE FROM TRAVEL GROUP BY CODE HAVING COUNT (*) >1;

(vi) SELECT DISTINCT CODE FROM TRAVEL;

Ans:

i) Select NO, NAME,TDATE from Travel order by NO desc;

ii) Select Name from Travel where code=101 or code=102;

iii) Select No,Name from Travel where Tdate between '2015-12-31' and '2015-04-01';

iv) Select Max (KM),min (KM) from Travel

v) 2 101

   2 103

vi) 101

   104

   105

   103

Q3 Write SQL queries for (i) to (iv) and output for SQL queries (v) to (vi), which are based on the table given below:

Table: SPORTS

Rno	Class	Name	Game1	Grade1	Game2	Grade2
10	7	Sammer	Cricket	B	Swimming	A
11	8	Sujit	Tennis	A	Skating	C
12	7	Kamal	Swimming	B	Football	B
13	7	Venna	Tennis	C	Tennis	A
14	9	Archana	Basketball	A	Cricket	A
15	10	Arpit	Cricket	A	Athletics	C

(i)   Display the names of the students who have grade 'A' in either Game1 or
       Game2 or both.
(ii)   Display the number of students having game 'Cricket'
(iii) Display the names of students who have same game for both Game1 and Game2.
(iv)   Display the games taken by the students whose name starts with 'A'
(v)   SELECT COUNT(*) FROM SPORTS WHERE NAME LIKE '%a%';
(vi)   SELECT MAX(Class) FROM SPORTS WHERE Grade1=Grade2;
(vii) SELECT COUNT(*) FROM SPORTS GROUP BY Game1;

Ans

(i) SELECT Name from SPORTS WHERE Grade1='A' OR Grade2='A';
(ii) SELECT Count(*) from SPORTS WHERE Game1='Cricket' or
Game2='Cricket';
(iii) SELECT Name from SPORTS WHERE Game1=Game2;
(iv) SELECT Game1, Game2 from SPORTS WHERE Name LIKE ('A%');
(v) 5
(vi) 9

Q4   Write SQL queries for (i) to (iv) and output for SQL queries (v) to (vi), which are
      based on the table given below:

Table :- Courier

CNO	CRec	CSen	Amount	CDat	City
159	Vicky	Jack	250	01-Jan-2018	Los Angeles
245	Sam	Kate	220	11-Feb-2019	Paris
358	Alex	Sam	315	30-Apr-2018	London
468	Louis	Simmy	160	01-Mar-2018	Los Angeles
576	Terry	Jane	190	01-Aug-2019	Mexico
688	Lima	Roger	200	03-Nov-2019	Mexico
790	Rosy	Richard	200	21-Jul-2019	Los Angeles
894	Luke	Richard	325	17-May-2018	London
940	Elizabeth	Nicole	150	15-Jan-2019	Paris
999	Nicolas	Longmen	100	10-Jul-2019	Paris

(i)
(ii)   To display crec, cdate and city of all the couriers in decreasing order or amount
(iii) To view cno, amount from the table courier having cdat between 01-apr-2018
and   01-jun-2018
(iv)   To view the number of couriers with amount more than 200.
(v)   To view total amount for each city from the table courier
(vi)   Select cno, crec, from courier where city like 'P%';
(vii) Select count(cno) from courier where csen like 'R%';

Ans:
(i)   select crec, cdate, city from courier order by amount desc;
(ii) select cno, amount from courier where cdate between '01-apr-2018' and '01-
jun-2018';
(iii) Select count(cno) from courier where amount>200;
(iv) Select sum(amount), city from courier group by city;

(v)

Cno	Crec
245	Sam
940	Elizabeth
999	Nicolas

(vi)

Count (Cno)
3

Q5   Write the SQL commands for the i) to iv) and write the output of the (v) on the basis of table

TEACHER.

No.	Name	Age	Department	Dateofadm	Salary	Sex
1	Jugal	34	Computer	1997-10-01	12000	M
2	Sharmila	31	History	1998-03-24	20000	F
3	Sandeep	32	Maths	1996-12-12	30000	M
4	Sangeeta	35	History	1999-01-07	40000	F
5	Rakesh	42	Maths	1997-05-09	25000	M
6	Shyam	50	History	1998-06-27	30000	M
7	Shivam	44	Computer	1997-02-25	21000	M
8	Shalakha	33	Maths	1997-07-27	20000	F

i)   To show all information about the teacher of History department.

ii)   To list the names of female teachers who are in Maths department.

iii)   To list names of all teachers with their date of admission in ascending order.

iv)   To insert a new row in the TEACHER table with the following data:
9,'Param', 26,'Computer', {13/05/95}, 2300,'M'

v)   Give the output of the following SQL statements.
   a.   Select COUNT (distinct Department) from TEACHER;
   b.   Select MAX (Age) from TEACHER where SEX='F';
   c.   Select AVG (Salary) from TEACHER where SEX='M';
   d.   Select SUM (Salary) from TEACHER where Department="History";

Answer:
   i.   Select * from teacher
       Where Department="History";
   ii.   Select name from teacher
       Where Department="Maths" and Sex="F";
   iii.   Select name, Dateofadm from teacher
       Order by Dateofadm;
   iv.   Insert into teacher values (9,'Param', 26,'Computer', "1995-05-13", 2300,'M');
   v.
     a) 3
     b) 33
     c) 23600
     d) 90000

ASSERTION & REASONING

Q1   Assertion (A): SELECT RIGHT ('Program',4) ; Output will be 'ram'
Reason (R): It is used to return a specified number of characters from the right of the string. The number of characters returned is determined by the second argument.
   a. Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of assertion (A).
   b. Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of assertion (A).
   c. Assertion (A) is true but reason (R) is false.
   d. Assertion (A) is false but reason (R) is true.

Ans   a. Assertion (A) is false but reason (R) is true.

Q2   Assertion (A): The ORDER BY clause sorts the result set in descending order by default.

Reason (R): To sort a result set in ascending order we can use ASC keyword with ORDER BY clause.

   a. Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of assertion (A).
   b. Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of assertion (A).
   c. Assertion (A) is true but reason (R) is false.
   d. Assertion (A) is false ut reason (R) is true.

Ans   d. Assertion (A) is false but reason (R) is true

CASE STUDY BASED QUESTIONS

Q1
A Gift Gallery has different stores in India. Database Administrator Abhay wants to maintain database of their Salesmen in SQL to store the data, He has decided that
Name of the database: GiftGallery
Name of the table: Salesman
Attributes of the tables: Scode – Numeric, Sname – Character 25, Address – Character 25, Dojoin – Date, Sales – Numeric and Area – Character 10
Consider the following records in 'Salesman' table and answer the given questions:

Table : Salesman

Scode	Sname	Address	Dojoin	Sales	Area
100	Amit	Delhi	2017/09/29	5000.9	East
101	Sushant	Gurgaon	2018/01/01	7000.75	East
102	Priya	Noida	2018/04/25	3450.45	West
103	Mohit	Delhi	2018/11/03	6000.5	North
104	Priyanshi	Delhi	2019/12/15	8000.62	North

1. State the command that will give the output as :

Sname
Sushant
Priya

   a. Select Sname from Salesman Where Not Address ="Delhi";
   b. Select Sname from Salesman Where Address NOT IN ("Delhi");
   c. Select Sname from Salesman Where Address !="Delhi";
   d. All of the above;

Answer: (d) All of the above

2. Which of the following commands will display the details of all sales record of North Area, regardless of case (whether North / NORTH / north):
a. Select * from salesman where area like upper 'north';
b. Select * from salesman where area = 'North' or 'NORTH' or north;
c. Select * from salesman where upper (area) =' NORTH';
d. Select * from salesman where area= =upper ('North")';

Answer : (c) Select * from salesman where upper (area) =' NORTH';

3. Help Priya to display sname and sales of east and west areas
a. Select sname, sales from Salesman where area="East" and area="West";
b. Select sname, sales from Salesman where area="East" or area="West";
c. Select sname, sales from Salesman where area in "East" and "West";
d. Select sname, sales from Salesman where area="East" , "West";

Answer: (b) Select sname, sales from Salesman where area="East" or area="West";

4. The command to display the name of the salesman along with the sales amount rounded off to one decimal point will be:
   a. Select sname, round (sales,1) from salesman;
   b. Select sname, round (sales,0.1) from salesman;
   c. Select sname, trunc (sales,1) from salesman;
   d. Select sname, trunc (sales,0.1) from salesman;

answer: (a) Select sname, round (sales,1) from salesman;

5. What will be the output of the following command?
   Select Right (Sname,3), Round (Sales) from Salesman Where Sname Like "P%";

A

Right (Sname,3)	Round (Sales)
Pri	3450
Pri	8000

B

Right (Sname,3)	Round (Sales)
iya	3450
shi	8000

C

Right (Sname,3)	Round (Sales)
iya	3450
shi	8001

D

Right (Sname,3)	Round (Sales)
Pri	3450
Pri	8001

Answer : (d)

Q2
Vivek Sharma, a car dealer has stored the details of all cars in her showroom in a table called CARMARKET.
The table CARMARKET has attributes CARCODE which is a primary key, CARNAME, COMPANY, COLOR, and COST (in lakh rupees) of the car and DOM which is the Date of Manufacture of the car.
Answer following questions based on the table CARMARKET from the below mentioned

questions.

Table: CARMARKET

CARCODE	CARNAME	COMPANY	COLOR	COST	DOM
C01	BALENO	SUZUKI	BLUE	5.9	2019-11-07
CO2	INDIGO	TATA	SILVER	12.9	2020-10-15
C03	GLC	MERCEDES	WHITE	62.38	2020-01-20
C04	A6	AUDI	RED	58.55	2018-12-29
C05	INNOVA	TOYOTA	BLACK	32.82	2017-11-10
C06	WAGON-R	SUZUKI	WHITE	12.11	2016-11-11
C07	BREZZA	SUZUKI	GOLDEN	9.8	2016-10-03

Choose the correct SQL query to do the following (for parts 1 to 4)

i. Display the carname along with the charges rounded off to 1 digit afterdecimal place.
    a. Select carname, round(cost) from carmarket;
    b. Select carname, round.cost(1) from carmarket;
    c. Select carname, round.cost() from carmarket;
    d. Select carname, round(cost,1) from carmarket;

Correct answer - d

ii. Display the carname, color and position of the character 'E' in the color ofall the cars.
    a. select carname, color from carmarket where color like "%E%";
    b. select carname, color, instr(color,'E') from carmarket;
    c. select carname, color from carmarket where color = "%E%";
    d. select carname, color, substr(color,1,'E') from carmarket;

Correct answer - b

iii. Display the carname ,name of the company in lower case of all cars whose year (of dom) is 2020.
    a. select carname,lcase(company) from carmarket where year(dom) = 2020;
    b. select carname,lcase(company) from carmarket where yearof(dom) like'2020%';
    c. select carname,lower(company) from carmarket where dom from'2020-01-01' to '2020-
    d. 12-31';
    e. select carname,lower(company) from carmarket where yearfrom(dom) =2020;

Correct answer - a

iv. Display the number of cars manufactured each year.
    a. select count(*),year(dom) from carmarket where year(dom) = distinct;
    b. select count(*),year(dom) from carmarket group by year(dom);
    c. select count(carmarket),year(dom) from carmarket group by year(dom);
    d. select count(distinct *),year(dom) from carmarket group by year(dom);

Correct answer - b

v. What is the cardinality and degree of the table CARMARKET?
    a. Cardinality = 8 and Degree = 6
    b. Cardinality = 6 and Degree = 7
    c. Cardinality = 7 and Degree = 6
    d. Cardinality = 7 and Degree = 8

Correct answer - c

Unit 3: Introduction to Computer Networks

Introduction to Networks:

In general terms, a network is a group of two or more similar things or people interconnected with each other.
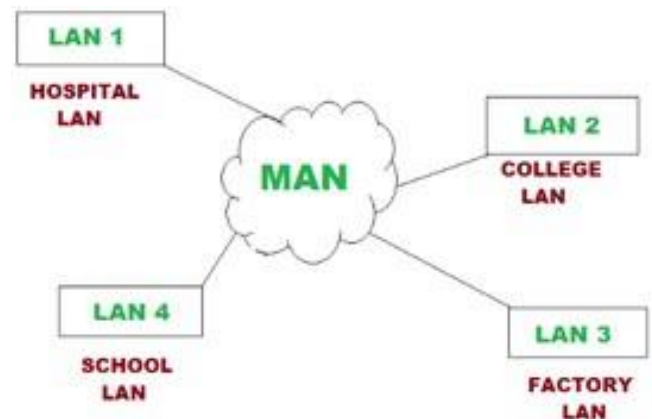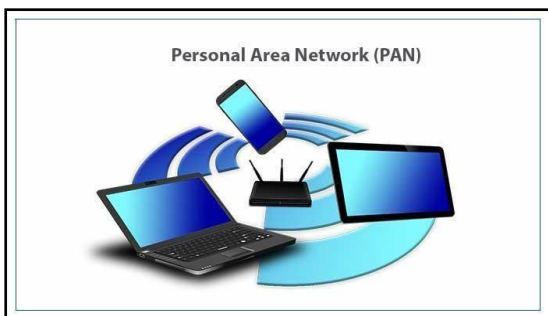
- Some examples of network are:
    - Social network
    - Mobile network
    - Network of computers
    - Airlines, railway, banks, hospitals networks
- A **computer network** is an interconnection among two or more computers or devices, which allow computers to share data and resources (Hardware and Software) among each other.

Types of Network

Computer networks are broadly categorized as:

- PAN (Personal Area Network)
- LAN (Local Area Network)
- MAN (Metropolitan Area Network)
- WAN (Wide Area Network)

PAN (Personal Area Network): A PAN is a network of personal devices (i.e., Mobiles, Laptops, Printers and other IoT Devices). It can be set up using guided media (USB cable) or unguided media (Bluetooth, Infrared, Wi-Fi, RFID, NFC, Hotspots etc.).

Personal Area Network (PAN)

Local Area Network (LAN):

- 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.
- Connected with wires, Ethernet cables, fiber optics or Wi-Fi
- LANs provide the short-range communication with the high-speed data transfer rates
- Can be extended up to 1 km
- Data transfer from 10 Mbps to 1000 Mbps (Mbps- Megabits per Second)

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 is less than LAN.
- e.g: Cable TV Network, Cable based broadband Internet.
- Can be extended up to 30-40 kms.
- Many LANs can be connected together to form MAN.

Wide Area Network (WAN)

- It 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 Devices

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:

- Stands for '**MO**dulator (Conversion from Digital Data to Analog Signal) **DEM**odulator (from Analog Signal to Digital Data).
- Modems are connected to both the source and destination nodes
- 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.

Ethernet Card/NIC/NIU/LAN Card:

- It is a network adaptor used to set up a wired network.
- It acts as an interface between the computer and the outside network.
- Ethernet cable connects the computer to the network through NIC.
- Data transfer rate varies between 10 Mbps and 1 Gbps.
- Each NIC has a unique MAC (Media Access Control) Address/Physical Address, which helps in uniquely identifying thecomputer on the network.
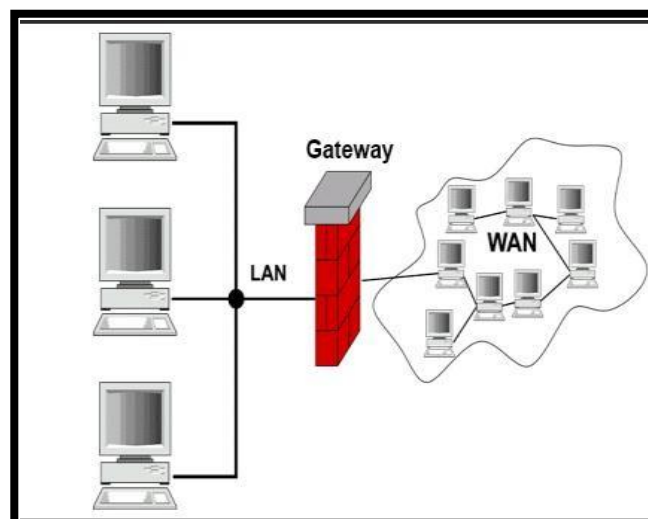- Example of MAC Address: -
  00:01:5c:10:43:ad

Repeater

- Data is carried in the form of signals over the cable.
- Signals lose their strength beyond a certain limit and become weak. The weakened signal appearing on the cable is regenerated and put back on the cable by a repeater.
- Signal limit for various wired media is

Gateway

- A gateway is a device that connects dissimilar networks. (Networks with different software and hardware configurations and with different transmission protocols).
- 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.
- It can be implemented as software, hardware, or a combination of both because a network gateway is placed at
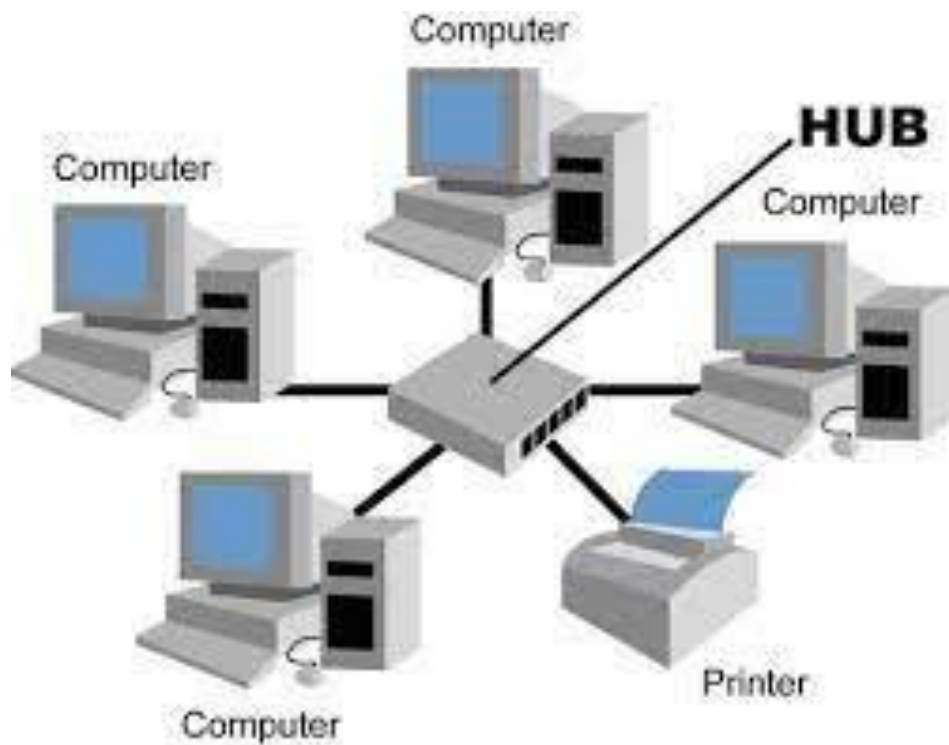- the edge of a network and the firewall is usually integrated with it.

Network Topologies

The arrangement of computers and other networking devices in a network is called its topology. Some common topologies are as follows:

Star Topology: Each communicating device is connected to a central node, which is a networking device like a hub or a switch.

Advantages:

- Easy to troubleshoot

- Very effective and fast.

- Fault detection and removal of faulty parts is easier.

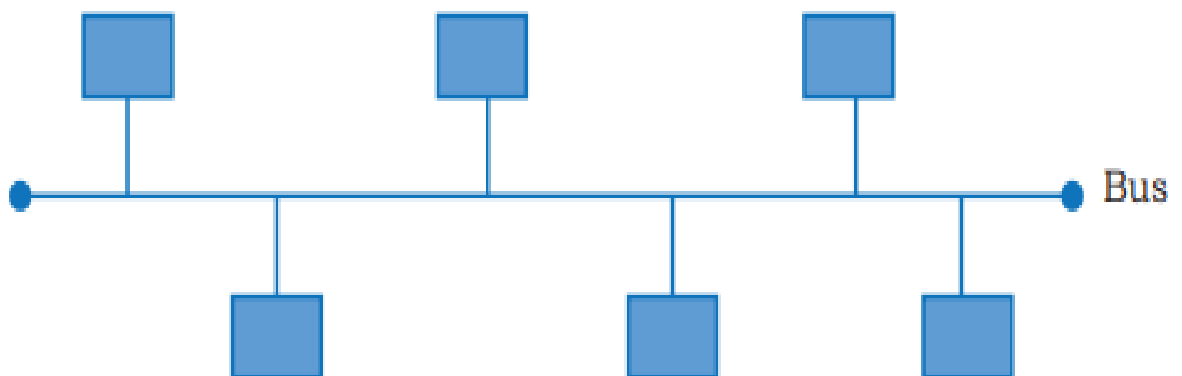- In case a workstation fails, the network is not affected.

Disadvantages: -

- Difficult to expand.
- More cable is required.
- The cost of hub and cables makes it expensive over others.
- In case the hub fails, the entire network stops working.

Bus Topology

- Each communicating device connects to a central transmission medium, known as bus.
- Data transmitted in both directions.
- Data can be received by any of the nodes of the network.
- A terminator is required at the end of the bus.

Advantages:

- Single backbone wire /bus used to connect computers hence it is cheaper.
- It is also easy to maintain.

Disadvantages: -

- Doesn't support a very large network.
- Problem identification is difficult.
- If the main cable suffers failure or damage, the whole network fails or partially breaks down.
- Slower data transmission speed.

Tree/Hybrid Topology:

- It is a hierarchical topology, in which there are multiple branches and each branch can have one or more basic topologies like star, ring and bus.

Features of Tree Topology

- Ideal if workstations are located in groups.
- Used in Wide Area Network.

Advantages

- Extension of bus and star topologies.
- Expansion of nodes is possible and easy.
- Easily managed and maintained.

Disadvantages

- Higher maintenance cost.
- Difficult to configure.
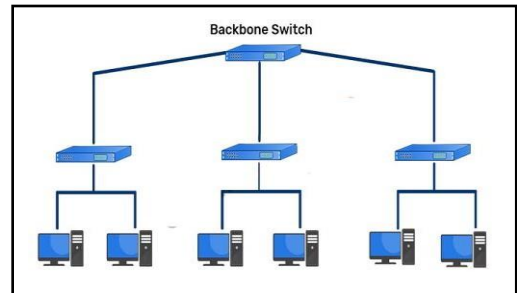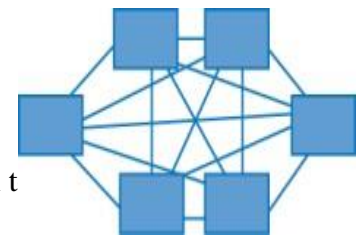
Mesh Topology

- Generally, each communicating device is connected with every other device in the network

Advantages:

- Can handle large amounts of traffic since multiple nodes can transmit data simultaneously
- If any node gets down doesn't affect other nodes.
- Secure than other topologies as each cable carries different data.

Disadvantages:

- Wiring is complex and cabling cost is high in creating such networks.
- There are many redundant or unutilized connections. 3.4 Introduction t Internet, URL, WWW, and its applications

The Internet

- It is the global network of computing devices including desktops, laptops, servers, tablets, mobile phones, other handheld devices as well as peripheral devices such as printers, scanners, etc.

Applications of Internet:

Following are some of the broad areas or services prov
ided through Internet:

1. The World Wide Web (WWW)
2. Electronic mail (Email)
3. Chat
4. Voice Over Internet Protocol (VoIP)

The World Wide Web (WWW)

- It is an ocean of information, stored in the form of trillions of interlinked web pages and web resources.
- A British computer scientist named Tim Berners Lee, invented the revolutionary World Wide Web in 1990 by defining three fundamental technologies that lead to creation of web:

- **HTML — Hypertext Markup Language**
  - language which is used to design standardized Web Pages so that the Web contents can be read and understood from any computer across the globe.

- **URL — Uniform Resource Locator**
  - A URL is the address of a given unique resource on the Web or address of a website. The URL is an address that matches users to a specific resource online, such as a web page or a media.
  - Example-http://www.cbse.nic.in

- **HTTP — The Hypertext Transfer Protocol**
  - Set of rules which are used to retrieve linked web pages across the web
  - A more secure and advanced version is HTTPS.

Electronic Mail (Email)

- It is one of the ways of sending and receiving message(s) using the Internet.
- can be sent anytime to any number of recipients anywhere.
- To use email service, one needs to register with an email service provider by creating a mail account. These services may be free or paid.
- Some of the popular email service providers are Google (Gmail), Yahoo (yahoo mail), Microsoft (outlook), etc.

Chat

- Chatting or Instant Messaging (IM) over the Internet means communicating to people at different geographic locations in <u>real time</u> through text message(s).
- With ever increasing internet speed, it is now possible to send images, documents, audio, video as well through instant messengers. I
- Applications such as WhatsApp, Slack, Skype, Yahoo Messenger, Google Talk, Facebook Messenger, Google Hangout, etc., are examples of instant messengers.

VoIP

- Voice over Internet Protocol - allows us to have voice call (telephone service) over the Internet.
- VoIP works on the simple principle of converting the analog voice signals into digital and then transmitting them over the broadband line. These services are either free or very economical.
- VoIP call(s) can be received and made using IP phones from any place having Internet access.
- WhatsApp Call, Google Meet, Microsoft Teams, Zoom etc are examples of VoIP.

Advantage of VoIP:

- Save a lot of money.
- More than two people can communicate or speak.
- Supports high quality audio transfer.
- Can transfer text, image, video along with voice.

Disadvantages of VoIP:

- Does not work in the absence of an active Internet connection.
- Slow Internet connection will lead to poor quality of calls.

Website

- A website is a collection of multiple related web pages which are connected through hyperlinks.
- A Website can be created for a particular purpose, theme or to provide a service.
- A website is stored on a web server.

Purpose of a Website

- Portfolio: A website of an organization or an individual to display the information like kvsangathan.nic.in.
- E-Commerce: Selling products and delivering services like chroma, flip kart etc.
- E- Governance: Government portals like e-passport, mygov, UIDAI etc.
- Communication: Communicating with each other with help of Social Media like Instagram,Facebook etc.
- Search Engines and Wikis: Posting and finding information on the internet like google, reddit, Wikipedia etc.
- Streaming Services: Disseminating contents online like Netflix, Disney+ etc.
- Other web-based activities: Online gaming, Cloud Services etc.

Web Page

- A web page is a document on the WWW that is viewed in a web browser.
- Structure of a web page is created using HTML (Hypertext Markup Language) and CSS(Cascaded Style Sheet).
- Contain information in different forms, such as: text in the form of paragraphs, lists, tables,images, audio, video, software application, other interactive content
- The first page of the website is called a home page

Static vs Dynamic Web Pages

Static Webpage	Dynamic Webpage
The static web pages display the same content each time when someone visits it.	In the dynamic Web pages, the page content changes according to the user.
It takes less time to load over internet.	Dynamic web pages take more time while loading.
No Database used.	A database is used at the server end in a dynamic web page.
Changes rarely.	Changes frequently.
Example: ncert.nic.in	Example: twitter.com

Difference between Website and Webpage: -

Website	Webpage
1. A collection of web pages which are grouped together and usually connected together in various ways, Often called a "web site" or simply a "site."	A document which can be displayed in a web browser such as Firefox, Google Chrome, Opera, Microsoft Internet Explorer etc.
2. Has content about various entities.	Has content about a single entity.
3. More development time is required.	Less development time is required.
4. Website address does not depend on the Webpage addresses.	Webpage address depends on Website address.

Web Server

- Used to store and deliver the contents of a website to clients such as a browser that requests it. A web server can be software or hardware.
- The server needs to be connected to the Internet so that its contents can be made accessible to others.
- The web browser from the client computer sends a request (HTTP request) for a page containing the desired data or service. The web server then accepts, interprets, searches and responds (HTTP response) to the request made by the web browser.
- If the server is not able to locate the page, it sends the error message (Error 404 – page not found) to the client's browser.

Web Hosting: -

- Online service that enables users to publish websites or web applications on the internet. When a user sign-up for a hosting service, they basically rent some space on a server on which the user can store all the files and data necessary for the website to work properly.
- A server is a physical computer that runs without any interruption so that website is available all the time for anyone who wants to see it.

Web Browsers

Browser:
- Software application that helps us to view the web page(s).
- Helps to view different contents retrieved from different web servers on the internet
- Mosaic was the first web browser developed by the National Centre for Supercomputing Application (NCSA).
- Mozilla Firefox is an open source web browser which is available free of cost and can be easily downloaded from the

Internet.

Browser Setting

- Every web browser has got certain settings that define the manner in which the browser will behave. These settings may be with respect to privacy, search engine preferences, download options, auto signature, autofill and autocomplete feature, theme and much more.

Add-Ons and Plug-ins

- Add-ons and plug-ins are the tools that help to extend and modify the functionality of the browser.
- Both the tools boost the performance of the browser, but are different from each other.

- A plug-in is a complete program or may be a third-party software. For example, Flash and Java are plug-ins. A Flash player is required to play a video in the browser. A plug-in is a software that is installed on the host computer and can be used by the browser for multiple functionalities and can even be used by other applications as well.
- An add-on is not a complete program and so is used to add only a particular functionality to the browser. It is also referred to as extension in some browsers

Cookies

- A cookie is a text file, containing a string of information, which is transferred by the website to the browser when we browse it.
- This string of information gets stored in the form of a text file in the browser.
- The information stored is retransmitted to the server to recognize the user, by identifying pages that were visited, choices that were made while browsing various menu(s) on a particular website.
- It helps in customizing the information that will be displayed, for example the choice of language for browsing, allowing the user to auto login, remembering the shopping preference, displaying advertisements of one's interest, etc. Cookies are usually harmless and they can't access information from the hard disk of a user or transmit virus or malware.

MULTIPLE CHOICE QUESTIONS

Q.1. URLs are of two types:

   (i) Absolute & Relative   (ii) Static & Dynamic

   (iii) Absolute and Dynamic   (iv) None of the above

Answer: (i) Absolute & Relative

Q.2. Which device is used to regenerate the signals over long distance data transmission:

   (i) Switch   (ii) Modem

   (iii) Repeater   (iv) None of the above

Answer: (iii) Repeater

Q.3 A computer network created by connecting the computers of your school's computer lab is an example of

   (i) LAN   (ii) MAN

   (iii) WAN   (iv) PAN

Answer: (i) LAN

Q.4. The device used to connect two networks using different protocols is:

   (i) Router   (ii) Repeater

   (iii) Gateway   (iv) Hub

Answer: (iii) Gateway

Q.5. Collection of millions of interlinked web pages and resources on the internet forms the:

   (i) Web Server   (ii) Website

   (iii) World Wide Web   (iv) E-mail System

Answer: (iii) World Wide Web

01 MARKS QUESTIONS:

Q.1 Identify the Domain name and URL from the following:

   http://www.income.in/home.aboutus.html

Answer: Domain name – income.in

     URL – http://www.income.in/home.aboutus.html

Q.2. Which type of network (out of LAN, PAN and MAN) is formed, when you connect two mobiles using Bluetooth to transfer a video?

 Answer: PAN

Q.3. Write two advantages of using an optical fiber cable over an Ethernet cable to connect two service stations, which are 200 m away from each other.

Answer: Advantages of optical fiber:

  (i) Faster speed than ethernet

  (ii)   Lower attenuation

Q.4. Explain the purpose of a router.

Answer: A router established connection between two networks and it can handle network with different protocols. Using a routing table, routers make sure that the data packets are travelling through the best possible paths to reach their destination.

Q.5. Identify the type of topology from the following:

   (i)   Each node is connected with the help of a single cable

  (ii)   Each node is connected with the help of independent cable with central switching.

Answer : (i)   Bus topology   (ii)   Star topology

02 MARKS QUESTIONS

Q.1. Explain the terms Web Page and Web Site.

Answer: A simple individual page is Webpage and an interlinked collection of

Webpages makes a website

Q.2 Write any two limitations of Star topology.

Answer: (i). Requires more cable length than a linear topology.

(ii). Dependency on central node: If the hub, switch, or concentrator fails, nodes attached are disabled.

(iii) More expensive than linear bus topologies because of the cost of the

Hubs, etc.

4. Requires more cable to setup the network .

Q.3. Expand the following terms related to Computer Networks:

(i) SMTP **(ii)** POP **(iii)** FTP **(iv)** TCP

Answer: (i) Simple Mail Transfer Protocol **(ii)** Post Office Protocol

(iii) File Transfer Protocol **(iv)** Transmission Control Protocol

Q.4. Explain the terms Static and dynamic Web pages.

Answer:

Static Webpages	Dynamic Web Pages
Static webpage content is constant in all time	The page content changes according to the user.
Loading time is less	Loading time is more
No database is used	A database is used in the server side
Content changes rarely	Content changes frequently

Q.5. What are cookies?

Answer: cookies are small files which are stored on a user's computer and contains information like which Web pages visited in the past, logging details Password etc. They are designed to hold a small amount of data specific to particular client and website and can be accessed by the web server or the client computer.

03 MARKS QUESTIONS:

Q.1. Seema is doing a course in networking. She is unable to understand the concept of URL. Help her by explaining it with the help of suitable example.

Answer: URL: It stands for Uniform Resource Locator. It provides the location and mechanism (protocol) to access the resources over the internet. URL is sometimes also called a web address. It not only contains the domain name, but other information as well that completes a web address.

Examples: https://www.cbse.nic.in, https://www.mhrd.gov.in, http://www.ncert.nic.in, http://www.airindia.in, etc

Q.2. Explain the terms Web page and Home Page.

Answer. Web Page: A Web Page is a part of a website and is commonly written in HTML. It can be accessed through a web browser. Home Page: It is the first web page you see when you visit a website

Q.3. Define Web hosting with example?

Answer: It is an online service that enables the user to publish websites or web applications on the internet. When a user signs up for a hosting service, they basically rent some space on a server on which the user can store all the files and data necessary for the website to work properly.

Example: GoDaddy Webhosting, WordPress Hosting etc.

Q.4. Explain the function of the following network devices:

    (i) Repeater   (ii) Firewall

Answer: Repeater: A repeater is an electronic device that receives a signal and retransmits it. It regenerates the signal and forwards the refreshed signal. A repeater operates at the physical layer.

Firewall: A Firewall is a network security device that monitors and filters incoming and outgoing network traffic based on an organization's previously established security policies.

Q.5. What do you mean by network topology? what are its types?

Answer: A network topology is the physical and logical arrangement of nodes and connections in a network.

    Types: (i) Bus Topology   (ii) Star Topology

            (iii) Tree Topology   (iv) Mesh Topology

Q.1.(i) Identify odd one out of the following: Optical Fiber/Coaxial Cable/ Bluetooth/Twisted Pair Cable. Give reason for your answer.

Answer: Odd one: Bluetooth Reason: Bluetooth is a wireless/unguided communication media while others are wired/guided communication media

(ii) Which of the following are valid IP addresses? Give reason(s) if invalid.

(i) 121.23.1.45   (ii) 192.168.0. 254   (iii) 192.168.0.1   (iv) 198.-1.1.1

Answer: Valid IP addresses: (i), (ii), (iii) Invalid IP address: (iv) 198.-1.1.1 because an IP address is a group of four bytes; each of which can be a number from 0 to 255.

(iii) How is it easier to diagnose fault in Star topology than in Bus topology?

Answer: In Star topology each node is directly connected to a central hub / switch, hence fault diagnosis becomes easy. In bus topology all the nodes are connected to the backbone cable. The signal travels through the entire length of the backbone and is received by the node for which it is intended. Hence, fault diagnosis is difficult.

(iv) Which of the following is/are not communication media?

(i)   Microwaves (ii) Optical Fiber cable   (iii)   Node   (iv)   Radio waves

Answer(iii)Node

Q.2.(i) Name the protocol that is used to transfer files from one system to another.

Answer-FTP-File Transfer Protocol

(ii) Rearrange the following types of network PAN, MAN, LAN, WAN in descending order of their area coverage.

Answer: WAN-MAN-LAN-PAN

(iii) What do you mean by internet?

Answer: Network of networks is called internet.

Or

The internet is the world-wide network of computer networks.

(iv) Bus, ring and star topologies are mostly used in the

(i) LAN   (ii) MAN   (iii) WAN   (iv) Internetwork

Answer. (i) LAN

Q.3.Identify the following devices

(i) An intelligent device that connects several nodes to form a network and redirects the received information only to intended node(s)

Answer: Switch

(ii) A device that regenerates(amplifies) the received signal and re-transmits it to its destinations.

Answer: Repeater

(iii)A device that is used to connect different types of networks. It performs the necessary transmission so that the connected networks can communicate properly.

Answer: Router

(iv) A device that converts data from digital bit stream into an analog signal and vice Versa.

Answer: Modem

Q.4. (i) Which networking device with similar functionality can be used to replace a hub?

Answer: Switch.

 (ii) Give one advantage of bus topology of network. Also state how four computers can be connected to each other using star topology of network.

Answer: In bus topology, the workstations can easily be extended or removed. In star topology, four computers can be connected with each other through a switch or hub.

 (iii)   For web pages, where information changes frequently, e.g. stock prices, weather reports, etc., which out of the following options would you suggest?

 (i)   Static web page   (ii) Dynamic web page   (iii) Both   (iv)None of the above

Answer(ii) Dynamic web page

 (iv)   I can keep you signed in.

     I can remember your site preferences.

     I can give you locally relevant content.

     Who am I?

Answer: Cookies.

 Q.5.(i) Write two characteristics of WIFI.

 Answer(i)It allows an electronic device to exchange data or connect to the internet wirelessly using microwaves.

         (ii)Network range of WIFI is much less than other network technologies like wired LAN.

 (ii)   What is web hosting?

  Answer: Web hosting is a means of hosting web server applications on a computer system through which electronic content on the internet is readily available to any web-browser client.

  (iii) What is the difference between Email and Chat?

  Answer. (i) Chat is type of software while Email is a protocol.
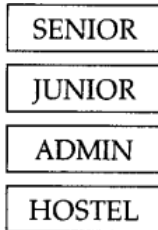
         (ii)Chat requires the permission of both parties while Email does not.

   (iv) Which cables in networks are used for LAN connections?

Answer: Twisted pair and fiber optic cables are used for LAN connections.

05 MARKS QUESTIONS

Q.1. **Indian School, in Mumbai is starting up the network between its different wings. There are four Buildings named as SENIOR, JUNIOR, ADMIN and HOSTEL as shown below:**

| SENIOR |
| JUNIOR |
| ADMIN |
| HOSTEL |

The distance between various buildings is as follows:

ADMIN TO SENIOR	200m
ADMIN TO JUNIOR	150m
ADMIN TO HOSTEL	50m
SENIOR TO JUNIOR	250m
SENIOR TO HOSTEL	350m
JUNIOR TO HOSTEL	350m

SENIOR	130
JUNIOR	80
ADMIN	160
HOSTEL	50

Number of Computers in Each Building:
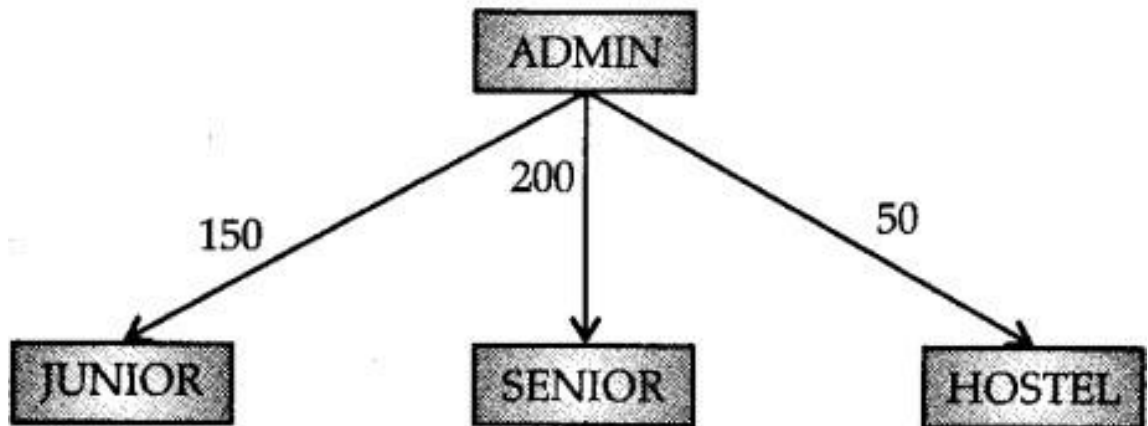
Now Answer the following questions:

(i) Suggest the cable layout of connections between the buildings.

(ii) Suggest the most suitable place (i.e., building) to house the server of this school, provide a suitable reason.

(iii) Suggest the placement of the following devices with justification.

- o Repeater
- o Hub/Switch

(iv) The organization also has inquiry office in another city about 50-60 km away in hilly region. Suggest the suitable transmission media to interconnect to school and inquiry office out of the following:

- o   Fiber optic cable
- o   Microwave
- o   Radio wave
- o

(v) VoIP technology is to be used which allows one to make voice calls using a broadband internet connection. Expand the term VoIP
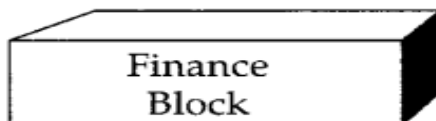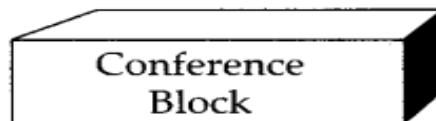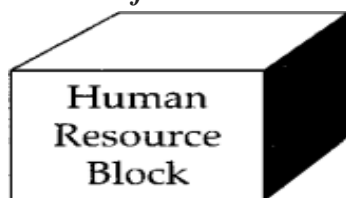
Answers:

(i)

(ii) Server can be placed in the ADMIN building as it has the maximum number of computers.

(iii)   Repeater can be placed between ADMIN and SENIOR building as the distance is more than 70 m. Switch/Hub is placed in every building.

(iv)   Radio waves can be used in hilly regions as they can travel throughobstacles.

(v)   Voice Over Internet Protocol.

Q.2 Trine Tech Corporation (TTC) is a professional consultancy company. The company is planning to set up their new offices in India with its hub at Hyderabad. As a network adviser, you have to understand their requirement and suggest them the best available solutions. Their queries are mentioned as (i) to (v) below. Physical Locations of the blocked of TTC

Block to Block distances (in Mtrs.)

Block (From)	Block (To)	Distance
Human Resource	Conference	110
Human Resource	Finance	40
Conference	Finance	80

Expected number of computers to be installed in each block.
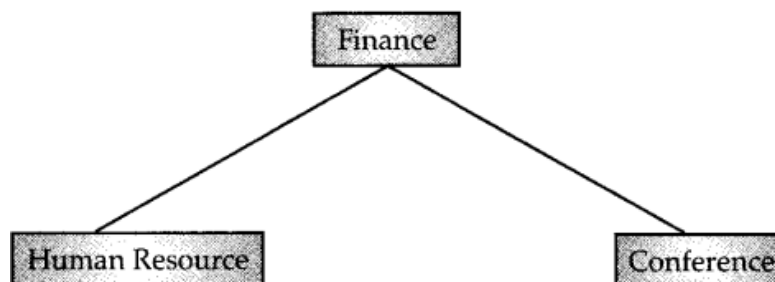
Block	Computers
Human Resource	25
Finance	120
Conference	90

(i) What will be the most appropriate block, where TTC should plan to install their server?

(ii) Draw a block to cable layout to connect all the buildings in the most appropriate manner for efficient communication.

(iii) What will be the best possible connectivity out of the following, you will suggest to connect the new setup of offices in Bangalore with its London based office:

- o Satellite Link
- o Infrared
- o Ethernet Cable

(iv) Which of the following device will be suggested by you to connect each computer in each of the buildings:

- o Switch
- o Modem
- o Gateway

(v) The Trine Tech Corporation (TTC) intends to link its all the offices located at Hyderabad . Out of LAN, MAN, or WAN, what kind of network will be created? Justify your answer.

Answers:

(i) Finance block because it has maximum number of computers.
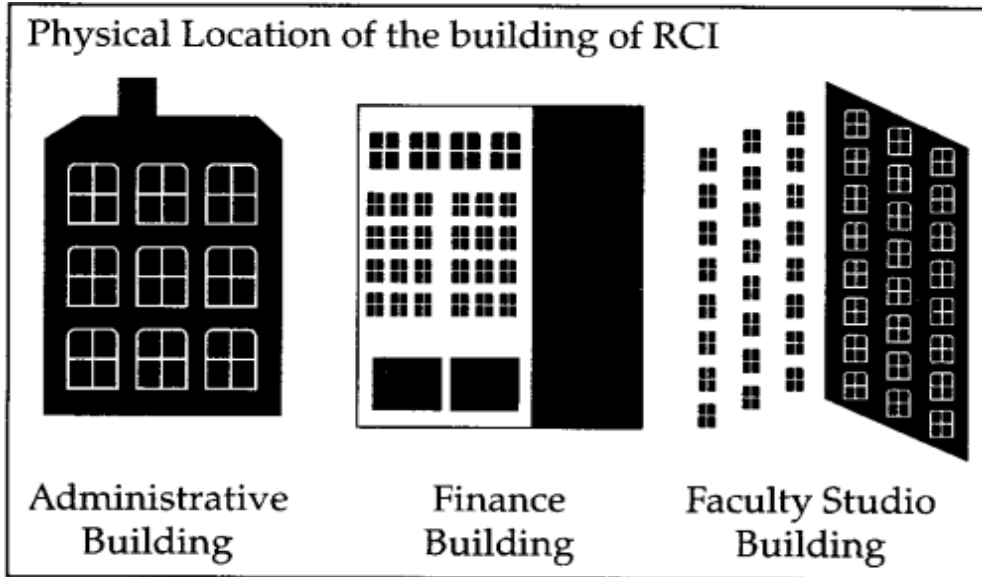
(ii)

(iii) Satellite link

(iv) Switch
(v) LAN , Because very small distances between the offices.

Q.3. *Rovenza Communications International (RCI) is an online corporate training provider company for IT related courses. Thecompany is setting up their new campus in Kolkata. You as a networkexpert have to study the physical locations of various blocks and the number of computers to be installed. In the planning phase, provide the best possible answers for the queries (i) to (v) raised by them.*

Physical Location of the building of RCI

Administrative Building   Finance Building   Faculty Studio Building

Block to Block Distances(in Mtrs.)

From	To	Distance
Administrative Building	Finance Building	60
Administrative Building	Faculty Studio Building	120
Finance Building	Faculty Studio Building	70

Expected computers to be installed in each block

Buildings	Computers
Administrative Building	20
Finance Building	40
Faculty Studio Building	120

(i) Suggest the most appropriate block, where RCI should plan to installthe server.

(ii) Suggest the most appropriate block to block cable layout to connect allthree blocks for efficient communication.

(iii) Which type of network out of the following is formed by connecting thecomputers of these three blocks?
- o LAN
- o MAN
- o   WAN

(iv) Which wireless channel out of the following should be opted by RCI toconnect to students from all over the world?
- o Infrared
- o Microwave
- o Satellite

 (v) Suggest the placement of the following devices with justification.
- o Repeater
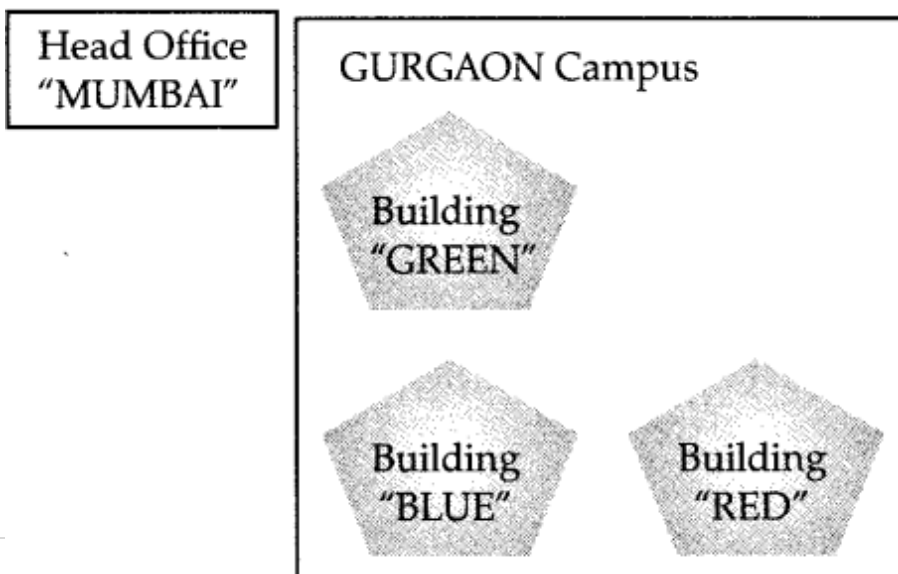- o Hub/Switch

Answers:

(i) Faculty Recording Block.

(ii) Star topology

(iii)LAN

(iv) Satellite connection

(v) Repeater can be placed between the Administrative Building and Faculty Studio Building building as the distance is more than 70 m.
Switch/Hub is placed in every Building.

Q.4. Workalot Consultants are setting up a secured network for their office campus at Gurgaon for their day-to-day office and web-based activities. They are planning to have connectivity between threebuildings and the head office situated in Mumbai. Answer the questions (i) to (v) after going through the building positions in the campus and other details, which are given below:

Distances between various buildings:

Building "GREEN" to Building "RED"	110 m
Building "GREEN" to Building "BLUE"	45 m
Building "BLUE" to Building "RED"	65 m
Gurgaon Campus to Head Office	1760 km

Number of computers

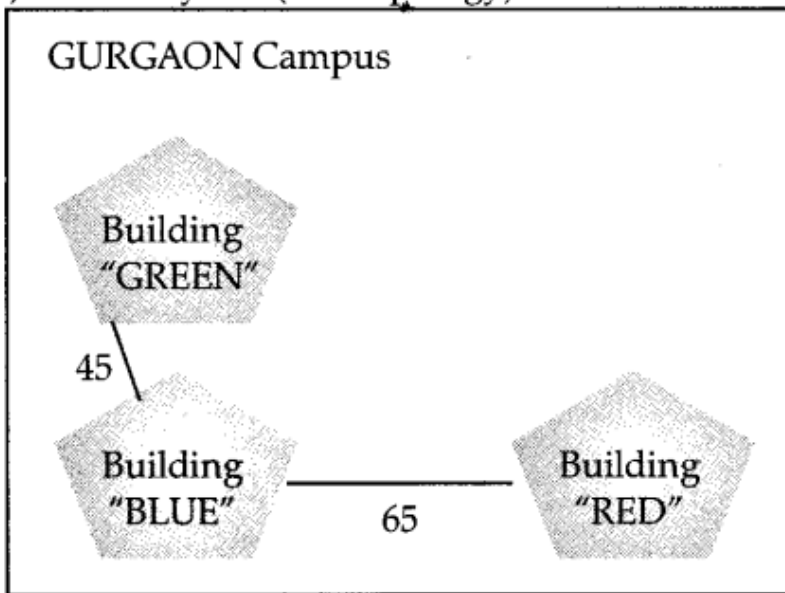|	
Building "GREEN"	32
Building "RED"	150
Building "BLUE"	45
Head Office	10

(i) Suggest the most suitable place (i.e., building) to house the server of this organization. Also give a reason to justify your suggested location.

(ii) Suggest a cable layout of connections between the buildings inside the campus.

(iii) Suggest the placement of the following devices with justification:

(i) Repeater.
(ii) Switch.

(iv) The organization is planning to provide a high-speed link with its head office situated in Mumbai using a wired connection. Which of the following cables will be most suitable for this job?

(ii) Optical Fiber

(iii) Co-axial Cable

(iv) Ethernet Cable

(v) The organization is planning to connect its Head office in Mumbai, which is more than 1760 km current location. Which type of network out of LAN, MAN, or WAN will be formed? Justify your answer

Answer:

(i) The most suitable place to install server is building "RED" because this building has maximum computer which reduce communication delay.

(ii) Cable layout. (Bus topology).

GURGAON Campus

Building "GREEN"

45

Building "BLUE" —————— Building "RED"

65

(iii)(a) Since the cabling distance between buildings GREEN, BLUE and REDare quite large, so a repeater each, would ideally be need along their path to avoid loss of signals during the course of data flow in their routes.

GURGAON Campus

Building "GREEN"

—Repeater

Building "BLUE" ———— Building "RED"

Repeater

(iii) (b) In the layout a switch each, would be needed in all the buildings, to interconnect the group of cables from the different computers in each building

.

GURGAON Campus

switch —— □ Building "GREEN"

switch —— □ Building "BLUE"

switch —— □ Building "RED"

(iv) Optical fiber

(v) WAN, Because the distance is very large.

Q.5.Ayurveda Training Educational Institute is setting up its centre in Hyderabad with four specialized departments Orthopedics, Neurology and Pediatrics along with an administrative office in separate buildings. The physical distances between these department buildings and the number of computers to be installed in these department administrative office are given as follows. Answer the queries as raised by them in (i) to (v).

Shortest distances between various locations in meters:

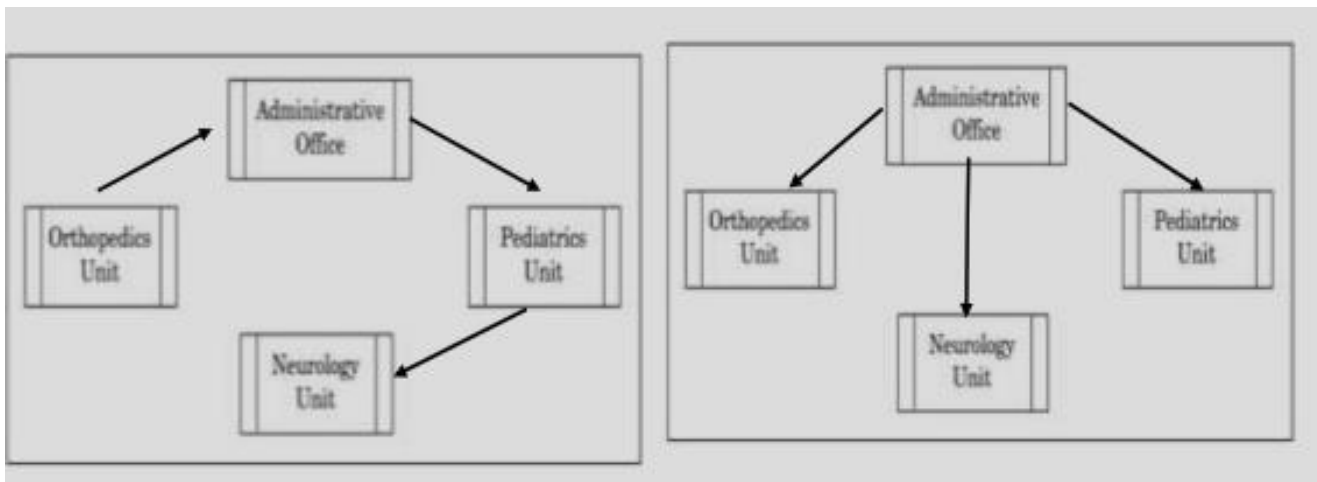|	
Administrative Office to Orthopedics Unit	55
Neurology Unit to Administrative Office	30
Orthopedics Unit to Neurology Unit	70
Pediatrics Unit to Neurology Unit	50
Pediatrics Unit to Administrative Office	40
Pediatrics Unit to Orthopedics Unit	110

Number of Computers installed at various locations are as follows:

Pediatrics Unit	40
Administrative Office	140
Neurology	50
Orthopedics Unit	80

(i) Suggest the most suitable location to install the main server of this institution to get efficient connectivity.

(ii) Suggest the best cable layout for effective network connectivity of the building having server with all the other buildings.

(iii) Suggest the devices to be installed in each of these buildings for connecting computers installed within the building out of the following:
 Gateway, switch, Modem

(iv) Suggest the topology of the network and network cable for efficiently connecting each computer installed in each of the buildings out of the following:
Topologies: Bus Topology, Star Topology
Network Cable: Single Pair Telephone Cable, Coaxial Cable, Ethernet Cable.

(v) Suggest type of network to connect each building   Network: PAN, LAN, MAN and WAN

Answer:

(i)   Administrative Office

(ii)

(iii) Switch

(iv) STAR and Ethernet Cable

(v)   LAN

ASSERTION & REASONING

Mark the correct choice as

   (i)   Both A and R are true and R is the correct explanation for A
   (ii)   Both A and R are true and R is not the correct explanation for A
   (iii) A is True but R is False
   (iv)   A is false but R is True

Q.1. Assertion (A):- VoIP makes audio and video calls possible from any internet connected device having

a microphone and speakers.

Reasoning (R):- VoIP is possible if both caller and receiver have the right software and hardware to

peak to one another

Answer: Both A and R are true and R is the correct explanation for A.

Q.2 Assertion (A):-Internet cookies are text files that contain small pieces of data, like a username

, password and user's preferences while surfing the internet.

Reasoning (R): - To make browsing the internet faster and easier, it is required to store certain

information on the server's computer.

Answer: (iii) A is true but R is false.

CASE STUDY BASED QUESTIONS:

Q.1. Anant is the hardware engineer of "Happy School". He has been given the task of installing a
network in the school lab which has around 40 computers.
(i) Suggest the most suitable type of network topology he should use in order to maximize speed and
make each computer independent of network breakdowns.
              (i) Bus Topology   (ii) Star Topology   (iii). Ring Topology   (iv) Mesh Topology
Answer: (ii)Star Topology
(ii) In order to allow data transfer from server to only the intended computers which network device is
required in the lab to connect the computers?
              (i) Switch   (ii) Hub   (iii) Router   (iv) Gateway
 Answer: (i)Switch
 (iii) After setting up the lab and internet in the lab, Anant is now required to enable videos and
animations to be played on the web browser for students of multimedia class. Which browser tool
/service can be used for the same?

(i) Plug ins   (ii) Add ons   (iii) Control Panel (iv) Download Settings

Answer: (ii) Add ons

(iv) During an international exchange programme the students need to connect to a classroom in Russia using Skype. Anant helps the students to connect. Which type of network service is being used?

     (i) Instant messaging (ii). Email messaging   (iii) VoIP   (iv) WWW

Answer: (iii) VoIP

(v) Anant has asked students of class 7 to identify different parts of URL. Help the students to choose the correct option for label 1 and 2.

Uniform Resource Locator

(i) 1- Domain Name 2-Protocol

(ii). 1- Protocol 2-Domain Name

(iii). 1. Domain name 2. subdomain

(iv) 1-Protocol 2-subdomain

Answer: (ii). 1- Protocol 2-Domain Name

Q.2. Web Server is an uncommon PC framework running on HTTP through website pages. The page is a medium to convey information starting with one PC framework then onto the next. The working of the webserver begins from the customer or client. The client sends their request through the web browser to the webserver. Web server takes this request, processes it, and then sends back processed data to the client. The server gathers
All of our web page information and sends it to the user, which we see on our Computer System in the form of a web page. When the client sends a request for processing to the web server, a domain name and IP address are important to the webserver. The domain name and IP address are used to identify the user on a large network.

(i)   A piece of icon or image on a web page that is associated with another webpage is called_____

Answer: Hyper link.

(ii)   The_____translates internet domain and host names to IP address.

Answer: Domain name system

(iii)   What does the webserver need to send back information to the user?
Answer: Processed data

(iv)   What is the full form of HTTP?
Answer: Hypertext Transfer Protocol.

(v)   What is IP Address?
Answer: An Internet Protocol (IP) address is a unique numerical identifier for every device or network that connects to the internet.

ABBREVIATIONS RELATED TO COMPUTER NETWORK

1	NIU	Network Interface Unit
2	MAC	Media Access Control
3	TCP/IP	Transmission Control Protocol/Internet Protocol
4	PAN	Personal Area Network
5	LAN	Local Area Network
6	MAN	Metropolitan Area Network
7	WAN	Wide Area Network
8	UTP	Unshielded Twisted Pair
9	STP	Shielded Twisted Pair
10	Mbps	Megabits per sec
11	EMI	Electro Magnetic Interference
12	RJ	Registered Jack
13	Wi-Fi	Wireless Fidelity
14	VPN	Virtual Private Network
15	IAAS	Infrastructure as A Service
16	PAAS	Platform as A Service
17	SAAS	Software as A Service
18	DAAS	Desktop as A Service
19	IOT	Internet Of Things
20	NIC	Network Interface Card
21	CSMA/CD	Carrier Sense Multiple Access/CollisionDetection
22	CSMA/CA	Carrier Sense Multiple Access/CollisionAvoidance
23	DNS	Domain Name System
24	DHCP	Dynamic Host Configuration Protocol
25	ISP	Internet Service Provider
26	URL	Uniform Resource Locator

27	HTTP	Hyper Text Transfer Protocol
28	FTP	File Transfer Protocol
29	FDMA	Frequency Division Multiple Access
30	TDMA	Time division Multiple Access
31	CDMA	Code Division Multiple Access
32	SIM	Subscriber Identity Module
33	EDGE	Enhanced Data rates for GSM Evolution
34	UMTS	Universal Mobile Telecommunications System
35	LTE	Long Term Evolution
36	GPRS	General Packet Radio Service
37	ICMP	Internet Control Message Protocol
38	OSI	Open Systems Interconnection
39	SMTP	Simple Mail Transfer Protocol
40	VoIP	Voice Over Internet Protocol
41	SIP	Session Initiation Protocol
42	QoS	Quality of Service
43	POP	Post Office Protocol
44	IMAP	Internet Mail Access Protocol
45	SCP	Secure Copy Protocol
46	SSH	Secure Shell
47	IEEE	Institute of Electrical & Electronic Engineering
48	NFC	Near-Field Communication
49	NFS	Network File System
50	NTP	Network Time Protocol
51	SLIP	Serial Line Internet Protocol
52	PPP	Point to Point Protocol
53	UDP	User Datagram Protocol
54	SNMP	Simple Network Management Protocol

:

Unit 4. Societal Impacts

Digital Footprint

A digital footprint is **data that is left behind when users have been online**. Whatever a person be on internet creates his usage or we can say left a shadow behind of that activity and all these activities shadow creates your identity, this identity is called digital footprint.

An active digital footprint is where the user has deliberately shared information about themselves either by using social media sites or by using websites.

What are examples of digital footprints?

- Your search history.
- Text messages, including deleted messages.
- Photos and videos, including deleted ones.
- Tagged photos, even those you never wanted online.
- Likes/loves on sites like Facebook and Instagram.
- Browsing history, even when you are on 'Incognito' mode.
- E-mail you sent, information you shared, websites you visited and the activities you took part online.

Digital footprint is of two types:

1. **Active Digital Footprint:** When a user knowingly share the personal data in order to share information about the user by means of social networking digital platform. e.g. when user makes a comment or post something on social media.
2. **Passive Digital Footprint:** When the personal data of the user in collected without letting him know or collection of personal data of user without the permission of him is known as passive digital footprint. e.g. when user visits any website traces his physical location using user's device IP address.

Net and Communication Etiquettes（Netiquettes）

- Netiquette is a way to communicate over Internet． In real world, we use a manner to talk so that the exact meaning could successfully convey to the listener． On Internet, this manner is known as Netiquettes which help the user to get exact idea of what is said．

- Netiquettes makes the communication process successful because without it sender's message can be misinterpreted by the receiver though he will not be able to see the facial expression of the sender．

- Netiquettes makes the communication more effective by adding human emotion to it． By using netiquettes, sender can express what he was feeling while writing the post or message．

- Netiquettes help the user in establishing good relation with the other users because when use netiquettes he can express what he feels or what he wants to say．

Some rules of internet etiquette

Rule 1： Remember the Human

Rule 2： Be ethical

Rule 3： Know where you are

Rule 4： Respect other people's time and data limits

Rule 5： Make yourself look good online

Rule 6： Share expert knowledge

Rule 7： Keep disagreement healthy

Rule 8： Respect other people's privacy

Rule 9： Don't abuse your power

Rule 10： Be forgiving of other people's mistakes

Communication etiquettes

Communication etiquette refers **to the accepted ways of communicating with others in the workplace．** Good communication etiquette includes behavior and strategies that can help you relay information clearly while maintaining positive relationships with your supervisors, colleagues and clients．

The rules of writing a thank you note are an example of etiquette

An agreed－upon list of rules for communication that help create a healthy work environment

Social－Media Etiquette：

Social media etiquettes make you more empathetic towards others． Using etiquettes on social media **encourages you to put yourself in people's shoes．** And in doing so, it gives you a better understanding of their requirements and needs．

The Do's and Don'ts

Day－to－day life has rules of etiquette． The challenges of online communication （see pages <u>262－265</u>） mean that social media has an etiquette all its own, Below are 10 important rules to follow as you interact with others on all types of social media．

1. Do	read every message before clicking "Send."
2. Don't	click "Send" when you're tired or emotional. Especially avoid sending messages when you're angry. Once posted, a message is difficult or impossible to take back.
3. Do	introduce yourself whenever you "friend" someone, "follow" someone, or join a conversation.
4. Don't	post embarrassing or incriminating photos or video to social-media sites at any time. Again, once posted, they may be out of your control.
5. Do	comment on and promote other people's work.
6. Don't	bully or gang up on people.
7. Do	strive for honesty and transparency in your interactions.
8. Don't	feel obligated to "follow" or "friend" someone. Likewise, don't make others feel obligated to "follow" or "friend" you.
9. Do	consider your audience. Know the difference between a public and a private message.
10. Don't	post either your own or someone else's private information online (telephone number, home address, etc.).

Data Protection

• It is the process of safeguarding important information from corruption, compromise or loss. In short, you should be able to decide whether or not you want to share some information, who has access to it, for how long, for what reason and be able to modify some of this information and more.

• A large part of a data protection strategy is ensuring that data can be restored quickly after any corruption or loss. Protecting data from compromise and ensuring data privacy are other key components of data protection.

There are two key areas of data management used in data protection as:

(i) Data life cycle management is the process of automating the movement of critical data to online and offline storage.

(ii) Information life cycle management is a comprehensive strategy for valuing, cataloguing and protecting information assets from application and user errors, malware and virus attacks, machine failure or facility outage and disruptions.

The Data Protection Act (DPA) is a United Kingdom Act of Parliament which was passed in 1988. It was developed to control how personal or customer information is used by organisations or government bodies. It protects people and **lays down rules about how data about people can be used.**

1998 Act	GDPR
Principle 1 – fair and lawful	Principle (a) – lawfulness, fairness and transparency
Principle 2 – purposes	Principle (b) – purpose limitation
Principle 3 – adequacy	Principle (c) – data minimization
Principle 4 – accuracy	Principle (d) – accuracy
Principle 5 – retention	Principle (e) – storage limitation
Principle 6 – rights	No principle – separate provisions in Chapter III
Principle 7 – security	Principle (f) – integrity and confidentiality
Principle 8 – international transfers	No principle – separate provisions in Chapter V
(no equivalent)	Accountability principle

Intellectual Property

• When someone owns a house or a motorcycle, we say that the person owns that property. Similarly, if someone comes out with a new idea, this original idea is that person's intellectual property.

• Intellectual property refers to the inventions, literary and artistic expressions, designs and symbols, names and logos. The ownership of such concepts lies with the creator or the holder of the intellectual property. Intellectual property is legally protected through copyright patents, trademarks etc.

(i) **Copyright**: It grants legal rights to creators for their original works like writing, photograph, audio recordings, video, sculptures, architectural works, computer software, and other creative works like literary and artistic work.

(ii) **Patent**: It is usually granted for inventions. Unlike copyright, the inventor needs to file for patenting the invention. When a patent is granted, the owner gets an exclusive right to prevent others from using selling or distributing the protected invention.

(iii) **Trademark**: It includes any visual symbol, word, name, design, slogan, label, etc., that distinguishes the brand or commercial enterprise, from other brands or commercial enterprise.

Intellectual Property Rights (IPR)

• Intellectual Property Rights are the exclusive rights given to the person over his/her creation for specific time period. These rights allow the patents or owner to buy, sell and exchange their licensed goods to different people or organizations. Intellectual property rights are largely covered by laws governing to patents. Copyrights,industrial design rights, trademarks, plant variety rights, trade dress, geographical indications, circuit design rights and supplementary protection certificates for pharmaceutical products and database rights, etc.

Violation of IPR

1. **Plagiarism**: With the availability of Internet, we can instantly copy or share text, pictures and videos. Presenting someone else's idea or works as one's own idea or work is called plagiarism. If we copy some contents from Internet, but do not mention the source or the original creator, then it is considered as an act of plagiarism.

2. **Copyright Infringement：** Copyright infringement is when we use other person's work without obtaining their permission to use or we have not paid for it, if it is being sold．Suppose we download an image from the Internet and use it in our project．But if the owner of the copyright of the image does not permit its free usage, then using such image even after giving reference of the image in our project is a violation of copyright．

3. **Trademark Infringement：** Trademark infringement means unauthorised use of other's trademark on products and services．An owner of a trademark may commence legal proceedings against someone who infringes its registered trademark．

Software License

• It is a document that provides legally binding guidelines for the use and distribution of software．Software licenses typically provide end users with the right to one or more copies of the software without violating copyrights．

Types of Software License：

1. Proprietary license
2. GNU General Public License（GPL)
3. End User License Agreement（EULA)
4. Creative Commons（CC）license

Free and Open Source Software（FOSS)

• FOSS has a large community of users and developer who are contributing continuously towards adding new features or improving the existing features．

• The term "free" indicates that the software does not have constraints on copyrights．The "Term" "open source" refers software development from expert developers collaborating worldwide without any need for reverse engineering．It is also referred as Free/Libre open source software（FLOSS）or free open source software（FOSS）．

Cyber Safety

• Cyber safety is the act all about the responsible and safe use of Internet services by dealing with the risk which is associated using the Internet．This behavior helps us to protect our personal information and minimize the danger online．

Cyber Crime

• Criminal activities or offences carried out in a digital environment can be considered as a cyber crime．In such crimes, either the computer itself is the target or the computer is used as a tool to commit a crime．

• Cyber crimes are carried out against either an individual or a group or an organization or even against a country, with the intent to directly or indirectly cause physical harm, financial loss or mental harassment．A cyber criminal attacks a computer or a network to reach other computers in order to disable or damage data or services．The nature of criminal activities are alarmingly increasing day by day, with frequent reports of hacking, ransom ware attacks, denial of services, phishing, e-mail fraud, banking fraud and identity theft．

1．Hacking

Hacking is the act of unauthorised access to a computer, computer network or any digital system．Hackers usually have technical expertise of the hardware and software．

They look for bugs to exploit and break into the system．

2. Phishing and Fraud e-mails

Phishing is an unlawful activity where fake websites or e-mails that look original or authentic are presented to the user to fraudulently collect sensitive and personal details, particularly usernames, passwords, banking and credit card details.

3. Ransomware

This is another kind of cyber crime where the attacker gains access to the computer and blocks the user from accessing, usually by encrypting the data. The attacker blackmails the victim to pay for getting access to the data or sometimes threaten to publish personal and sensitive information or photographs unless a ransom is paid.

Cyber Bullying

• Cyber bullying or bullying that takes place over digital devices like cell phones, computers and tablets. Cyber bullying can occur through SMS, text and apps or online in social media, forums or gaming where people can view, participate or share content. Cyber bullying includes sending, posting or sharing negative, harmful, false or mean content about someone else. It can include sharing personal or private information about someone else causing embarrassment or

humiliation. Some cyber bullying crosses the line into unlawful or criminal behavior.

Cyber Law

• It is any law that applies to the Internet and Internet related technologies. Cyber law is one of the newest areas of the legal system. This is because Internet technology develops at such a rapid pace.

• Cyber law provides legal protections to people using the Internet. This includes both businesses and everyday citizens. Understanding cyber law is of the utmost importance to anyone who uses the Internet. Cyber law has also been referred to as the "law of the Internet".

India Information Technology Act (IT Act)

• With the growth of Internet, many cases of cyber crimes, frauds, cyber attacks and cyber bullying are reported. The nature of fraudulent activities and crimes keeps changing. To deal with such menaces, many countries have come up with legal measures for protection of sensitive personal data and to safeguard the rights of Internet users.

• The Parliament of India passed its first Cyber law the Information Technology (IT) Act, 2000, on the 17th October 2000, which provides the legal infrastructure for e-commerce in India. The purpose of the IT Act, 2000, as mentioned in the language of the Act is:

An Act to provide legal recognition for transaction carried out by means of electronic data interchange and other means of electronic communication, commonly referred to as "electronic commerce", which involves the use of alternative to paper based methods of communication and storage of information, to facilitate electronic filling of document with the Government agencies

and further to amend the Indian Penal Code, the Indian Evidence Act,1872, the Banker's Book Evidence Act, 1891 and The Reserve Bank of India Act, 1934 and for matters connected therewith or incidental thereto.

E-waste Management

• In most part of the world, underground water is not drinkable directly．Long ago, people simply used to draw up water from wells and drink it．But now, you have to use some sort of filter to purify the water and make it drinkable．Why? It is just one of the many problems and hazards of e-waste．The electronic devices, dead cells and batteries you throw away with other garbage contains lead that easily mixes with underground water, making it unfit for direct consumption．That is just the tip of the iceberg − the problems of e-waste disposal．

• This wordhas caughtupinthe recentpast only whensomeone studying the subjectnotedthat our environment will be 3x more congested with e-waste by 2017．E-waste is growing in huge volumes．The reason why e-waste is increasing is that technology is growing fast and in an attempt to get better devices, we casually get rid of old electronics − the best examples being that of smart-phones．

Treating e-Waste

• As of now, there are no proper methods being implemented even in the first world to eliminate the problem of e-waste．The two methods that found interesting for proper treatment of e-waste are recycling and refurbishing．

• For recycling, there may be products that cannot be recycled completely．PVC layers, for example, stay as such for ages and cannot be recycled．It would be better if the manufacturers use recyclable material so that the e-waste is converted into something that can be used again without harming the planet and its inhabitants．Thus, one of the major factors in treating e-waste is to compel manufacturers to use green elements．

• Give Electronics to Certified E-Waste Recycler −This is why the safest way to dispose of e-waste is by giving it to a certified e-waste recycler．E-waste recyclers can also refurbish it to make new products．

Health concerns related to overuse of technology

Advancements in technology allow people to be more connected than ever, but this may come at a price．Overuse of social media and mobile devices have been linked to eyestrain, difficulty focusing on other tasks, and depression．

While some forms of technology may have made positive changes in the world, there is evidence for the negative effects of technology and its overuse, as well．

The overuse of technology may have a more significant impact on developing children and teenagers．

Technology can be seen as an addiction because it can involve certain factors that include：

• Inability to control the amount of time spent on technology
• Need for more time or new technology-related things to achieve desired effects
• Experience withdrawal symptoms when not engaged
• Continuing obsessive behavior despite the negative consequences, it has on one's life and health
• Impact on social life, work, or school
• Mood changes．
• Poor mental health．
• Poor physical health．
• Problems processing information and problem-solving．
• Sleep problems．
• Lack of social interaction and social skills．
• Problems at work, school, or in relationships．

Some of the most common types of technology addictions include：

- Gaming addiction
- Online gambling addiction
- Social media addiction
- Online shopping addiction

Psychological effects

Overuse or dependence on technology may have adverse psychological effects, including：

Isolation

Technologies, such as social media, are designed to bring people together, yet they may have the opposite effect in some cases． A 2017study in young adults aged 19−32 years found that people with higher social media use were more than three times as likely to feel socially isolated than those who did not use social media as often． Finding ways to reduce social media use, such as setting time limits for social apps, may help reduce feelings of isolation in some people．

Depression and anxiety

The authors of a 2016 systematic review Trusted Source discussed the link between social networks and mental health issues, such as depression and anxiety． Their research found mixed results． People who had more positive interactions and social support on these platforms appeared to have lower levels of depression and anxiety． However, the reverse was also true． People who perceived that they had more negative social interactions online and who were more prone to social comparison experienced higher levels of depression and anxiety．

So, while there does appear to be a link between social media and mental health, a significant determining factor is the types of interactions people feel they are having on these platforms．

Physical health effects

Technology use may increase the risk of physical issues as well, including：

Eyestrain

Technologies, such as handheld tablets, smartphones, and computers, can hold a person′s attention for long periods． This may lead to eyestrain．

Symptoms of digital eyestrain can include blurred vision and dry eyes． Eyestrain may also lead to pains in other areas of the body, such as the head, neck, or shoulders．

Several technological factors may lead to eyestrain, such as：

- screen time
- screen glare
- screen brightness
- viewing too close or too far away
- poor sitting posture
- underlying vision issues

Taking regular breaks away from the screen may reduce the likelihood of eyestrain.

Anyone regularly experiencing these symptoms should see an optometrist for a checkup.

The 20-20-20 rule for digital viewing

When using any form of digital screen for longer periods of time, the American Optometric Association recommend using the 20-20-20 rule.

To use the rule, after every 20 minutes of screen time, take a 20-second break to look at something at least 20 feet away.

Doing this may help reduce the strain on the eyes from staring at a screen for a continuous period.

Poor posture

The way many people use mobile devices and computers may also contribute to incorrect posture. Over time, this may lead to musculoskeletal issues.

Many technologies promote a "down and forward" user position, meaning the person is hunched forward and looking down at the screen. This can put an unnecessary amount of pressure on the neck and spine. Some common problems are-

- Neck pain or spasms
- Headaches
- Stiff neck
- Pain between your shoulder blades
- Tingling or numb thumbs
- Blurry vision from too much screen time/glare

Sleep problems

Using technology too close to bedtime may cause issues with sleep. This effect has to do with the fact that blue light, such as the light from cell phones, e-readers, and computers, stimulates the brain. Authors of a 2014 study found that this blue light is enough to disturb the body's natural circadian rhythm. This disturbance could make it harder to fall asleep or lead to a person feeling less alert the next day.

To avoid the potential impact of blue light on the brain, people can stop using electronic devices that emit blue light in the hour or two before bedtime.

Gentle activities to wind down with instead, such as reading a book, doing gentle stretches, or taking a bath, are alternatives.

Reduced physical activity

Most everyday digital technologies are sedentary. More extended use of these technologies promotes a more sedentary lifestyle, which is known to have negative health effects, such as contributing to:

- obesity
- cardiovascular disease
- type 2 diabetes
- premature death

Finding ways to take breaks from sedentary technologies may help promote a more active lifestyle.

Other forms of technology may help, however.

This could help people set healthful patterns and become more physically active.

In children

Children's brains are still developing and may be more sensitive to the effects of technology and its overuse than adult brains.

Children who overuse technology may be more likely to experience issues, including:

- low academic performance
- lack of attention
- low creativity
- delays in language development
- delays in social and emotional development
- physical inactivity and obesity
- poor sleep quality
- social issues, such as social incompatibility and anxiety
- aggressive behaviors
- addiction to these technologies
- higher BMI

MULTIPLE CHOICE QUESTIONS

Q1 Which of the following is not a type of cyber-crime?

    i.   Data theft

    ii.   Damage to data and systems

    iii.   Forgery

    iv.   Installing antivirus for protection

    Answer: iv

Q2 Cyber-crime can be categorized into types.

    i.   4

    ii.   2

    iii.   3

    iv.   6

    Answer: ii

Q3 In which year the Indian IT Act, 2000 got updated?

    i.   2006

    ii.   2010

    iii.   2008

    iv.   2012

    Answer: iii

Q4 Our digital footprint can be created by

    i) visiting any website   ii) sending email

    iii) Posting online   iv) All of the above

    Answer: iv

Q5 IPR stands for _____

    i.   Indian Property Right

    ii.   Intellectual Property Right

    iii.   Intelligent Property Right

    iv.   Intellectual Property Resource

    Answer: ii

01 MARKS QUESTIONS

Q1 Define Digital property.

Ans Digital property refers to any information about you or created by you in digital form. Eg: personal blog or website

Q2 Give any 2 benefits of ICT on today's society?

Ans Benefits of ICT:
   i. increased access to services, and information
   ii. better means of communication in the form of Instant Messaging, and VoIP

Q3 If someone hacks your website, who would you complain to?

Ans The complaint has to be lodged to the police under the IT Act.

Q4 Define e-waste.

Ans The garbage of electronic gadgets such as computers peripherals, laptop accessories, mobiles is known as e- waste.

Q5 What do you understand by Net Etiquettes?

Ans There are some rules that you must obey when you are online and using the Web/internet. These rules are called net etiquette (Netiquettes), Internet etiquettes or Online etiquettes.

02 MARKS QUESTIONS

Q1 What is identity theft? Give example.

Ans Stealing someone's personal identifying information and pretends to be that person in order to gain some financial benefits.

Eg.:- using stolen credit card information.

Q2 What are intellectual property rights?

Ans Intellectual property rights are the rights of the owners of information to decide how much information is to be exchanged shared or distributed. Also it given the owners a rights to decide the price for doing (exchanging/ sharing/ distributing) so.

Q3 What do you understand by privacy of data?

Ans The ethical and legal rights that individuals have with regard to control over the discussion and use of their personal information is known as privacy of data.

Q4 What are the problems that burning of e-waste can cause?

Ans
1) It causes air pollution which harm the environment
2) burning of e-waste cause many health hazards in humans.

Q5 What do you mean by psychological problems caused by over use technology?

Ans   It means the effects that over use of technology can have on the mind

03 MARKS QUESTIONS

Q1   What is a free software, Give Example?

Ans   Free Software are those which are freely accessible, freely used, changed, improved,
         copied and distributed. It provides all types of freedom. The term 'Free' means
         'Freedom' at very little or No cost. E.g. Python, Java,

Q2   What is Open Source Software? Give example.

Ans   Open Source Software are those whose source codes are openly available for
         anyone and everyone to freely access, use, change, improve copy and distribute.
         E.g. Python, Mozilla Firefox etc

Q3   List three points of network security components

Ans   The three network security components are

         i.   Antivirus and anti-spyware
         ii.   Firewall, to block unauthorised access to your network
         iii. Intrusion Prevention System (IPS) to identify fast spreading threads such as
               zero-day or zero-hour attacks.

Q4   Name three types of malicious code.

Ans   Three types of malicious code are:

         (i)   Virus
         (ii) Worm
         (iii) Trojan.

Q5   Explain the following terms:
         1. Phishing   2. Hacking

Ans   1. Phishing: Phishing refers to an activity carried out by email or SMS or phone call
         with the demand of sensitive data like credit card details, banking passwords or OTP
         and can be resulted in identity theft or financial loss.

         2. Hacking : gaining unauthorized access to acquire sensitive information from
         individuals over the internet.

04 MARKS QUESTIONS

Q1   State benefits of e–waste recycling?

Ans   Benefits of e–waste recycling :

     i.   Saves the environment and natural resources

     ii.   Allows for recovery of precious metals

     iii.   Protects public health and water quality

     iv.   Saves landfill space

Q2   Describe four separate measure that can be taken to prevent accidental or deliberate misuse of date on any computer system in any organization .

Ans   Measure that can be taken include :

(i)   Physical restrictions to the computer departments . Most organizations require all employees to wear an ID badge . The computer rooms are commonly protected from access by a locked door, which can only be opened by authorized personnel .

(ii)   While using a computer terminal, people are require to sign on with a user-ID and password, Password must not be written down must not be composed of common names, word or dates and must be changed frequently .

(iii)   Restrictions are placed on the location and time at which computer can be used to access data . So that for example a user in the production department will not be able to access records .

(iv)   Special software can be installed on a computer system which will maintain an 'audit' of who has logged on from which computer terminal and for how much time . This will enable any unusual activity to be spotted and investigations made .

Q3   List the measure taken by an individual to protect his/her rights to privacy .

Ans   (i)   Avoid being added to mailing lists .

     (ii)   Make online purchase only through secure websites .

     (iii)   Never assume that your e-mail is private .

     (iv)   Be careful when posting to newsgroups .

     (v)   Do not make online argument .

Q4   Explain Following

     Hacking, Viruses, Spamming, junk e-mails

Ans   (a) Hacking : Hacking is defined as unauthorized access to data held on computer system . Hacking is often caused by employees of a company who have inside knowledge of particular users and passwords . The ability of such hackers to carry out illegal actions without being detected is hampered by the audit and monitor software that comes with operating systems . The motive behind hacking can often be mischievous, computing student who are learning about operating system may take delight in penetrating a school's security system to prove that it can be done .

(b) Viruses : Viruses are generally developed with a definite intention to damage computer files or, cause inconvenience and annoyance to computer user . The virus usually overwrites the first few instructions of a particular program on an infected disk and relies on a user choosing to execute that program . When an infected program is executed the virus spreads by first series of instructions . In most cases the viruses first action is to copy itself from the diskette into the PC and hide within obscure files . The virus can than proceed to perform any of the tasks ranging from irritating to disaster such as reformatting the hard disk . Some viruses lie sleeping waiting to be particular event or date the 'Friday 13th virus' being a well-known one . The virus then infect other diskettes or spreads through e-mail to other system .

(c) Spamming : Spam are unwanted e-mail which are business related and sent to the e-

mail account in bulk . This fills the e-mail storage capacity and wastes user time because the subject are shown very attractive like- 'Some one is waiting for you' , 'Get a car free' , 'Give answer and be millionaire' etc ., and users could not resist themselves from reading it . Some times they get many links on that e-mail and visit on different web sites . Thus it is clear that spams are unwanted e-mail which waste our time, efforts and cover the memory space Sometimes they send virus too .

(d) Junk e-mails : The unwanted messages from various senders in an electronic mail box are junk e-mail .

Q5   What a short note on Cyber Crime .

Cyber Crime : Cyber Crime is that crime which is done through internet . The Cyber act

2000, was now enforced by Indian government to punish the cyber Criminals . The points of cyber act 2000 are as follows .

    (i)   The documents transferred through internet are legally valid and can be produced in court of law .

    (ii)   The digital signatures are described on Authentic documents .

    (iii)   Cyber Crime is defined and provision of giving punishment to the cyber criminals .

    (iv)   A plan is made to investigate the Cyber Crime and to take action on the criminal activities in cyber field .

05 MARKS QUESTIONS

Q1   Write the full form of the following terms : –

FOSS , IPR, CC License, OSS, GPL

Ans   i.   FOSS : Free and Open Source Software .

    ii.   IPR : Intellectual Property Rights .

    iii.   CC License : Creative Commons License .

    iv.   OSS : Open Source Software

    v.   GPL : General Public License .

Q2   Explain any some etiquettes using internet .

i.   Be respectful.

ii.   Be aware of what you are commenting on social media.

iii.   Be careful with humor and sarcasm

iv.   Take care of how you are sharing your data and who can see this.

v.   Friend requests and group invites should be checked before accepting

vi.   Take time to have a read of the rules of conduct / community standards

vii.   Be forgiving do not take fight online

Q3   What are the merits of social networking

Merits of social networking are-

i.   Global Connections Are Made Possible Through Social Networking.

ii.   Quick and Simple Communication Methods.

iii.   Social Networking Helps Businesses Advertise Their Brands.

iv.   Reduces the Price Of Marketing.

v.   An Excellent Educational Tool.

vi.   Shares Large Amount of Information Daily.

vii.   Banking and bill pay at our fingertips

viii.   Online learning, job skills, content discovery.

ix.   Opportunities for remote employment

Q4   What are the disadvantages of social networking ?

Ans   Some disadvantages of social networking are-

i.   Social Media is addicting. Makes People Addicted.

ii.   Well-being Risks.

iii.   Reduced Physical Interactions.

iv.   Increased Cybercrime.

v.   Hacker Risk.

vi.   Security Issues.

vii.   Social Media Can Interfere With Your Sleep Cycle.

viii.   False or Incorrect Information Can Be Swiftly Disseminated Through Social Networking.

ix.   Suicide Issues

x.   Bullying Issues

xi.   Online vs Reality.

xii.   Fear of Missing Out.

xiii.   Self-image issues.

Q5   List health hazards related to excessive use of technology.

Ans   Continuous use of device is like smartphones, computer desktop, laptop, headphones etc, can lead to many health hazards. These are some-

i.   Impact on bones and joints - Wrong poster or long hours of sitting in an

uncomfortable position can cause muscular bone injury.

   ii.   Impact on hearing– Using headphones or earphones for a prolonged period of time and at high volume can cause hearing problems and in severe cause may lead to hearing impairment.

   iii.   On eyes– This is the most common health hazard as prolonged hours of screen time can lead to extreme strain on the eyes.

   iv.   Sleep disorders– Bright light from computer devices block hormone called melatonin which helps us sleep. Thus, we can experience sleep disorder leading to short sleep cycles.

ASSERTION & REASONING

Q1   ASSERTION AND REASONING based questions.

Mark the correct choice as

   i.   Both A and R are true and R is the correct explanation for A

   ii.   Both A and R are true and R is not the correct explanation for A

   iii.   A is True but R is False

   iv.   A is false but R is True

Assertion (A): – E–waste cause of Damage to the immune system, Skin disease, Multi ailments and Skin problems.

Reasoning (R):– Mostly all electronic waste comprises of toxic chemicals such as lead, beryllium, mercury etc.

Ans   i)

Q2   ASSERTION AND REASONING based questions.

Mark the correct choice as

   i.   Both A and R are true and R is the correct explanation for A

   ii.   Both A and R are true and R is not the correct explanation for A

   iii.   A is True but R is False

   iv.   A is false but R is True

Assertion (A): – Social media are website or applications that enable their uses to participate in social networking but they cannot create and share content with others in the community.

Reasoning (R):– We should not waste precious time in responding to unnecessary emails or comments unless their some relevance for us.

Ans   iv

CASE STUDY BASED QUESTIONS

Q1

Namita has recently shifted to new city and new school. She does not know many people in her new city and school. But all of a student, someone is posting negative, demeaning comments on her social networking profile, school site's forum etc.

She is also getting repeated mails from unknown people. Every time she goes online, she finds someone chasing her online.

(i) What is this happening to Namita?

    a. Namita has become a victim of cyber bullying and cyber stalking.

    b. Eaves dropping

    c. Scam

    d. Violation of IPR

(ii) What action should be taken by her to stop them?

    a. Discuss with Parents

    b. Discuss in peer group

    c. Hide and get herself emotionally hurt

    d. She must immediately bring it to the notice of her parents and school authorities. And she must report this cybercrime to local police with the help of her parents.

(iii) The act of fraudulently acquiring someone's personal and private information, such as online account names, login information and passwords is called as _____ .

    a. Phishing

    b. Identity Theft

    c. Fraud

    d. Plagiarism

(iv) Namita needs to protect her personal information or data from unintentional and intentional attacks and disclosure which is termed as _____ .

    a. Digital right

    b. Privacy

    c. Copyright

    d. Intellectual property

(v) A set of moral principles that governs the behaviour of a group or individual and regulates the use of computers.

    a. Copyright

    b. Computer ethics

    c. Property rights

d. Privacy law

Ans

(i)　　a. Namita has become a victim of cyber bullying and cyber stalking.

(ii)　d. She must immediately bring it to the notice of her parents and school authorities. And she must report this cybercrime to local police with the help of her parents.

(iii)　a. Phishing

(iv)　c. Copyright

(v)　b. Computer ethics

Q2

Vivek is studying the concepts of digital footprints. Help him to clarify the concepts of digital footprints.

(i)　Digital footprints are also known as _____

a. Digital data　　b. Digital tattoos　c. Plagiarism　　d. Digital print

(ii)　Digital footprints are stored _____

a. Temporarily　b. for 7 days only　c. Permanently　　d. for 3 days

(iii)　Whenever we surf the Internet using smartphones we leave a trail of data reflecting the activities performed by us online, which is our _____

a. Digital footprint　b. Online handprint　c. Digital activities　d. Internet activities

(iv)　There are _____ kinds of Digital footprints.

a. 1　　　b. 3　　c. 2　　d. 4

(v)　Which is the correct type(s) of digital footprint?

a. Active digital footprint　b. passive digital footprint

c. Both a and　　　　　d. None

Ans-

　(i)　　　b. Digital tattoos
　(ii)　　c. Permanently
　(iii)　　a. Digital footprint
　(iv)　　c. 2
　(v)　　c. Both a and

*********************************ALL THE BEST*************************

Tips to score well

Important Tips to Remember for CBSE Exam:

- Make a schedule/time table and stay organized.
- Revise the formulae/rule or fact related to topics
- Take proper diet and Sleep
- Have a weekly revision and a written test of the subjects studied during the weekdays.
- Make sticky notes of things that are difficult to remember.
- It is important for the students to dedicate at least two hours of their day to studying the subjects that seem difficult.
- Students must avoid listening to music, watching television, text messaging or surfing the Internet while studying to avoid unwanted distractions.
- Practicing sample papers/previous year papers is crucial to understand the pattern, self-assessment, and identifying weak areas.
- Practice sample papers with effective Time –Management.
- Ensure to stay calm, positive and confident

MOST IMPORTANT

- Get acquainted with the CBSE 12th Syllabus 2023-24- Knowing the syllabus will help students know the important topics and mark distribution of all the subjects.

- Know the Exam Pattern - Knowing the exam pattern lets students know the important units and helps them prepare to score well.

Last but Not the LEAST

BE CONFIDENT.

STAY IN TOUCH WITH SUBJECT TEACHERS.

KEEP MATCHING SYLLABUS WITH YOUR PREPARATION.

STAY POSITIVE, DETERMINED, DEDICATED with SINCERETY but DO NOT BE OVERCONFIDENT