सूचना विज्ञान अभ्यास

INFORMATIONS PRACTICES(065)

कक्षा/Class: XII

2024-25

विद्यार्थी अध्ययन सामग्री

Student Support Material

केन्द्रीय विद्यालय संगठन

Kendriya Vidyalaya Sangathan

संदेश

विद्यालयी शिक्षा में शैक्षिक उत्कृष्टता प्राप्त करना केन्द्रीय विद्यालय संगठन की सर्वोच्च वरीयता है। हमारे विद्यार्थी, शिक्षक एवं शैक्षिक नेतृत्व कर्ता निरंतर उन्नति हेतु प्रयासरत रहते हैं। राष्ट्रीय शिक्षा नीति 2020 के संदर्भ में योग्यता आधारित अधिगम एवं मूल्यांकन संबन्धित उद्देश्यों को प्राप्त करना तथा सीबीएसई के दिशा निर्देशों का पालन, वर्तमान में इस प्रयास को और भी चुनौतीपूर्ण बनाता है।

केन्द्रीय विद्यालय संगठन के पांचों **आंचलिक शिक्षा एवं प्रशिक्षण संस्थान** द्वारा संकलित यह 'विद्यार्थी सहायक सामाग्री' इसी दिशा में एक आवश्यक कदम है । यह सहायक सामग्री कक्षा 9 से 12 के विद्यार्थियों के लिए सभी महत्वपूर्ण विषयों पर तैयार की गयी है । केन्द्रीय विद्यालय संगठन की 'विद्यार्थी सहायक सामग्री' अपनी गुणवत्ता एवं परीक्षा संबंधी सामाग्री-संकलन की विशेषज्ञता के लिए जानी जाती है और अन्य शिक्षण संस्थान भी इसका उपयोग परीक्षा संबंधी पठन सामग्री की तरह करते रहे हैं । शुभ-आशा एवं

विश्वास है कि यह सहायक सामग्री विद्यार्थियों की सहयोगी बनकर सतत मार्गदर्शन करते हुए उन्हें सफलता के लक्ष्य तक पहुंचाएगी ।

शुभाकांक्षा सहित ।

निधि पांडे

आयुक्त, केन्द्रीय विद्यालय संगठन

EDITORIAL TEAM

::COORDINATED BY::

Ms. Kriti Saxena, KV SSB Srinagar

Mr. Rahul Dev, KV NHPC Dharchula

::VETTED BY::

KVS ZIET CHANDIGARH

Mr. Sunil Kumar, KV Sec. 47 Chandigarh

CONTENTS

	Impacts	and open source software
		Cybercrime and Cyber Laws , Hacking ,Phishing , Cyber Bullying , Overview of Indian IT Act
		Waste: Hazards and management, Awareness about health concerns related to the usage of Technology.
6	**Solved and Unsolved Sample/Practice Papers**	

Informatics Practices (2024-25)
CLASS XII Code No. 065

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, W W W, 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.

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	-	12
4	Societal Impacts	10	14	-	14
	Project	-	-	7	7
	Practical	30	-	-	-
	Total	**100**	**71**	**49**	**120**

UNIT 1: Introduction to Matplotlib

Matplotlib is a powerful plotting library in Python used for creating static, animated, and interactive visualizations. Matplotlib's primary purpose is to provide users with the tools and functionality to represent data graphically, making it easier to analyze and understand. It was originally developed by John D. Hunter in 2003 and is now maintained by a large community of developers.

Key Features of Matplotlib:

Versatility: Matplotlib can generate a wide range of plots, including line plots, scatter plots, bar plots, histograms, pie charts, and more.

Customization: It offers extensive customization options to control every aspect of the plot, such as line styles, colors, markers, labels, and annotations.

Integration with NumPy: Matplotlib integrates seamlessly with NumPy, making it easy to plot data arrays directly.

Publication Quality: Matplotlib produces high-quality plots suitable for publication with fine-grained control over the plot aesthetics.

Extensible: Matplotlib is highly extensible, with a large ecosystem of add-on toolkits and extensions like Seaborn, Pandas plotting functions, and Basemap for geographical plotting.

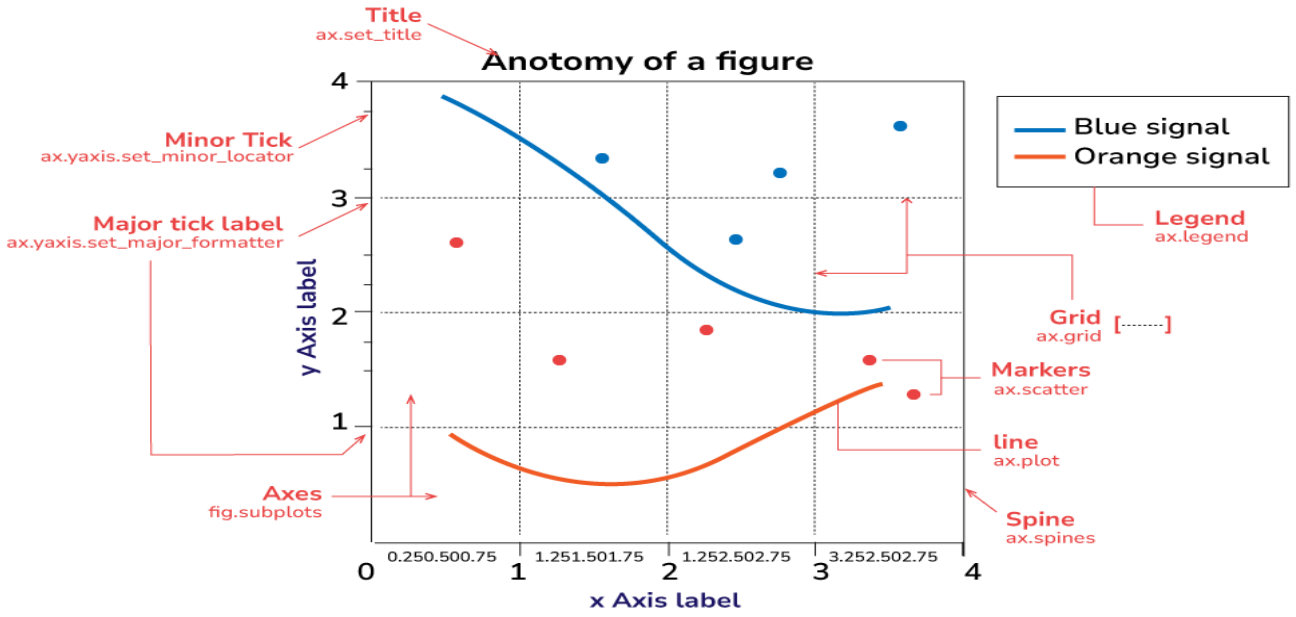
Cross-Platform: It is platform-independent and can run on various operating systems, including Windows, macOS, and Linux.

Interactive Plots: Matplotlib supports interactive plotting through the use of widgets and event handling, enabling users to explore data dynamically.

What is a Matplotlib Figure?

In Matplotlib, a figure is the top-level container that holds all the elements of a plot. It represents the entire window or page where the plot is drawn.

Matplotlib



Basic Components or Parts of Matplotlib Figure

The parts of a Matplotlib figure include (as shown in the figure above):

Figures in Matplotlib: The Figure object is the top-level container for all elements of the plot. It serves as the canvas on which the plot is drawn. You can think of it as the blank sheet of paper on which you'll create your visualization.

Axes in Matplotlib: Axes are the rectangular areas within the figure where data is plotted. Each figure can contain one or more axes, arranged in rows and columns if necessary. Axes provide the coordinate system and are where most of the plotting occurs.

Axis in Matplotlib: Axis objects represent the x-axis and y-axis of the plot. They define the data limits, tick locations, tick labels, and axis labels. Each axis has a scale and a locator that determine how the tick marks are spaced.

Marker in Matplotlib: Markers are symbols used to denote individual data points on a plot. They can be shapes such as circles, squares, triangles, or custom symbols. Markers are often used in scatter plots to visually distinguish between different data points.

Adding lines to Figures: Lines connect data points on a plot and are commonly used in line plots, scatter plots with connected points, and other types of plots. They represent the relationship or trend between data points and can be styled with different colors, widths, and styles to convey additional information.

Matplotlib Title: The title is a text element that provides a descriptive title for the plot. It typically appears at the top of the figure and provides context or information about the data being visualized.

Axis Labels in Matplotlib: Labels are text elements that provide descriptions for the x-axis and y-axis. They help identify the data being plotted and provide units or other relevant information.

Ticks: Tick marks are small marks along the axis that indicate specific data points or intervals. They help users interpret the scale of the plot and locate specific data values.

Tick Labels: Tick labels are text elements that provide labels for the tick marks. They usually display the data values corresponding to each tick mark and can be customized to show specific formatting or units.

Matplotlib Legend: Legends provide a key to the symbols or colors used in the plot to represent different data series or categories. They help users interpret the plot and understand the meaning of each element.

Matplotlib Grid Lines: Grid lines are horizontal and vertical lines that extend across the plot, corresponding to specific data intervals or divisions. They provide a visual guide to the data and help users identify patterns or trends.

Spines of Matplotlib Figures: Spines are the lines that form the borders of the plot area. They separate the plot from the surrounding whitespace and can be customized to change the appearance of the plot borders.

Different Types of Plots in Matplotlib:

Matplotlib offers a wide range of plot types to suit various data visualization needs. Here are some of the most commonly used types of plots in Matplotlib: Line Graph, Stem Plot, Bar chart, Histograms, Scatter Plot, Stack Plot, Box Plot, Pie Chart, Error Plot, Violin Plot & 3D Plots.

Advantages of Matplotlib

Matplotlib is a widely used plotting library in Python that provides a variety of plotting tools and capabilities. Here are some of the advantages of using Matplotlib:

- Versatility: Matplotlib can create a wide range of plots, including line plots, scatter plots, bar plots, histograms, pie charts, and more.
- Customization: It offers extensive customization options to control every aspect of the plot, such as line styles, colors, markers, labels, and annotations.
- Integration with NumPy: Matplotlib integrates seamlessly with NumPy, making it easy to plot data arrays directly.
- Publication Quality: Matplotlib produces high-quality plots suitable for publication with fine-grained control over the plot aesthetics.
- Wide Adoption: Due to its maturity and flexibility, Matplotlib is widely adopted in the scientific and engineering communities.
- Extensible: Matplotlib is highly extensible, with a large ecosystem of add-on toolkits and extensions like Seaborn, Pandas plotting functions, and Basemap for geographical plotting.
- Cross-Platform: It is platform-independent and can run on various operating systems, including Windows, macOS, and Linux.
- Interactive Plots: Matplotlib supports interactive plotting through the use of widgets and event handling, enabling users to explore data dynamically.
- Integration with Jupyter Notebooks: Matplotlib works seamlessly with Jupyter Notebooks, allowing for interactive plotting and inline display of plots.
- Rich Documentation and Community Support: Matplotlib has comprehensive documentation and a large community of users and developers, making it easy to find help, tutorials, and examples.

Pandas Introduction:

Pandas is a powerful and open-source Python library. The Pandas library is used for data manipulation and analysis. Pandas consist of data structures and functions to perform efficient operations on data.

What is Pandas Libray in Python?

Pandas is a powerful and versatile library that simplifies the tasks of data manipulation in Python. Pandas is well-suited for working with tabular data, such as spreadsheets or SQL tables.

The Pandas library is an essential tool for data analysts, scientists, and engineers working with structured data in Python.

What is Python Pandas used for?

The Pandas library is generally used for data science, but have you wondered why? This is because the Pandas library is used in conjunction with other libraries that are used for data science.

It is built on top of the NumPy library which means that a lot of the Structures of NumPy are used or replicated in Pandas.

You must be wondering, why you should use the Pandas Library. Python's Pandas library is the best tool to analyze, clean, and manipulate data.

Here is a list of things that we can do using Pandas.

- Data set cleaning, merging, and joining.
- Easy handling of missing data (represented as NaN) in floating point as well as non-floating point data.
- Columns can be inserted and deleted from DataFrame and higher-dimensional objects.
- Powerful group by functionality for performing split-apply-combine operations on data sets.

- Data Visualization.

Installing Pandas

The first step in working with Pandas is to ensure whether it is installed in the system or not. If not, then we need to install it on our system using the pip command.

Follow these steps to install Pandas:

Step 1: Type 'cmd' in the search box and open it.

Step 2: Locate the folder using the cd command where the python-pip file has been installed.

Step 3: After locating it, type the command:

pip install pandas

For more reference, take a look at this article on installing pandas follows.

Importing Pandas

After the Pandas have been installed in the system, you need to import the library. This module is generally imported as follows:

import pandas as pd

Note: Here, pd is referred to as an alias for the Pandas. However, it is not necessary to import the library using the alias, it just helps in writing less code every time a method or property is called.

Data Structures in Pandas Library

Pandas generally provide two data structures for manipulating data. They are:

- Series
- DataFrame

MULTIPLE CHOICE QUESTIONS WITH ANSWER

Q1. Which of these definitions correctly describes a module?

a) Denoted by triple quotes for providing the specification of certain program elements
b) Design and implementation of specific functionality to be incorporated into a program
c) Defines the specification of how it is to be used
d) Any program that reuses code

Ans: b)

Q2. Which of the following is not an advantage of using modules?

a) Provides a means of reuse of program code
b) Provides a means of dividing up tasks
c) Provides a means of reducing the size of the program
d) Provides a means of testing individual parts of the program

Ans: c)

Q3 Program code making use of a given module is called a of the module.

a) Client
b) Docstring
c) Interface
d) Modularity

Ans a)

Q4._____is a string literal denoted by triple quotes for providing the specifications of certain program elements.

a) Interface
b) Modularity
c) Client
d) Docstring

Ans d)

Q5. Which of the following is false about "from-import" form of import?

a) The syntax is: from module name import identifier
b) This form of import prevents name clash
c) The namespace of imported module becomes part of importing module
d) The identifiers in module are accessed directly as: identifier

Ans b)

Q6. Which of the statements about modules is false?

a) In the "from-import" form of import, identifiers beginning with two underscores are private and aren't imported
b) dir() built-in function monitors the items in the namespace of the main module
c) In the "from-import" form of import, all identifiers regardless of whether they are private or public are imported
d) When a module is loaded, a compiled version of the module with file extension .pyc is automatically produced

Ans c)

Q7 What is function name to create legends using Matplotlib package in python?

a) Legends() b) Legendlines() c) lg() d) legend()

Ans - d)

Q8 The syntax for histogram in Python is

a) plt.hist(x, bins = number of bins)
b) plt.show()
c) both
d) none

Ans- a)

Q.9 What is the standard way to import matplotlib's pyplot library in python?

a) import matplot as plt
b) import matplotlib.pyplot as plt
c) from matplotlib import pyplot as plt
d) import matplotlib pyplot as plt

Answer: b)

Q10. What is the correct way to plot a line graph?

a) plot(x, y)
b) plt.plot(x, y)
c) plt(x, y)
d) plot.plt(x, y)

Answer: b)

2 Marks Question Answer

Q1. What is the difference between plt.show () and plt.savefig() in Matplotlib?

Answer 1: plt.show () is used to display a plot in the output console, while plt.savefig() is used to save a plot as an image file.

Q2. How can you add a legend to a plot in Matplotlib?

Answer: You can add a legend to a plot in Matplotlib using the plt.legend() method. For example:
plt.plot(x, y, label='My Line') plt.legend()

Q3. What is the purpose of the plt.subplots() function in Matplotlib?

Answer: The plt.subplots() function is used to create multiple subplots in a single figure. It returns a tuple containing the figure object and an array of subplot objects.
Q4. How can you add text to a plot in Matplotlib?
Answer: You can add text to a plot in Matplotlib using the plt.text() method. For example:
plt.text(x, y, 'My Text')
Q5. How can you set the color of a plot in Matplotlib?
Answer : You can set the color of a plot in Matplotlib using the color parameter of the plotting function. For example:
plt.plot(x, y, color='red')

3 Marks Question Answer

Q1. What is panda in Python?
Answer : Pandas is an open-source Python library with powerful and built-in methods to efficiently clean, analyze, and manipulate datasets. Developed by Wes McKinney in 2008, this powerful package can easily blend with various other data science modules in Python.
Pandas is built on top of the NumPy library, i.e., its data structures Series and DataFrame are the upgraded versions of NumPy arrays.
Q2. How can you plot a line plot with multiple lines in Matplotlib?
Answer 2: You can plot multiple lines in Matplotlib by calling the plt.plot() function multiple times with different data. For example:
x = np.linspace(0, 10, 100) y1 = np.sin(x)
y2 = np.cos(x) plt.plot(x, y1) plt.plot(x, y2)
Q3 How to Install Matplotlib in Python Using Command Prompt
Answer: To install Matplotlib in Python, you can follow these simple steps. Matplotlib is a popular data visualization library that allows you to create a wide range of plots and charts.
Step 1: Check Your Python Installation
Before installing Matplotlib, ensure you have Python installed on your system. Open your terminal or command prompt and enter the following command to check your Python version:
python --version
If Python is not installed, download and install it from the official Python website: https://www.python.org/downloads/
Step 2: Open a Terminal or Command Prompt
Open a terminal or command prompt on your computer. The exact method varies depending on your operating system.
Step 3: pip install Matplotlib in Python
To install Matplotlib, you can use Python's package manager, pip. Enter the following command: pip install matplotlib
This command will download and install Matplotlib and its dependencies. Wait for the installation process to complete.
Step 4: Verify the Installation
After the installation, you can verify it by running a simple Python script. Create a Python script:
Q4. How can you add a legend to a plot in Matplotlib?
Answer : You can add a legend to a plot in Matplotlib using the plt.legend() function. For example:
x = np.linspace(0, 10, 100) y = np.sin(x)
plt.plot(x, y, label='Sine') plt.legend()

ASSERTION AND REASON BASED QUESTIONS

Q1. 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.

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

Ans A

Q2. Assertion (A) : Data visualization refers to the graphical representation of information and data using visual elements like charts, graphs and maps etc.
Reason (R) : To install matplotlib library we can use the command pip install matplotlib.

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

Ans B

Q3. ASSERTION(A) :A histogram is basically used to represent data provided in the form of groups spread in non-continuous ranges
REASON(R) : matplotlib.pyplot.hist() function is used to compute and create histogram of a variable.

a) A is true but R is false.
b) Both A and R are true
c) A is false but R is true.
d) Both A and R are false. Ans: C

Case Studies Based Question

Mr. Ankit is working in an organisation as data analyst. He uses Python Pandas and Matplotlib for the same. 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:

Code to create the above data frame:

	Year	Month	Passengers
0	2010	Jan	25
1	2010	Mar	50
2	2012	Jan	35
3	2010	Dec	55
4	2012	Dec	65

```
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)
```

1. Choose the right code from the following for statement 1.

a) pd
b) df
c) data
d) p

2. Choose the right code from the following for the statement 2.

a) Dataframe
b) DataFrame
c) Series
d) Dictionary

3. Choose the correct statement/ method for the required output: (5,3)

a) df.index
b) df.shape()
c) df.shape
d) df.size

4. He wants to print the details of "January" month along with the number of passengers, Identify the correct statement:

	Month	Passengers
0	Jan	25
2	Jan	35

a) df.loc[['Month','Passengers']][df['Month']=='Jan']
b) df[['Month','Passengers']][df['Month']=='Jan']
c) df.iloc[['Month','Passengers']][df['Month']=='Jan']
d) df(['Month','Passengers']][df['Month']=='Jan')

5. Mr. Ankit wants to change the index of the Data Frame and the output for the same is given below. Identify the correct statement to change the index.

	Year	Month	Passenger
Air India	2010	Jan	25
Indigo	2010	Mar	50
Spice Jet	2012	Jan	35
Jet	2010	Dec	55
Emirates	2012	Dec	65

a) df.index[]=["Air India","Indigo","Spicejet","Jet","Emirates"]
b) df.index["Air India","Indigo","Spicejet","Jet","Emirates"]
c) df.index=["Air India","Indigo","Spicejet","Jet","Emirates"]
d) df.index()=["Air India","Indigo","Spicejet","Jet","Emirates"]

Answer 1) a 2) b 3) c 4) b 5) c

Chapter 2. Data Structure in Pandas-Series and Data Frame

Python Pandas

The term "Pandas" refers to an open-source library for manipulating high-performance data in Python. It was created in 2008 by Wes McKinney and is used for data analysis in Python. Pandas is an open-source library that provides high-performance data manipulation in Python. Before Pandas, Python was able for information planning, however it just offered restricted help for information investigation. As a result, Pandas entered the picture and enhanced data analysis capabilities.

DataFrame and Series are the two data structures that Pandas provides for processing data.

The best way to think of these data structures is that the higher dimensional data structure is a container of its lower dimensional data structure. For example, DataFrame is a container of Series, Panel is a container of DataFrame. These data structures are discussed below

Python Pandas Series

A one-dimensional array capable of storing a variety of data types is how it is defined. The term "index" refers to the row labels of a series. We can without much of a stretch believer the rundown, tuple, and word reference into series utilizing "series' technique. Multiple columns cannot be included in a Series. Only one parameter exists:

Data: It can be any list, dictionary, or scalar value.

Key Points

- Homogeneous data
- Size Immutable
- Values of Data Mutable

Python Pandas DataFrame

It is a generally utilized information design of pandas and works with a two-layered exhibit with named tomahawks (lines and segments). As a standard method for storing data, DataFrame has two distinct indexes-row index and column index. It has the following characteristics:

The sections can be heterogeneous sorts like int, bool, etc.

It can be thought of as a series structure dictionary with indexed rows and columns. It is referred to as "columns" for rows and "index" for columns.

Name	Age	Gender	Rating
Steve	32	Male	3.45
Lia	28	Female	4.6
Vin	45	Male	3.9
Katie	38	Female	2.78

The table represents the data of a sales team of an organization with their overall performance rating. The data is represented in rows and columns. Each column represents an attribute and each row represents a person.

Data Type of Columns

The data types of the four columns are as follows −

Column	Type
Name	String
Age	Integer
Gender	String
Rating	Float

Key Points

- Heterogeneous data
- Size Mutable
- Data Mutable

MULTIPLE CHOICE QUESTIONS

1. Important data structure of pandas are :
a)- Series b)- Data Frame c)- Both of the above d)- None of the above
2. Pandas series can have _____data types
a)-float b)- Integer c)- String d)- All of the above
3. ____is one dimensional array
a)- Series b)- Data Frame c)- Both of the above d)- None of the above
4. A series By default have numeric data labels start from
a)-0 b)- 1 c)- 3 d)- 2
5. Data labels associated to the particular value of series is called its ____
a)- data value b)- index c)- value d)- None of the above
6. Which of the following module is to be imported to create Series
a)- Numpy b)- Panda c)- Matplotlib d)- None of the above
7. Which of the following statement is used to create empty series
a)- s1=pd.Series(None)
b)- s1=pd.Series()
c)- All of the above
d)- None of the above
8. Pandas data frame is size_____ and Value_____.
a)- mutable, mutable
b)-Immutable , Immutable
c)- Immutable , mutable
d)- mutable, Immutable
9. In Pandas _____are used to store data in multiple columns
a)- Series b)- Data Frame c)- Both of the above d)- None of the above
10. Which of the following function is used to create data frame
a)- DataFrame()
b)- NewFrame()
c)- Create DataFrame()
d)-None of the above

REASON – ASSERTION 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
1. Assertion (A):- A DataFrame can be created by importing pandas library.
Reasoning (R): - A DataFrame is a two-dimensional labelled data structure.
2. Assertion (A):-To delete a column from Pandas DataFrame,drop() method is used.
Reasoning (R): - Columns are deleted by dropping columns with index label.
3. Assertion (A):- DataFrame has both a row and column index.
Reasoning (R): - A DataFrame is a two-dimensional labelled data structure like a table of MySQL.
4. Assertion (A):- DataFrame is a two dimensional labelled array. Its column type can be heterogeneous i.e.,of varying types Reasoning (R): - We need a DataFrame with a Boolean index to use the Boolean indexing.

CASE BASED QUESTION

Q.1. Mr. Ankit is working in an organisation as data analyst. He uses Python Pandas and Matplotlib for the same. 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.

	YEAR	MONTH	PASSENGER
0	2010	JAN	25
1	2010	MAR	50
2	2012	JAN	35
3	2010	DEC	55
4	2012	DEC	65

Help him by filling the blanks with correct code to create the above data frame:

```
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)
```

2. Mr. Puneet is working in an organisation as data analyst. He uses Python Pandas and Matplotlib for the same. He got a dataset of rain for the year 2010 to 2014 for January, February, March and December. Help him by filling the blanks with correct code to create the above data frame:

```
import pandas as _____  #Statement 1
data={"Year":[2010,2011,2012,2013,2014],"Month":["Jan","Feb","Mar","Dec","Dec"],"rain":[25,50,35,55,65]}
df=pd._____(data) #Statement 2
print(df)
```

3. Ekam, a Data Analyst with a multinational brand has designed the DataFrame df that contains the four quarter's sales data of different stores as shown below: Write code to create the data frame

	Store	Qtr1	Qtr2	Qtr3	Qtr4
0	Store1	300	230	450	230
1	Store2	350	340	403	210
2	Store3	250	180	145	160

VERY SHORT ANSWER TYPE QUESTIONS

1. Write a program to create a series object using a dictionary that stores the number of students in each class from 9 to 12 of your school.
Note: Assume 9, 10, 11 and 12 having 45, 50, 43, 35 students respectively and pandas library has been imported as pd.

2. What will be the output of the following code:

```
>>>import pandas as pd
>>>A=pd.Series(data=[35,45,55,40])
>>>print(A[-1:])
```

3. Carefully observe the following code and give output :

```
import pandas as pd
x=[[100,200,300],[10,20]]
df=pd.DataFrame(x)
print(df)
```

Short Answer Type Questions

1. What will be the output of the following code:

```
>>>import pandas as pd
>>>A=pd.Series(data=[25,45,70,40])
>>>print(A<=40)
```

2. Write a program to create a series from dictionary that stores classes (6,7,8,9,10) as keys and number of students as values.

3. Write a program to create a series from a given Tuple data data=(100,"Aavya Verma",96.3,"A").

LONG ANSWER TYPE QUESTIONS

1. Write python code to create a dataframe df (runs scored by batsman in last three years) from the dictionary given below:
{'Virat':[1000,962,1035],'Rohit':[635,580,602],'Surya':[1200,1008,1258]}

2. Create a DataFrame in Python from the given list:
[['Divya','HR',95000],['Mamta','Marketing',97000],['Payal','IT',980000], ['Deepak','Sales',79000]] Also give appropriate column headings

3. Write a Python code to create a DataFrame with appropriate column headings from the list given below:
[[101,'Gurman',98],[102,'Rajveer',95],[103,'Samar' ,96],[104,'Yuvraj',88]]

ANSWERS

MULTIPLE CHOICE QUESTIONS

1- c , 2-d , 3- a , 4- a , 5- b , 6- b, 7- b, 8- a , 9 – b , 10 – a

REASON – ASSERTION BASED QUESTIONS

1-(i), 2-(i), 3 –(i), 4-(ii)

CASE BASED QUESTION

1. pd, DataFrame
2. pd, DataFrame
3. import pandas as pd

```
df=[{store1:[300,230,450,230]},{store2:[350,340,403,210], {store3:[250,180,145,160]}]
df=pd.DataFrame(df, columns=["QTR1","QTR2", "QTR3"])
print(df)
```

VERY SHORT ANSWER

1.
```
import pandas as pd
di = {9: 45, 10:50, 11: 43, 12:35}
NP = pd.Series( di)
print(NP)
```

2. 40

3.
```
0    100    200    300
1     10     20    NaN
```

SHORT ANSWER TYPE

1. 25, 40

2.
```
import pandas as pd
di = {6: 41, 7: 65, 8: 55, 9: 45, 10:50, 11: 43, 12:35}
NP = pd.Series( di)
print(NP)
```

3.
```
import pandas as pd
data=(100,"Aavya Verma" ,96.3,"A").
s=pd .Series(data)
print(s)
```

LONG ANSWER TYPE QUESTIONS

1.
```
import pandas as pd
D= {'Virat':[1000,962,1035],'Rohit':[635,580,602],'Surya':[1200,1008,1258]}
df=pd.DataFrame(D)
print(df)
```

2. import pandas as pd
D=[["Divya","HR",95000],["Mamta","Markting",97000],["Payal","IT",980000],["Deepak","Sales",79000]]
df=pd.DataFrame(D,columns=["Name","Department", "Salary"])
print(df)
3. 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'])

print(df)

Series: Creation of series from NDArray, Dictionary, Scaler values

Series

A Pandas Series is a one-dimensional labeled ndarray structure. A Pandas Series can be thought of as a column in a spreadsheet. It consists of two main components: the labels and the data.

For example

```
0    'Nirmal'
1    20
2    5.3
3    False
dtype: object
```

Here, the series has two columns, labels (0, 1, 2 and 3) and data ('nirmal', 20, 5.3, False).

The labels are the index values assigned to each data point, while the data represents the actual values stored in the Series.

Note: Pandas Series can store homogeneous data elements. It uses a concept called dtype (data type) to manage and represent the underlying data in a Series.

Creating a Pandas Series

To create Series any of the following methods can be used. Make sure to import pandas library.

Creating an empty Series: Series() function of Pandas is used to create a series. A basic series, which can be created, is an Empty Series.

```
# import pandas as pd
import pandas as pd
 # Creating empty series
ser = pd.Series()
 print(ser)
```

Output:

```
Series([], dtype: float64)
```

By default, the data type of Series is float.

Creating a series from array: In order to create a series from NumPy array, we have to import numpy module and have to use array() function.

```
 # import pandas as pd
 import pandas as pd
  # import numpy as np
 import numpy as np
  # simple array
 data = np.array(['g', 'e', 'e', 'k', 's'])
  ser = pd.Series(data)
 print(ser)
```

Output:

```
0    g
1    e
2    e
3    k
4    s
dtype: object
```

By default, the index of the series starts from 0 till the length of series -1.
Creating a series from array with an index: In order to create a series by explicitly providing index instead of the default, we have to provide a list of elements to the index parameter with the same number of elements as it is an array.

```
import pandas as pd
 import numpy as np
 # simple array
data = np.array(['g', 'e', 'e', 'k', 's'])
 # providing an index
ser = pd.Series(data, index=[10, 11, 12, 13, 14])
print(ser)
```

Output:

```
10    g
11    e
12    e
13    k
14    s
dtype: object
```

Creating a series from Lists: In order to create a series from list, we have to first create a list after that we can create a series from the list.

```
import pandas as pd
# a simple list
list = ['g', 'e', 'e', 'k', 's']
# create series form a list
ser = pd.Series(list)
print(ser)
```

Output :

```
0    g
1    e
2    e
3    k
4    s
dtype: object
```

Creating a series from Dictionary: In order to create a series from the dictionary, we have to first create a dictionary after that we can make a series using dictionary. Dictionary keys are used to construct indexes of Series.

```
import pandas as pd
# a simple dictionary
dict = {'Geeks': 10, 'for': 20,  'geeks': 30}
# create series from dictionary
ser = pd.Series(dict)
```

```
print(ser)
```

Output:

```
Geeks    10
for      20
geeks    30
dtype: int64
```

Creating a series from Scalar value: In order to create a series from scalar value, an index must be provided. The scalar value will be repeated to match the length of the index.

```
import pandas as pd
 import numpy as np
 # giving a scalar value with index
ser = pd.Series(10, index=[0, 1, 2, 3, 4, 5])
 print(ser)
```

Output:

```
0    10
1    10
2    10
3    10
4    10
5    10
dtype: int64
```

Accessing elements of a series

We can access the data elements of a series by using various methods. We will continue to use the series created above to demonstrate the various methods of accessing.

Accessing the First Element

The first element is at the index 0 position. So it is accessed by mentioning the index value in the series. We can use both 0 or the custom index to fetch the value.

Example

```
import pandas as pd
s = pd.Series([11,8,6,14,25],index = ['a','b','c','d','e'])
print s[0]
print s['a']
```

Output

11
11

Accessing the First Three Elements

In a similar manner as above we get the first three elements by using the : value in front of the index value of 3 or the appropriate custom index value.

Example

```
import pandas as pd
s = pd.Series([11,8,6,14,25],index = ['a','b','c','d','e'])
print s[:3]
print s[:'c']
```

Output:

a 11
b 8
c 6
dtype: int64
a 11
b 8

c 6
dtype: int64

Accessing the Last Three Elements

In a similar manner as above, we get the first three elements by using the: value at the end of the index value of 3 with a negative sign or the appropriate custom index value.

Example

```
import pandas as pd
s = pd.Series([11,8,6,14,25],index = ['a','b','c','d','e'])
print s[-3:]
print s['c':]
```

Output:

```
c 6
d 14
e 25
dtype: int64
c 6
d 14
e 25
dtype: int64
```

Accessing Elements using Index Labels

In this case, we use the custom index values to access non-sequential elements of the series.

Example

```
import pandas as pd
s = pd.Series([11,8,6,14,25],index = ['a','b','c','d','e'])
print s[['c','b','e']]
```

Output:

```
c 6
b 8
e 25
dtype: int64
```

Mathematical Operation on Series object

We can do arithmetic operations (+, -, *, /) on more than one series objects.
The arithmetic operation is performed only on matching index.
For non-matching index it produces NaN values.
If data items of matching indexes are not compatible for the operation, it produces NaN values as a result.

Program-1

```
import pandas as pd
S1 = pd.Series([12,23,34])
S2 = pd.Series([10,20,10])
print("Addition of Series with matching indexes")
print(S1 + S2)
```

Output –

```
Addition of Series with matching indexes
0    22
1    43
2    44
dtype:    int64
```

Program-2

```
import pandas as pd
S1 = pd.Series([12,23,34,56])
S2 = pd.Series([10,20,10])
print("Addition of Series of Different sizes")
print(S1 + S2)
```

Output –

```
Addition of Series of Different sizes
0    22
1    43
2    44
3    NaN
dtype:    int64
```

Program-3

```
import pandas as pd
S1 = pd.Series([12,23,34])
S2 = pd.Series([10,20,10],index=['a','b','c'])
print("Addition of Series With Non Matching Index")
print(S1 + S2)
```

Output –

```
Addition of Series with Non Matching Index
0        NaN
1        NaN
2        NaN
a        NaN
b        NaN
c        NaN
dtype:    float64
```

Program-4

What will be the output produced by the following programming statements-1 & 2?

```
import pandas as pd
S1=pd.Series (data=[31,41,51])
print(S1>40) -->Statement1
print(S1[S1>40]) -->Statement2
```

Output –
Statement-1

0	False
1	True
2	True

Statement-2

1	41
2	51

Summary

Pandas Series is a one dimensional array like labeled structure.
Series labels need not be unique but must be a hashable type.
Homogenous – Series elements must be of the same data type.
Size-immutable – Once created, the size of a Series object cannot be changed.
The series object supports both integer and label-based indexing and provides various methods for performing operations involving the index.
Series can be created using List, array, dictionary and scalar value.

MCQ

1. A Series by default have numeric data labels starting from _____.
a. 3 b. 2 c. 1 d. 0
2. The data label associated with a particular value of Series is called its _____
a. Data value
b. Index
c. Value
d. None of the above
3. Which of the following module is to be imported to create Series?
a. NumPy
b. Pandas
c. Matplotlib
d. None of the above
4. Which of the following function/method help to create Series?
a. series( )
b. Series( )
c. createSeries( )
d. None of the above
5. How many elements will be there in the series named “S1”?
>>> S1 = pd.Series(range(5))
>>> print(S1)
a. 5
b. 4
c. 6
d. None of the above
6. When we create a series from dictionary then the keys of dictionary become _____
a. Index of the series
b. Value of the series
c. Caption of the series
d. None of the series
7. What type of error is returned by following code?

```
import pandas as pd
S1 = pd.Series(data = (31, 2, -6), index = [7, 9, 3, 2])
print(S1)
```

a. SyntaxError
b. IndexError
c. ValueError
d. None of the above
8. We can assign user-defined labels to the index of the series?(T/F)
a. True
b. False
9. Write the statement to get NewDelhi as output using positional index.
import pandas as pd
S1 = pd.Series(['NewDelhi', 'WashingtonDC', 'London', 'Paris'],
index=['India', 'USA', 'UK', 'France'])
a. print(S1[0])
b. print(S1[‘India’])
c. Both of the above
d. print(S1.India)
10. Which of the following statement shows first five values of Series ‘S1’?
a. S1.head( )
b. S1.head(5)
c. Both of the above
d. None of the above
11. Which of the following are valid operations on Series ‘S1’?
a. >>> S1 + 2
b. >>> S1 ** 2
c. >>> S1 * 2
d. All of the above
12. Assertion (A) : We can’t modify the values of series elements once created .
Reason(R): Series is an immutable object.
Both A and R are true and R is the correct explanation of A.
Both A and R are true and R is not the correct explanation of A.
A is true but R is false.
Both A and R are false.
13. Assertion (A) : Elements of series can be accessed using positional index.
Reason(R): Positional index value ranges from 1 to n, if n is the size of the series.
Both A and R are true and R is the correct explanation of A.
A is true but R is false.
A is false but R is true.
Both A and R are false.
14. Assertion (A): Dictionaries can’t be used to create series objects.
Reason(R): Dictionaries have key, value pairs and series is one dimensional data structure.
Both A and R are true and R is the correct explanation of A.
Both A and R are true and R is not the correct explanation of A.
A is true but R is false.
A is false but R is true.
15. Assertion (A): We can’t access more than one element of a series without slicing.
Reason(R): More than one element of a series can be accessed using a list of positional index or labelled index.
Both A and R is true and R is the correct explanation of A.
Both A and R is true and R is not the correct explanation of A.
A is true but R is false.
A is false but R is true.
Q14. Write the output of the following:
import pandas as pd
S1 = pd.Series(12, index = [4, 6, 8])
print(S1)

Ans. Output is :
4 12
6 12
8 12
dtype: int64
15. Write the output of the following:
```
import numpy as num
import pandas as pd
arr=num.array([31,47,121])
S1 = pd.Series(arr, index = (7,77,777))
print(S1[777])
```
Ans. 121
16. Write the output of the following :
```
import pandas as pd
L1 = list("My name is Ravi Kumar")
S1 = pd.Series(L1)
print(S1[0])
```
Ans. M
Q17. Write the code to display last 3 rows of a series S1.
Ans. print(S1.tail(3))

CASE STUDY BASED QUESTIONS

Q.18.
Pushp, a student of class-XII, has been assigned a code to create a pandaseries S1, as shown below.
a 100
b 200
c 300
d 400
e 500
dtype: int64
With reference to the above, answer the given questions:
Choose the command that will give the following output
b 200
c 300
dtype: int64
a. print(S1[:3])
b. print(S1[0:3])
c. print(S1[1:3])
d. print(S1[2:4])
ii. Help him to identify the correct statement that can be used to extract the value with the index 'c'
a. print(S1[c])
b. print(S1(c))
c. print('S1' ['c'])
d. print(S1 ['c'])
iii. W h i c h of the following command will give the following output
b 200
d 400
dtype: int64
a. print(S1.iloc[1:4])
b. print(S1.iloc[2:4])
c. print(S1.iloc(1:4))
d. print(S1.iloc[1:4:2])
iv. Which of the following command will display the series by adding 10 in each value.

a. print(S1 [+10])
b. print(S1+10)
c. print(S1)+10
d. print(S1)+print(10)
v. Pushp wants to delete the value against index 'd'. Help him to choose the suitable option to do so:
a. S1=S1.drop(d)
b. S1=S1.drop('d')
c. S1=drop('d')
d. S1=S1.drop['d']
Solution:
i. c) print(s1[1:3])
ii. d) print(S1 ['c'])
iii. d) print(S1.iloc[1:4:2])
iv. b) print(S1+10)
v. b) S1=S1.drop('d')
19. Section wise strength of class XII is to be stored in a python series. Consider the Series object S12 that stores the section wise strength, as shown below:

A	B	C	D	E
45	51	35	42	44

Write code to create the series.
ii) Write code to display strength of section D.
iii) Write code to display first three sections strength.
iv) Write code to delete section E.

Very Short Answer Questions:

20. Write a Pandas program to create and display a one-dimensional array-like object containing an array of data.
Answer :
```
import pandas as pd
ds = pd.Series([2, 4, 6, 8, 10])
print(ds)
```
21. Write a Pandas program to add, two Pandas Series.
Sample Series: [2, 4, 6, 8, 10], [1, 3, 5, 7, 9]
Answer :
```
import pandas as pd
ds1 = pd.Series([2, 4, 6, 8, 10])
ds2 = pd.Series([1, 3, 5, 7, 9])
ds = ds1 + ds2
print("Sum of two Series:")
print(ds)
```
22. Write a Pandas program to convert a dictionary to a Pandas series.
Sample dictionary: d1 = {'a': 100, 'b': 200, 'c':300, 'd':400, 'e':800}
Answer:
```
import pandas as pd
d1 = {'a': 100, 'b': 200, 'c':300, 'd':400, 'e':800}
print("Original dictionary:")
print(d1)
new_series = pd.Series(d1)
print("Converted series:")
print(new_series)
```

SHORT ANSWER QUESTIONS

23. Create a series with 5 elements, then find square of each even element and find cube of each odd elements.

```
1 import pandas as pd
2 seq=pd.Series([5,2,3,6,8,7])
3 #square of even elements
4 print(seq[seq%2==0]**2)
5 #cube of odd elements
6 print(seq[seq%2==1]**3)
```

```
1     4
3    36
4    64
dtype: int64
0    125
2     27
5    343
dtype: int64
```

24.

5. A series object "S8" stores the bonus of different employees, like:

Raj	5800
Raman	7800
Rahul	6874
Amit	5500
Ajay	6500

a) Write a statement to create the above series

Answer :

```
1 import pandas as pd
2 emp={'Raj':5800,'Raman':7800,'Rahul':6874,'Amit':5500,'Ajay':6500}
3 S8=pd.Series(emp)
4 print(S8)
```

```
Raj      5800
Raman    7800
Rahul    6874
Amit     5500
Ajay     6500
dtype: int64
```

b) Write a statement to display all employees who are getting salary more than 6000.

Answer :

```
1 #display all employees who are getting salary more than 6000
2 print(S8[S8>6000])
```

```
Raman    7800
Rahul    6874
Ajay     6500
dtype: int64
```

Long Answer Questions:

1. Write any one difference between list and series.
Answer : In Python, both lists and Series are used to store sequences of data, but there are some key differences between them:
Lists: Lists are basic built-in data structures in Python, used to store an ordered sequence of elements. They can store elements of different data types, including other lists. Lists are mutable, meaning you can add, remove, or change elements in a list.
Series: Series is a one-dimensional labeled array in the Pandas library, used for data analysis.
Series have an index associated with each element, which allows for more efficient indexing and data alignment.
Series can store elements of only one data type, whereas lists can store elements of different data types.
Series have built-in methods for handling missing data and performing data operations that are more convenient and efficient than what is available in lists.
2.
Consider a series object "study", created using the following statements:
study=pd.Series([11,23,31,61,87,93], index=['a','b','c','d','e','f'])
Based on the series object, write statements to do the following:

a) Retrieve the third element and print it.

Answer: study['c']

b) Retrieve and print the first three elements

Answer : print(study[:3]) or print(study['a':'c']) or print(study.head(3))

c) Retrieve and print the last two elements

Answer : print(study.tail(2))

d) Retrieve and print alternate elements, starting from index 'b'

Answer : print(study['b'::2])

e) Retrieve and print all elements where value is even

Answer : print(study[study%2==0])

3. Create a Series with 5 values and indexes, then:
a) Sort the series element by ascending order of elements.
b) Sort the series index by ascending
Answer: (a)

```
1 import pandas as pd
2 seq=pd.Series([5,2,3,6,8,7], index=['a','b','c','d','e','f'])
3 print(seq.sort_values())
```

```
b    2
c    3
a    5
d    6
f    7
e    8
dtype: int64
```

(b)

```
1 import pandas as pd
2 seq=pd.Series([5,2,3,6,8,7], index=['c','e','a','d','b','f'])
3 print(seq.sort_index())
```

```
a    3
b    8
c    5
d    6
e    2
f    7
dtype: int64
```


```
1 import pandas as pd
2 seq=pd.Series([5,2,3,6,8,7], index=['c','e','a','d','b','f'])
3 print(seq.sort_index())
```

```
a    3
b    8
c    5
d    6
e    2
f    7
dtype: int64
```

4. Mathematical operations; Head and Tail functions, Selection, Indexing and slicing

Mathematical operations:- The Series () allows you to define a function or expression that can calculate values for the data sequence. It is done in the following form :

<Series Object>=pandas.Series(index= None, data= <function|expression)

Vector operations on Series objects

Any operation on Series object will be applied to each items of the Series. This is known as Vector Operation

For Example

```
Import pandas as pd
S1= pd.Series([15,20,21], index=['A', 'B', 'C'])
S2= pd.Series([10,10,6], index=['A', 'B', 'C'])
print('Series object(S1)')
print(S1)
print('Series object(S2)')
print(S2)
```

Output

```
Series object(S1)
A    15
B    20
C    21
Series object (S2)
A    10
B    10
C    06
```

Arithmetic operation	Operator		Example	
Addition	+ or	add	>>> s1+s2 Output A 25.0 B 30.0 NaN NaN	or >>> s1.add(s2)
Subtraction	- or	sub	>>> s1-s2 or >>> s1.sub(s2) Output A 5.0 B 10.0 NaN NaN	
Multiplication	* or	mul	>>> s1*s2 or >>> s1.mul(s2) Output A 150.0 B 200.0 NaN NaN	

MCQ

1. The result of an operation between unaligned Series will have the ---------of the indexes involved
   a) intersection
   b) union
   c) total
   d) all of the above

Ans: b

2. We can perform _____ on two series in Pandas
   a) Addition
   b) Subtraction
   c) Multiplication
   d) All of the above

Ans: d

3. Which of the following method is used to add two series?
   a) sum( )
   b) addition( )
   c) add( )
   d) None of the above

Ans: c

4. Which of the following statement will display the difference of two Series ‘A’ and ‘B’?
   a) A – B
   b) A.sub(B)
   c) Both a and b
   d) None of the above

Ans c

5. Which of the following are valid operations on Series ‘S1’?
   a) S1 + 2
   b) S1 ** 2
   c) S1 * 2
   d) All of the above

Ans: d

6. Which of the following function is used for basic mathematical operations in Series?
   a) add( )
   b) mul( )
   c) div( )
   d) All of the above

Ans: d

1. Consider the following two series objects S1, S2

Series - S1

0 10

1 18

Series - S2

a 5

b 6

What will be the output of S1+S2

a) 0 NaN

1 NaN
a NaN
b NaN

b) 0 10
1 18
a 5
b 6

c) 0 15
1 24

d) a 15
b 24

Ans: a

Choose the correct option:

2. Assertion (A): We can add two series objects using addition operator (+) or calling explicit function add() .
Reason (R): While adding two series objects index matching is implemented and missing values are filled with NaN by default.
Both A and R are true and R is the correct explanation of A.
Both A and R are true and R is not the correct explanation of A.
A is true but R is false.
A is false but R is true.
Ans: a

3. Assume there is a series S1 having data elements as 11, 12, and 13 respectively. Programmer 'Ravi' wrote print(s1*2) in his python program.
Statement 1: A series will data elements as 22, 24, 26 will get printed.
Statement 2: Series supports vectorized operation.
Only Statement 1 is true.
Only Statement 2 is true.
Both Statement 1 and 2 are true, Statement 2 is not correct reasoning of Statement 1.
Both Statement 1 and 2 are true, Statement 2 is correct reasoning of Statement 1.
Ans: d

4. Assertion (A): We can perform mathematical operations on two series objects of different size but not on two 1 D arrays of different size.
Reason (R) : if two series are not aligned NaN are generated but in case of arrays no concept of NaN and hence operations fail to perform.
Both A and R are true and R is the correct explanation of A.
Both A and R are true and R is not the correct explanation of A.
A is true but R is false.
A is false but R is true.
Ans: a

5. Assuming the given series, named Salary, which command will be used to increase 2000 in every employee's salary?

Om	35000
Vinay	35000
Simi	50000
Nitin	54000
Nandi	60000

dtype: int64

a. Salary*2000
b. Salary.add(2000)

c. Salary+2000
d. Salary.count()

Ans: c

6. Write the output of the given program:
```
import pandas as pd
S1=pd.Series([3,6,9,12],index=['a','b','c','e'])
S2=pd.Series([2,4,6,8],index=['c','d','b','f'])
print(S1*S2)
```

(A)	(B)	(C)	(D) Error
a 6.0 b 24.0 c 54.0 d 96.0 e NaN f NaN dtype: float64	a NaN b 36.0 c 18.0 d NaN e NaN f NaN dtype: float64	a 6.0 b 36.0 c 18.0 d 24.0 e NaN f NaN dtype: float64	

Ans: B

7. Predict the output of the following code:
```
import pandas as pd
stationary=['pencils','notebooks','scales','erasers']
S1=pd.Series([20,33,52,10],index=stationary)
S2=pd.Series([17,13,31,32],index=stationary)
S1=S1+S2
print(S1+S2)
```

(A)	(B)	(C)	(D) Error
pencils 37 notebooks 46 scales 83 erasers 42 dtype: int64	pencils 54 notebooks 59 scales 114 erasers 74 dtype: int 64	pencils 20 notebooks 33 scales 52 erasers 10 dtype: int64	

Ans: B

8. Write the output of the following:
```
import pandas as pd
S1 = pd.Series(data = (31, 2, -6))
print(S1*2)
```

a) 0 31 1 2 2 -6 3 31 4 2 dtype: int64	b) 0 31 1 2 2 -6 dtype: int64	c) 0 62 1 4 2 -12 dtype: int64	d) Error

Ans : c

9. Write the output of the following :
```
import pandas as pd
S1=pd.Series([1,2,3,4])
S2=pd.Series([7,8,9,10])
S2.index=['a','b','c','d']
print((S1+S2).count())
```
a. 8

b. 4
c. 0
d. 6

Ans: c
10. What will be the output of the following code?
```
import pandas as pd
s1=pd.Series([4,5,7,8,9],index=['a','b','c','d','e'])
s2=pd.Series([1,3,6,4,2],index=['a','p','c','d','e'])
print(s1-s2)
```

a 3.0 b 0 c 1.0 d 4.0 e 7.0 p 0 dtype: float64	a 3.0 b NaN c 1.0 d 4.0 e 7.0 p NaN dtype: float64	a 3.0 c 1.0 d 4.0 e 7.0 dtype: float64	a 3.0 b –1.0 c 1.0 d 4.0 e 7.0 dtype : float64

Ans b

Head function

The head function in Python displays the first five rows of the dataframe by default. It takes in a single parameter: the number of rows. We can use this parameter to display the number of rows of our choice.

Syntax

The head function is defined as follows:

```
dataframe.head(N)
```

N refers to the number of rows. If no parameter is passed, the first five rows are returned.

```
import pandas as pd
# Creating a dataframe
df = pd.DataFrame({'Sports': ['Football', 'Cricket', 'Baseball', 'Basketball', 'Tennis', 'Table-tennis', 'Archery', 'Swimming', 'Boxing']})
print(df.head()) # By default
print('\n')
print(df.head(3)) # Printing first 3 rows
print('\n')
print(df.head(-2)) # Printing all except the last 2 rows
```

```
      Sports
0   Football
1   Cricket
2   Baseball
3   Basketball
4   Tennis


      Sports
0   Football
1   Cricket
2   Baseball
      Sports
0   Football
1   Cricket
2   Baseball
3   Basketball
4   Tennis
```

5	Table-tennis
6	Archery

Tail function

The tail function in Python displays the last five rows of the dataframe by default. It takes in a single parameter: the number of rows. We can use this parameter to display the number of rows of our choice.

Syntax

The tail function is defined as follows:

dataframe.tail(N)

N refers to the number of rows. If no parameter is passed, the last five rows are returned.

The tail function also supports negative values of N. In that case, all rows except the first N rows are returned.

```
# Creating a dataframe
df = pd.DataFrame({'Sports': ['Football', 'Cricket', 'Baseball', 'Basketball',
            'Tennis', 'Table-tennis', 'Archery', 'Swimming', 'Boxing']})
print(df.tail()) # By default
print('\n')
print(df.(3)) tail# Printing last 3 rows
print('\n')
print(df.tail(-2)) # Printing all except the first 2 rows
```

	Sports
4	Tennis
5	Table-tennis
6	Archery
7	Swimming
8	Boxing

	Sports
6	Archery
7	Swimming
8	Boxing

	Sports
2	Baseball
3	Basketball
4	Tennis
5	Table-tennis
6	Archery
7	Swimming
8	Boxing

Question

A series object trdata consists of aroung 500 rows of data. Write a statement to print following details

i) First 50 rows of data ii) Last 5 rows of data

Answer

```
trdata.head(50)
trdata.tail()
```

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

count()	Returns the number of non-NaN values in the Series	>>> seriesTenTwenty.count() 10

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

MCQ TYPE QUESTIONS

1. Which of the following statement shows first five values of Series 'S1'?
   a) S1.head( )
   b) S1.head(5)
   c) Both of the above
   d) None of the above

Ans c

2. Which of the following returns number of non-NaN values of Series?
   a) count
   b) size
   c) index
   d) values

Ans a

3. Which of following statement will return 10 values from the end of the Series 'S1'?
   a) S1.tail( )
   b) S1.tail(10)
   c) S1.head(10)
   d) S1(10)

Ans b

4. Function to display the first n rows in the Series:
   a) tail (n)
   b) head (n)
   c) top (n)
   d) first (n)

Ans b

5. To get bottom three rows of a Series, you may use _____ function: 1

a) tail()
b) bottom(3)
c) bottom(3)
d) tail(3)

Ans d

1. Write the output of the following:

```
import pandas as pd
S1=pd.Series([1,2,3,4])
S2=pd.Series([7,8])
print((S1+S2).count())
```

a) 6
b) 4
c) 2
d) 0

Ans b

2. Which of the following returns number of non-NaN values of Series?

a) count
b) size
c) index
d) values

Ans a

3. Write the output of the following:

```
import pandas as pd
S1=pd.Series([1,2,3,4])
S2=pd.Series([7,8])
S3=S1+S2
print(S3.head(3))
```

a)
```
0    8.0
1   10.0
2    NaN
```
b)
```
0    1.0
1    2.0
2    NaN
```
c)
```
0    7.0
1    8.0
2    NaN
```
d)
```
0    1.0
1    7.0
2    NaN
```

Ans a

4. Write the output of the following:

```
import pandas as pd
S1=pd.Series([1,2,3,4])
S2=pd.Series([7,8])
print((S1+S2).tail(2))
```

a)
```
2   NaN
3   NaN
```
b)
```
0    8.0
1   10.0
```
c)
```
2   3
3   4
```
d)
```
0   7
1   8
```

Ans a

Indexing/Slices from Series Object

A slice object is created from Series object using a syntax of <object>[Start : end : step] but the start and stop signify the positions of elements not the indexes. The slice object of a series object is also a panda Series type object.

Slicing takes place position wise and not the index wise in a series object

The index [] operator can be used to perform indexing and slicing operations on a Series object. The index[] operator can accept either-

Index/labels

Integer index positions

Using the index operator with labels-
The index operator can be used in the following ways-
Using a single label inside the square brackets- Using a single label/index inside the square brackets will return only the corresponding element referred to by that label/index.
For example Object : Month

Position	index	Data
0	Jan	31
1	Feb	28
2	March	31
3	April	30
4	May	31

```
>>>Month[1:]
        Feb     28
        March   31
        April   30
        May     31
dtype:  int64
```

```
>>>Month[2 : 4]
        March   31
        April   30
        May     31
dtype:  int64
```

```
>>>Month[0 :  :2]
        Jan     31
        March   31
        May     31
dtype:  int64
```

```
>>>Month[ :  : -1]
        May     31
        April   30
        March   31
        Feb     28
        Jan     31
```

```
>>>Month[ :3 : 2]
        Jan     31
        April   31
dtype:  int64
```

```
>>>Month[ : 2 : -1]
        May     31
        April   30
```

Using multiple labels- We can pass multiple labels in any order that is present in the Series object. The multiple labels must be passed as a list i.e. the multiple labels must be separated by commas and enclosed in double square brackets. Passing a label is passed that is not present in the Series object, should be avoided as it right now gives NaN as the value but in future will be considered as an error by Python.

```
# indexing a Series object multiple labelsimport pandas as pd
d={'a':101, 'b':102, 'c':103, 'd':104, 'e':105, 'f':106}
s=pd.Series
(d) u=s[['b', 'a', 'f']] print(u)
        o/p:
        b       102
        a       101
        f       106
dtype: int64
```

Using slice notation start label : end label- Inside the index operator we can pass start label : end label. Here contrary to the slice concept all the items from start label values till the end label values including the end label values is returned back.

```
# indexing a Series object using startlabel : endlabel
import pandas as pd
d={'a':101, 'b':102, 'c':103, 'd':104, 'e':105, 'f':106}
s=pd.Series(d)
u=s['b':'e’]
print(u)
Output
b       102
c       103
d       104
e       105
dtype: int64
```

Slicing a Series object using Integer Index positions-

The concept of slicing a Series object is similar to that of slicing python lists, strings etc. Even though the data type of the labels can be anything each element of the Series object is associated with two integer numbers:

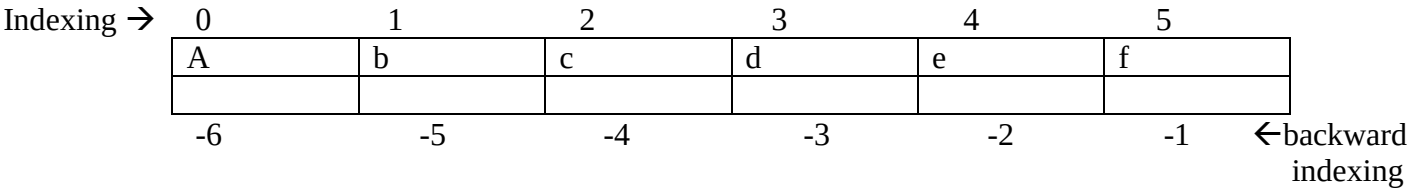
In forward indexing method the elements are numbered from 0,1,2,3, … with 0 being assigned to thefirst element, 1 being assigned to the second element and so on.

In backward indexing method the elements are numbered from -1,-2, -3,

… with -1 being assigned tothe last element, -2 being assigned to the second last element and so on.

```
d={'a':101, 'b':102, 'c':103, 'd':104, 'e':105, 'f':106}
s=pd.Series(d)
```

The Series object is having the following integer index positions-



Slice concept-

The basic concept of slicing using integer index positions is common to Python object such as strings, list, tuples, Series, Dataframe etc. Slice creates a new object using elements of an existing object. It is created as: ExistingObjectName[start : stop : step] where start, stop , step are integers

```
# Slicing a Series object
import pandas as pd
d={'a':101, 'b':111, 'c':121, 'd':131, 'e':141, 'f':151}
s=pd.Series(d)
x=s[1: :2]
print('x=\n', x)
y=s[-1: :-1]
print('y=\n', y)
z=s[1: -2: 2]
print('z=\n', z)
```

Output

```
x=      b      111
        d      131
        f      151
        dtype: int64
y=
        f      151
        e      141
        d      131
        c      121
        b      111
        a      101
        dtype: int64
z=
        b      111
        d      131
        dtype: int64
```

Modifying elements of Series object-

The elements of a Series object can be modified using any of the following methods-

Using index [ ] operator to modify single/multiple values

```
# Modifying a Series object index [ ] method
```

```
 import pandas as pd
d={'a':101, 'b':111, 'c':121, 'd':131, 'e':141, 'f':151}
          a        777
          b        111
          c        555
          d        131
          e        141
          f        666
dtype: int64 s
s=
a        777
0
1
2
e        141
f        666
dtype: int64 s
string at/iat property to modify a single value
    # Modifying a Series object at/iat property
import pandas as pd
d={'a':101, 'b':111, 'c':121, 'd':131, 'e':141, 'f':151}
s=pd.Series(d)
s['c'] = 555
s[['f','a']] = [666,777]
print('s=\n', s)
s['b':'d']=[0,1,2]
print('s=\n', s)
Output s=
a        101
b        111
c        121
d        999
e        141
f        777
dtype : int64
  Using loc, iloc property to modify single /multiple values
#Modifying a Series object loc iloc property
import pandas as pd
d={'a':101, 'b':111, 'c':121, 'd':131, 'e':141, 'f':151}
s=pd.Series(d)
s.loc['b'] = 9
s.loc['e':'f'] = [8,7]
print('s=\n', s)
s.iloc[1: :2] = [33,44,55]
print('s=\n', s)
Output s=
a        101
b          9
c        121
d        131
e          8
f          7
dtype: int64
```

s=
a 101
b 33
c 121
d 44
e 8
f 55

e) Using slice method to modify multiple values

```
# Modifying a Series object slice method
import pandas as pd
d={'a':101, 'b':111, 'c':121, 'd':131, 'e':141, 'f':151}
s=pd.Series(d)
s[1: :2] = [1,2,3]
print('s=\n', s)
```

Output s=
a 101
b 1
c 121
d 2
e 141
f 3
dtype : int64

Changing indexes of Series object-

The index property can be used to change the indexes of a Series object import pandas as pd

```
# Changing indexes of Series object
import pandas as pd
d={'a':101, 'b':111, 'c':121, 'd':131}
s=pd.Series(d)
s.index = ['have','a','nice', 'day']
print('s=\n', s)
```

Output
s=
have 101
A 111
Nice 121
Day 131
dtype: int64

MCQ

1. What will be the output of the given code?

```
import pandas as pd
s = pd.Series([1,2,3,4,5], index=['akram','brijesh','charu','deepika','era'])
print(s['charu'])
```

a 1 b 2 c 3 d 4
Ans C

2. Consider the following series named animal:

L Lion
B Bear
E Elephant
T Tiger
W Wolf
dtype: object

Write the output of the command:

print(animal[::-3])

a L Lion
T Tiger
dtype: object

b B Bear
E Elephant
dtype: object

c W Wolf
B Bear
dtype: object

d W Wolf
T Tiger
dtype: object

Ans C

3. Write the output for the following Python code.

```
import pandas as pd
s=pd.Series([1,2,3,4,5,6],index=['A','B','C','D','E','F'])
print(s[s%2==0])
```

a. B 2
D 4
F 6

b. A 1
C 3
E 5

c. B 2
D 4
F 5

d . B 3
D 4
F 6

Ans a

4. Write the output of the following code ?

```
import pandas as pd
seriesMnths=pd.Series([2,3,4],index=['Feb','Mar','Apr'])
print(seriesMnths[1])
```

a. 2 b. Mar c. Feb d. 3

Ans d

5. Choose the correct output of the following code?

```
import pandas as pd
seriesCapCntry=pd.Series(['New Delhi','WashingtonDC','London','Paris'], Index= ['India','USA','UK','France'])
print(seriesCapCntry[[3,2]])
```

a. France Paris]France Paris
b. USA WashingtonDC France Paris
c. France Paris UK London
d. USA WashingtonDC UK London

Ans c

6. Assertion (A) : We cannot access more than one element of Series without slicing . Reason (R) :More than one element of series can be accessed using a list of positional index or labeled index.

Both A and R are true and R is the correct explanation of A.

Both A and R are true and R is not the correct explanation of A.
A is true but R is false.
A is false but R is true.
Both A and R are false.
Ans D
7. Assertion (A) : Elements of Series can be accessed using positional index.
Reason (R) : positional index values ranges from 1 to n if n is the size of the series.
Both A and R are true and R is the correct explanation of A.
Both A and R are true and R is not the correct explanation of A.
A is true but R is false.
A is false but R is true.
Both A and R are false
Ans A
8. Answer the following based on the series given below

```
import pandas as pd
list1=[1,2,3,4,5,6,7,8]
list2=['swimming','tt','skating','kho kho','bb','chess','football','cricket']
school=pd.Series(list1,index=list2)
school.name=("little")
print(school*2)          # statement 1
print(school.tail(3))    # statement 2
print(school['tt'])      # statement 3
print(school[2:4])
```

i)Choose the correct name of the Series
a. list1 b) list2 c) school d) little
Ans: c
ii)Choose the correct output of the statement print(school.tail(3)) # statement 2

a. swimming 1
   TT 2
   skating 3
b. chess 6
   football 7
   cricket 8
c. swimming 1
   kho kho 4
   bb 5
d. chess 6
   football 7
   cricket 8

Ans b
iii). Choose the correct output of the statement print(school['tt']) # statement 3
a. 2 b. 3 c. 2 d. true

Ans c
9. Write the output of the following:

```
import pandas as pd
S1 = pd.Series(['NewDelhi', 'WashingtonDC', 'London', 'Paris'], index=['India', 'USA', 'UK', 'France'])
print(S1['India', 'UK'])
```

a.
India NewDelhi

UK London
dtype: object
b.
India NewDelhi
UK Washington
dtype: object
c. Error
d. None of the above
Ans c
10. What will ne the output of the above given code?

```
import pandas as pd
s=pd.Series([1,2,3,4,5],index=["ajay", "pankaj","deepti","rajesh","ritika"])
print(s["rajesh"])
```

a. 1 b) 2 c) 3 d) 4

Ans d

SERIES: MATHEMATICAL OPERATIONS; HEAD AND TAIL FUNCTIONS; SELECTION, INDEXING AND SLICING.		
MULTIPLE CHOICE QUESTION		
1	State True or False A Pandas Series object can be thought of as a column or a row, essentially	1
Ans	True	
2	We can access elements in Series by using index and index. a) Numeric, labelled c) Positional, Naming c) Positional, labelled d) None of the above	1
Ans	b) Numeric, labelled	
3	Which of the following function is used for basic mathematical operation in Series? a) add() b) mul() c) div()d) All of the above	1
Ans	d) All of the above	
4	Which of the following function of series is used to return first ‘n’ elements from series? a) s.head() b) d.tail() c) s.top() d) s.on()	1
Ans	a) s.head()	
5	The head function returns how many elements by default from the series? a) 2 b) 3 c) 4 d) 5	1
Ans	d) 5	
6	head() function return n rows and tail function return_____ n rows from a pandas object. a) Last, first b) first, secondc) last, seven d) first, last	

Ans	d) first, last	
7	Which of the following code is helpful to access first 3 index values? a) S[:3] b) S[::3] c) S[3:] d) S[:3:]	1
Ans	b) S[:3]	
8	What will be the output of following code: import pandas as pd S=pd.Series([11,12,13,14,15,16]) S[1:4] =20 S.list(S) print(S)	1
	a) [11, 20, 20, 20, 15, 16] b) [20, 20, 20, 20, 15, 16] c) [20, 12, 13, 20, 15, 16] d) [11, 20, 13, 20, 15, 16]	
Ans	a) [11, 20, 20, 20, 15, 16]	
9	Ser =pd.Series(['C', 'O', 'M', 'F', 'O', 'R', 'T', 'A', 'B', 'L', 'E'], index=[1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11]) Print(pd.Series(Ser[4 :])) a) 4 F O R T A B L E dtype : Object b) 4 F 5 O 6 R 7 T 8 A dtype : Object c) 4 F 5 O 6 R 7 T 8 A 9 B dtype :Object d) 5 O 6 R 7 T 8 A 9 B 10 L 11 E dtype : Object	1
Ans	d)	
10	The data label associated with a particular value of Series is called its a) Data value b) index c) value d) None of the above	1
Ans	b) index	
11	Write the statement to get NewDelhi as output as output using positional index import pandas as pd S1= pd.Series(['NewDelhi', 'WashingtonDC','London','Paris'], index=['India', 'USA','UK', 'France']) a) Print(S1[0]) b) print(S1['India']) c) Both a and b d) print(S1.india)	1
Ans	c) Both a and b	1
12	What is the data type of Series 'S1' given below?	

	S1= pd.Series([11,12.5, 'OK']) a) int64 b) float64 c) object d) object64	
Ans	c) object	
REASON-ASSERTION QUESTION		
	In the following questions , a statement of Assertion(A) is followed by a statement of Reason(R) . Mark the correct choice as : Both A and R are true and R is the correct explanation of A Both A and R are true and R is not the correct explanation of A A is true but R is false for partly true. A is false but R is true.	
1	Assertion : The output of addition of two series will be NaN, if one of the elements or both the elements have no value(s) Reason: While performing mathematical operations on a series, by default all missing values are filled in with 0.	1
Ans	a) Both A and R are true and R is the correct explanation of A	
2	Assertion : Arithmetic operations on two series objects take place on matching indexes Reason : Non-matching indexes are removed from the result of arithmetic operations on series objects	1
Ans	c) A is true but R is false for partly true.	
3	Assertion : Arithmetic operations on two series objects take place on matching indexes Reason : for Non-matching indexes are removed from the result of arithmetic operations NaN is returned.	1
Ans	a) Both A and R are true and R is the correct explanation of A	
4	Assertion : The head( ) function is used to fetch last n rows from a Pandas object. Reason : If you do not provided any value for n, then head( ) will return first 5 rows of a Pandas object	1
Ans	d) A is false but R is true.	
5	Assertion : The tail () function is used to fetch last n rows from a Pandas object. Reason : If you do not provided any value for n then tail() will return last row of Pandas object	1
Ans	a) Both A and R are true and R is the correct explanation of A	

	Case Based Question	
1	Create a Series MonthDays from a numpy array having the number of days in the 12 months of a year. The labels should be the month numbers from 1 to 12	1
	i) Display the names of months 3 through 7 from the Series Month Days	1
	ii) Display the Series Month Days in reverse order.	1
	iii) Name the index of the Series MonthDays a monthno	1
Ans	import pandas as pd MonthDays=pd.Series([31, 28, 31, 30, 31, 30, 31, 31, 30, 31, 30, 31], index=[1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12])	

i) >>>MonthDays [2:7]

3	31
4	30
5	31
6	30
7	30

ii) >>>MonthDays[: : -1]

12	31
11	30
10	31
9	30
8	31
7	31
6	30
5	31
4	30
3	31
2	28
1	31

	iii) MonthDays.index.name=”monthno”	
2	Create a series vowels having 5 elements with index labels ‘a’, ‘e’, ‘i’, ‘o’, ‘u’ having values [2, 5, 6, 3, ,8] respectively and answer the following question	1
	i) Alter the labels of vowels to [‘A’, ‘E’, ‘I’,’O’,’U’]	1
	ii) Find the dimension and size of Series vowels.	1
	iii) Display the 3rd and 2nd values of the Series Vowels.	1
Ans	>>> vowels = pd.Series([2, 5, 6, 3, 8], index=[‘a’, ‘e’, ‘I’, ‘o’, ‘u’]) i) >>>newind = [‘A’, ‘E’, ‘I’, ‘O’, ‘U’] >>>vowels.index= newind vowels.shape and vowels.size vowels[2:0: -1]	
3	Create a Series Friends from a dictionary having roll number of five of yours friends as data and their name as keys.	1
	{11 : “Neville”, 14 : “Yash”, 17 : “Jashpreet”, 18 : “Pritam”, 19 : “Raghu”}	

	i) Display Last 3 Friends Name from the Series.	
	ii) Rename the Series Friends as FName	
	iii) Display the first 3 Friends Name of the Series.	
Ans	>>> dic1={11 : “Neville”, 14 : “Yash”, 17 : “Jashpreet”, 18:“Pritam”, 19 : “Raghu”} Friends = pd.Series(dict1) Friends.rename(“FName”) Friends.head(3)	
	VERY SHORT ANSWER QUESTION	
1	What is Series data structure of Python Pandas?	1
Ans	Series is a one-dimensional labelled array capable of holding any data type(integers, strings, floating point number, Python objects, and so forth)	
2	Write a code to create a Series object using the Python sequence [3, 5, 7, 9]. Assume that Pandas is imported as alias name	1
Ans	S1= pd.Series([3, 5, 7, 9])	
3	Write a commands to print following details of a Series object seal Indexes of the series The data type of underlying data	1
Ans	print(seal.empty) print(seal.dtype)	
	SHORT ANSWER QUESTION	
1	A Series object trdata consists of around 2500 rows of data. Write a code to print the following details: i) First 100 rows of data ii) Last 5 rows of data	2
Ans	print(trdata.head(100) print(trdata.tail())	
2	Write a program to create a series object using a dictionary that stores the number of Kendriya Vidyalayas in each city of cities of your state. Note: Assume some cities like AGRA, JHANSI, MATHURA, NOIDA having 4, 3, 5, 4 KVs respectively.	2
Ans	import pandas as pd Dict1= {‘AGRA’:4, ‘JHANSI’:3,’MATHURA’:5,’NOIDA’:4’}	
	S1=pd.Series(Dict1) print(S1)	

3	How is Series object different from and similar to ndarrays? Support your answer with examples	2
Ans	Python Pandas Series and ndarrays are both 1-dimensional data structures and from both, we can acess the elements using indexes. But they are different in terms of presence and usage of indexes.	

Numpy Array	Series
The Numpy Array has an implicitly defined integer index used to access the values	The Pandas Series has an explicitly defined index associated with the values.
We do not specify the index to ndarrays explicitly e.g., A1= numpy.ndarray([20, 40, 50])	The index values for a Series object canbe explicitly specified using index argument to the Series() function e.g., S1=pandas.Series([20,30, 40], index=['a', 'b', 'c']

4	What will be the output produced by the following code? Stationery = ['penciles', 'notebooks', 'scales', 'erasers'] S= pd.Series([20, 33, 52, 10],index =Stationery) S2= pd.Series([17, 13, 31, 52],index =Stationery) print(S + S2) S = S + S2 print(S + S2)	2
Ans	penciles 37 notebooks 46 scales 83 erasers 62 dtype: int64	

	penciles 54 notebooks 59 scales 114 erasers 114 dtype: int64	
	LONG ANSWER QUESTION	
1	Given two series S1 and S2 S1 A 39 B 41 C 42 D 44 S2 A 10 B 10 C 10 D 10 Find the output for following python pandas statements? a) S1[: 2]*100 b) S1 * S2 C) S1[: : -1]	3
Ans	a) A 3900 B 4100 b) A 390 B 410 C 420 D 440 c) D 44 C 42 B 41 A 39	
2	What will be the output of the following code: import pandas as pd list1=[2,4,6,8] list2=['gh','mn','pq','st'] school=pd.Series(list1,index=list2) print (school*2) print (school[1:3]) print(school[‘gh’:’pq’]	3
Ans	gh 4 mn 8 pq 12 st 16 dtype: int64 mn 4 pq 6 dtype: int64 gh 2 mn 4 pq 6 dtype: int64	

3	Consider following Series object namely S 0 -500 1 600 2 700 3 -800 What will be returned by following statements? a) S * 100 b) S1=pd.Series(S) c) s3=pd.Series(S) + 3	3
Ans	a) 0 -50000 1 60000 2 70000 3 -80000 dtype: int64 b) 0 -500 1 600 2 700 3 -800 dtype: int64 c) 0 -497 1 603 2 703 3 -797 dtype: int64	

Data Frames

Creation dictionary of Series, - from list of dictionaries, Text/CSV files; display; iteration;

Data Frame: It is a two-dimensional object that is useful in representing data in the form of rows and columns. It is similar to a spreadsheet or an SQL table. This is the most commonly used pandas object. Once we store the data into the Dataframe, we can perform various operations that are useful in analyzing and understanding the data.

DATA FRAME STRUCTURE

COLUMNS
PLAYERNAME
IPLTEAM
BASEPRICEINCR

→

0	1	2
ROHIT	VIRAT	HARDIK
MI	RCB	MI
13	17	14

PROPERTIES OF DATAFRAME:-

- A Dataframe has axes (indices)-

  Row index (axis=0)
  Column index (axes=1)
- It is similar to a spreadsheet, whose row index is called index and column index is called column name.

  A Dataframe contains Heterogeneous data.
  A Dataframe Size is Mutable.
  A Dataframe Data is Mutable.
- A data frame can be created using any of the following

  Series
  Lists
  Dictionary
  A numpy 2D array

How to create Empty Dataframe

```
import pandas as pd
df=pd.DataFrame()
print(df)
```

```
Empty DataFrame
Columns: []
Index: []
```

How to create Dataframe from Series

```
import pandas as pd
s = pd.Series(['a','b','c','d'])
df=pd.DataFrame(s)
print(df)
```

DataFrame from Dictionary of Series

```
import pandas as pd
name=pd.Series(['Hardik','Virat'])
team=pd.Series(['MI','RCB'])
dic={'Name':name,'Team':team}
df=pd.DataFrame(dic)
print(df)
```

```
     Name Team
0  Hardik   MI
1   Virat  RCB
```

DataFrame from List of Dictionaries

```
import pandas as pd
l = [{'Name': 'Sachin', 'SirName':'Bhardwaj'},
     {'Name': 'Vinod', 'SirName':'Verma'},
     {'Name': 'Rajesh', 'SirName':'Mishra'}]
df1=pd.DataFrame(l)
print(df1)
```

```
     Name   SirName
0  Sachin  Bhardwaj
1   Vinod     Verma
2  Rajesh    Mishra
```

Iteration on Rows and Columns

If we want to access record or data from a data frame row wise or column wise then iteration is used. Pandas provide 2 functions to perform iterations-
iterrows ()
iteritems ()
iterrows () It is used to access the data row wise. For Example-

```python
import pandas as pd
l = [{'Name': 'Sachin', 'SirName':'Bhardwaj'},
     {'Name': 'Vinod', 'SirName':'Verma'}]
df1=pd.DataFrame(l)
print(df1)
for(row_index,row_value) in df1.iterrows():
    print('\n Row index is ::',row_index)
    print('Row Value is::')
    print(row_value)
```

```
     Name   SirName
0  Sachin  Bhardwaj
1   Vinod     Verma

 Row index is :: 0
Row Value is::
Name         Sachin
SirName    Bhardwaj
Name: 0, dtype: object

 Row index is :: 1
Row Value is::
Name       Vinod
SirName    Verma
Name: 1, dtype: object
```

iteritems ()

```
import pandas as pd
l = [{'Name': 'Sachin', 'SirName':'Bhardwaj'},
     {'Name': 'Vinod', 'SirName':'Verma'}]
df1=pd.DataFrame(l)
print(df1)
for(col_name,col_value) in df1.iteritems():
    print('\n')
    print('Column Name is ::',col_name)
    print('Column Values are::')
    print(col_value)
```

```
     Name   SirName
0  Sachin  Bhardwaj
1   Vinod     Verma


Column Name is :: Name
Column Values are::
0    Sachin
1     Vinod
Name: Name, dtype: object


Column Name is :: SirName
Column Values are::
0    Bhardwaj
1       Verma
Name: SirName, dtype: object
```

Creating DataFrame from a **CSV file**

The read_csv()This function reads a CSV file and creates a DataFrame from it

Example :

	A	B	C	D
1	Name	Test (35)	100	Grade
2	Alisha Bajra	6	17	E
3	AMITA PRADHAN	27	77	B1
4	Chanchal Jindal	32	91	A1
5	KASHMIRI JAMUDA	20	57	C1
6	KHUSHI KUMARI	18	51	C1
7	N NANDITA	21	60	C1
8	TAVISHI SAHU	12	34	D
9				

Code:

```
import pandas as pd
df=pd.read_csv("marks.csv")
print(df)
```

Output:

```
              Name  Test (35)  100 Grade
0     Alisha Bajra          6   17     E
1    AMITA PRADHAN         27   77    B1
2  Chanchal Jindal         32   91    A1
3  KASHMIRI JAMUDA         20   57    C1
4    KHUSHI KUMARI         18   51    C1
5        N NANDITA         21   60    C1
6     TAVISHI SAHU         12   34     D
```

MULTIPLE CHOICE QUESTIONS

1. In given code dataframe ‘D1’ has _____ rows and ____columns.
import pandas as pd
LoD = [{‘a’:10, ‘b’:20}, {‘a’:5, ‘b’:10, ‘c’:20}, {‘a’:7, ‘d’:10, ‘e’:20}]
D1 = pd.DataFrame(LoD)
a. 3, 3
b. 3, 4
c. 3, 5
d. None of the above
Ans. c.

2. D1[:] = 77 , will set ____ values of a DataFrame ‘D1’ to 77.
a. Only First Row
b. Only First Column
c. All
d. None of the above
Ans. c.

3. The following statement will
df = df.drop(['Name', 'Class', 'Rollno'], axis = 1)#df is a DataFrame object
a. delete three columns having labels ‘Name’, ‘Class’ and ‘Rollno’
b. delete three rows having labels ‘Name’, ‘Class’ and ‘Rollno’
c. delete any three columns
d. return error
Ans. a. delete three columns having labels ‘Name’, ‘Class’ and ‘Rollno’

4. Which of the following are ways of indexing to access Data elements ina DataFrame?

a. Label based indexing
b. Boolean Indexing
c. All of the above
d. None of the above
Ans. c. All of the above

5. The following statement is
>>> DF=DF.rename({'Maths':'Sub1′,'Science':'Sub2′}, axis='index') #DF is a DataFrame
a. altering the column labels
b. altering the row and column labels (both)
c. Error
d. altering the row labels
Ans : b altering the column labels
6. Which of the following statement is Transposing the DataFrame 'DF1'?
DF1.transpose
DF1.T
DF1.Trans
DF1.t
Ans. b. DF1.T

7. CSV stands for:
a. Comma Separated Values
b. Comma Separated Variables
c. Column Separated Values
d. Column Separated Variables
Ans a) Comma Separated Values
8. In order to work with CSV files from Pandas, you need to import _____ , other than pandas.
a. csv
b. pandas
c. numpy
d. no extra package required
Ans : a) CSV

9. To read specific number of rows from a CSV file, which argument is to be givenin read_csv( ) ?
a. rows = <n>
b. nrows = <n>
c. n rows = <n>
d. number_rows = <n>
Ans : b) nrows = <n>
10. While reading from a CSV file, to use a column's values as index labels, argumentgiven in read_CSV( ) is:
a. index
b. index_col
c. index_values
d. index_label
Ans : b) index_col

Assertion (A) and Reason (R)

Assertion (A): sorting is the operation to arrange data in a specific order ,sort_values ()function used to perform the operation.
Reasoning (R): Row wise shorting cannot be performed in python dataframe objects
a. Both A and R are true and R is the correct explanation of A.
b. Both A and R are Ture and R is not the correct explanation of R .
c. A is True but R is false.
d. Both A and R are false

Answer : C

Assertion (A): We can read specific rows from a CSV file.
Reason (R): The nrows attribute of to_csv( ) is used to read specific rows from a CSV file.
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
Answer: C
Assertion (A): Nidhi has create data frame Df1
Df1

	Students	Marks	Sports
I	ABC	24.7	Cricket
II	DEF	27.5	Badminton
III	GHI	30.0	Football

She can expand or delete any row /column in this dataframe.
Reason(R): In python DataFrame objects can be concatenated or merged
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.
Ans: a) Both A and R are true and R is the correct explanation of A.

Assertion (A): DataFrame.count() function will display the sum of the values from the data frame
Reason (R): axis=0 ,argument is to used to find sum column-wise
Both A and R are true and R is the correct explanation of A.
A is true but R is false.
A is false but R is true.
Both A and R are false
Ans : C)

CASE STUDY

1. Mr. Ankit is working in an organization as data analyst. He uses Python Pandas and Matplotlib for the same. He got a dataset of the passengers for the year 2010 to 2012 for January, March and December. His managerwants certain information from him, but he is facing some problems. Helphim by answering few questions given below:

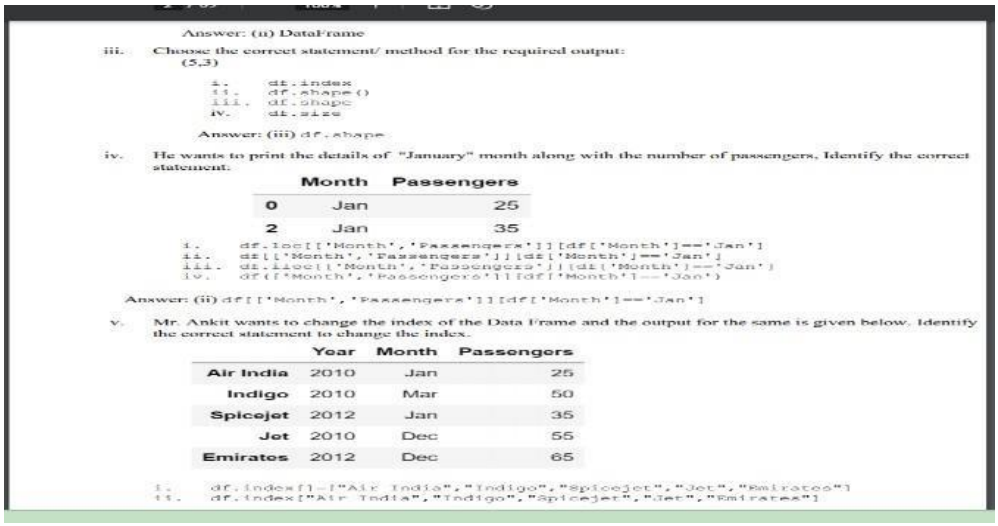

same. He got a dataset of the passengers for the year 2010 to 2012 for January, March and December. His manager wants certain information from him, but he is facing some problems. Help him by answering few questions given below:

	Year	Month	Passengers
0	2010	Jan	25
1	2010	Mar	50
2	2012	Jan	35
3	2010	Dec	55
4	2012	Dec	65

Code to create the above data frame:

Code to create the above data frame:
import pandas as #Statement
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)
Ans : Statement 1 # import pandas as pd Statement 2 # pd.DataFrame

(I) He wants to print the details of "January" month along with the numberof passengers, Identify the correct statement:



Answer: (ii) DataFrame

iii. Choose the correct statement/ method for the required output: (5,3)

```
i.   df.index
ii.  df.shape()
iii. df.shape
iv.  df.size
```

Answer: (iii) df.shape

iv. He wants to print the details of "January" month along with the number of passengers, Identify the correct statement:

	Month	Passengers
0	Jan	25
2	Jan	35

```
i.   df.loc[['Month','Passengers']][df['Month']=='Jan']
ii.  df[['Month','Passengers']][df['Month']=='Jan']
iii. df.iloc[['Month','Passengers']][df['Month']=='Jan']
iv.  df(['Month','Passengers']][df['Month']=='Jan')
```

Answer: (ii) df[['Month','Passengers']][df['Month']=='Jan']

v. Mr. Ankit wants to change the index of the Data Frame and the output for the same is given below. Identify the correct statement to change the index.

	Year	Month	Passengers
Air India	2010	Jan	25
Indigo	2010	Mar	50
Spicejet	2012	Jan	35
Jet	2010	Dec	55
Emirates	2012	Dec	65

```
i.   df.index[]=["Air India","Indigo","Spicejet","Jet","Emirates"]
ii.  df.index["Air India","Indigo","Spicejet","Jet","Emirates"]
```

df.loc[['Month','Passengers']] [df['Month'] =='Jan']
df[['Month','Passengers']][df['Month'] =='Jan']
iii.df.iloc[['Month','Passengers']][df['Month'] =='Jan'] iv.df(['Month','Passengers']][df['Month']=='Jan')
Answer: (ii) df[['Month','Passengers']][df['Month']=='Jan']

Mr. Ankit wants to change the index of the Data Frame and the output forthe same is given below. Identify the correct statement to change the index.

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v. Mr. Ankit wants to change the index of the Data Frame and the output for the same is given below. Identify the correct statement to change the index.

	Year	Month	Passengers
Air India	2010	Jan	25
Indigo	2010	Mar	50
Spicejet	2012	Jan	35
Jet	2010	Dec	55
Emirates	2012	Dec	65

```
i.   df.index[]=["Air India","Indigo","Spicejet","Jet","Emirates"]
ii.  df.index["Air India","Indigo","Spicejet","Jet","Emirates"]
```

df.index[]=["Air India","Indigo","Spicejet","Jet","Emirates"]
df.index["Air India","Indigo","Spicejet","Jet","Emirates"]
df.index=["Air India","Indigo","Spicejet","Jet","Emirates"]
df.index()=["Air India","Indigo","Spicejet","Jet","Emirates"]

Answer: (iii) df.index=["Air India","Indigo","Spicejet","Jet","Emirates"]

He wants to arrange records of all the passenger's year wise in descending order.
df.sort_values(by='Year', ascending=True, inplace =False)
df.sort_values(by='Year', ascending=False, inplace =False)
df.sort_values(by='Year', ascending=False, inplace =True)
df.sort_values(by='Year', descending=True, inplace =True)
Answer: (iii) df.sort_values(by='Year', ascending=False, inplace =True)
He wants to find out the transpose of the above data frame.
result = df.trans()
result = df.Trans()
result =df.transpose ()
result = df.Transpose()

Answer: (iii) result = df.transpose()

Ms Payal wants to create a CSV file from another CSV file. The original file contains 5 columns EmpName, EmpId, Salary, Designation, DOB. Payal wants to create another CSV file which contains only EmpName and Designation columns from the original file. She has found the code to do the task she wants but one lineof code is missing. Help her to complete the code.

```
import pandas as pd
df = pd.read_csv("E:\\Data\\Employee.csv") df.to_csv("E:\\Data\\Emp.csv",          )
column = ['EmpName', 'Designation']
columns = [EmpName, Designation]
['EmpName', 'Designation']
columns = ['EmpName', 'Designation']
```

Ans: d) columns = ['EmpName', 'Designation']

Consider the following DataFrame df

Roll No.	Name	UT1	UT2	UT3	UT4
1	Prerna Singh	24	24	20	22
2	Manish Arora	18	17	19	22
3	TanishGoel	20	22	18	24
4	Falguni Jain	22	20	24	20
5	KanikaBhatnagar	15	20	18	22
6	Ramandeep Kaur	20	15	22	24

Write down the command that will give output:

rollno	6
name	TanishGoel
UT1	24
UT2	24
UT3	24
UT4	24

Ans: print(df.max, axis=1)

ABC Enterprises is selling its products through three salesmen and keeping the records of sales done quarterly of each salesman as shown below:

	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Salesman 1	23000	18000	30000	35000
Salesman 2	11000	15000	20000	22000
Salesman 3	60000	40000	35000	55000

Company is storing the above information in a CSV file "Qtrly_Sales.csv". Mr. Rohit is a programmer. Company has given him the responsibility to create the program to visualise the above data. He wrote Python code but he is facing some difficulties. Help him by giving the solutions of following situation:

Python code:

```
import pandas as pd
import  as plt
df=      ("Qtrly_Sales.csv")
df.plot(='bar', color=['red','blue','brown','green'])
```

```
plt.      ('Quarterly Report')
plt.xlabel('Salesman')
plt.ylabel('Sales')
8 plt.    ()
```

Choose the correct Python library out of following options in line 2
A. matplotlib B. matplotlib.plot
C. py.plot D. matplotlib.pyplot
Ans. D

Choose the correct option to read the csv file in line 3
A. read_csv B. pd.read_csv
C. pd.get_csv D. get_csv
Ans B
Choose the correct option to select the type of graph in line 4
A. type B. kind
C. style D. graph
Ans B
Choose the correct word to give the heading in line 5
A. Label B. heading
C. title D. caption
Ans C
Choose the correct word to display the graph in line 8
A. plot() B. display()
C. showgraph() D. show()
Ans D

Very Short Answer

In given code dataframe 'D1' has rows and columns.

```
import pandas as pd
LoD = [{'a':10, 'b':20}, {'a':5, 'b':10, 'c':20}, {'a':7, 'd':10, 'e':20}]
D1 = pd.DataFrame(LoD)
```

Ans :- 3, 5

The following statement will

```
df = df.drop(['Name', 'Class', 'Rollno'], axis = 1)
```

Ans:- delete three columns having labels 'Name', 'Class' and 'Rollno'

What is the correct output for following Python code: import pandas as pd

```
data = {"Marks1": 90, "Marks2": 95, "Marks3": 97} ser = pd.Series(data)
print(ser)
```

Ans :
Marks1 90
Marks2 95
Marks3 97
A DataFrame has two axes
True
False
Ans : b

Short Answer

Write down function is to change the name of index in a data frame ?
Ans : df.rename(index={"Andhra p.":"A","Gujrat":"B", "Kerala":"C", "Punjab":"D"})

Answer the following questions based on the code given below : -
…….... # Statement 1 Ld=[{'a',10,'b':20},{'a':5,'b':10,'c':20}]
df=pd.DataFrame(Ld)print(df)
Write the statement 1 in the above code.
How many columns will be there in the dataframe.

Ans : (i) import pandas as pd
(ii) 3 columns

The python code written below has syntactical errors. Rewrite the correct codeand underline the corrections made.
IMPORT pandas as pd
df ={"name":["satish","rahul","arvind"],"exp(in months)":[14,41,31]}df= pd.dataframe(df) print(df).

Ans :
import pandas as pd
df ={"name":["satish","rahul","arvind"],"exp(in months)":[14,41,31]} df= pd.DataFrame(df)
print(df)

Long Answer

Ram designed the DataFrame df that contains the temperature of different cities as shown below:

	City	Maxtemp	Mintemp	Avgtemp	Rainfall
0	Delhi	40	32	35	24.1
1	Mumbai	31	23	27	32.6
2	Chennai	29	21	25	26.2

Answer the following Questions:
Predict the output of the following python statement:
Print(df.size)
Print(df[1:3])
Delete the last row from the DataFrame.
Write python statement to add a new city named 'Calcutta' having Maxtemp 28,Mintemp 19,
Avgtemp 24, Rainfall 20.1

Ans :-

i. a.15

b.

	City	Maxtemp	Mintemp	Avgtemp	Rainfall
1	Mumbai	31	23	27	32.6
2	Chennai	29	21	25	26.2

ii. df=df.drop(2) or
df,drop(2,axis=0)

iii. df.loc[4]=['Calcutta', 28,19,24,20.1]

Consider the following DataFrame, Class DF with row index St1, St2, St3, St4

	Rollno	Name	Class	Section	CGPA	Stream
St1	1	Aman	IX	E	8.7	Science
St2	2	Preeti	X	F	8.9	Arts
St3	3	Kartikey	IX	D	9.2	Science
St4	4	Lakshay	X	A	9.4	Commerce

Based on the above dataframe answer the followinsg:
Predict the output
ClassDF.T ii. ClasDF [: : -2]
Write python statement to print Name,class and CGPA for Student St2 and St3

OR

write python Statement to print the name and class of students having CGPA morethan 9.0

Ans :-

A . (i) Transpose of DataFrame

(ii) Data Frame in reverse order of two –two step

B . ClassDF.loc[St2:St3 , [‘Name’,’Class’,CGPA’]

OR

ClassDF[[‘Name’,’Class’][ClassDF.CGPA>9.0]

Riya, a Data Analyst working for a film studio, has created a DataFrame named 'movie_revenue_df' to store the revenue data of movies released by Viacom 18in the year 2022. The DataFrame looks like this:

	Movie	Revenue (in crores)
A.	GangubaiKathiawadi	125
B.	The Kashmir Files	340
C.	Bhediya	75
D.	JugJuggJiyo	250
E.	Bachchhan Pandey	120

An intern is working with her and has a few doubts. As Riya is busy withanalysis work. You answer on her behalf.

Predict the output of the following python statement:

print(movie_revenue_df[‘Revenue (in crores)’].dtypes)

print(movie_revenue_df.iloc[2,0])

Delete the Second last row from the DataFrame.

Find out the total revenue.

OR (Option for part iii only)

Write Python statement to export the DataFrame to a CSV file named “hit_movies_2022.csv” in the directory named ‘PMDB’ which is inside the Present working directory (PWD) of the project.

Ans :

(i)

int64

Bhediya

movie_revenue_df = movie_revenue_df.drop(movie_revenue_df.index[-3])

total_revenue = 0

for label, value in movie_revenue_df['Revenue (in crores)'].iteritems():total_revenue += value

OR

movie_revenue_df.to_csv('PMDB/hit_movies_2022.csv', index=False)

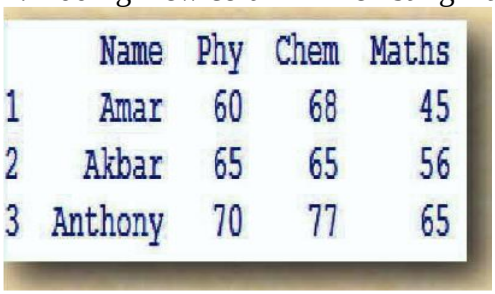
Operations on rows and columns

add, select, delete, rename,Head and Tail functions; Indexing using Labels, Boolean Indexing;

मुख्य बिंदु MAIN POINTS/

Modify the Data Frame- We can modify the existing data frame by Adding new row/columns, change the existing value of Row & Columns, rename the column/row and delete the row/columns.

1. Adding new column in existing DataFrame - Suppose a Existing DataFrame DF is like as



	Name	Phy	Chem	Maths
1	Amar	60	68	45
2	Akbar	65	65	56
3	Anthony	70	77	65

DF

We have to add new column 'Bio' with marks 65 for three students, then we can add new column as - DF['Eng']=65, after that Frame DF will be- like

	Name	Phy	Chem	Maths	Bio
1	Amar	60	68	45	65
2	Akbar	65	65	56	65
3	Anthony	70	77	65	65

We have to add new column 'IP' with marks 70,75,80 for three students,then we can add new column as - DF['IP']=[70,75,80] after that Frame DF will be- like

	Name	Phy	Chem	Maths	Bio	IP
1	Amar	60	68	45	65	70
2	Akbar	65	65	56	65	75
3	Anthony	70	77	65	65	80

2. Modify the existing value of column in Data Frame - we can change or modify the existing value of column/columns , suppose we have existing Data Frame as DF

	Name	Phy	Chem	Maths	Bio	IP
1	Amar	60	68	45	65	70
2	Akbar	65	65	56	65	75
3	Anthony	70	77	65	65	80

We have change the value of column 'Chem' with value 50,60,70 the we can write the command as - DF['Chem']=[50,60,70],then after that Frame DF will be

	Name	Phy	Chem	Maths	Bio	IP
1	Amar	60	50	45	65	70
2	Akbar	65	60	56	65	75
3	Anthony	70	70	65	65	80

We have change the value of more then one column 'Maths' to 'IP' with value 50 in respect to all rows the we can write the command as -
DF. loc[:, 'Maths':'IP']=50,then after that Frame DF will be

	Name	Phy	Chem	Maths	Bio	IP
1	Amar	60	50	50	50	50
2	Akbar	65	60	50	50	50
3	Anthony	70	70	50	50	50

3.Adding new row and modify values of rows- Suppose a Existing DataFrame DF is like as

	Name	Phy	Chem	Maths	Bio	IP
1	Amar	60	50	45	65	70
2	Akbar	65	60	56	65	75
3	Anthony	70	70	65	65	80

We have to add new row with index '4' and values 40,then we can add new column as - DF.loc[4,:]= 40 after that Frame DF will be- like

	Name	Phy	Chem	Maths	Bio	IP
1	Amar	60	50	45	65	70
2	Akbar	65	60	56	65	75
3	Anthony	70	70	65	65	80
4	40	40.0	40.0	40.0	40.0	40.0

We have to add new row with index '5' and different values ,then we can add new column as - DF.loc[5]= ['Ram',55,65,75,85,95] after that Frame DF will be- like

	Name	Phy	Chem	Maths	Bio	IP
1	Amar	60	50	45	65	70
2	Akbar	65	60	56	65	75
3	Anthony	70	70	65	65	80
4	40	40.0	40.0	40.0	40.0	40.0
5	Ram	55.0	65.0	75.0	85.0	95.0

*.*We also use .at in place of .loc
We can Modify the value of single /Multiple row of existing DataFrame- suppose we have to modify the value of row at index 1 with value 100,then we can do it as-
DF.loc[1]=100 or DF.at[1]= 100, then Frame will be -like

	Name	Phy	Chem	Maths	Bio	IP
1	100	100.0	100.0	100.0	100.0	100.0
2	Akbar	65	60	56	65	75
3	Anthony	70	70	65	65	80
4	40	40.0	40.0	40.0	40.0	40.0
5	Ram	55.0	65.0	75.0	85.0	95.0

For modify multiple row values, we can do it as-
DF.loc[2:4,:]=200 or DF.at[2:4,:]=200,then Frame will be -like

	Name	Phy	Chem	Maths	Bio	IP
1	100	100.0	100.0	100.0	100.0	100.0
2	200	200.0	200.0	200.0	200.0	200.0
3	200	200.0	200.0	200.0	200.0	200.0
4	200	200.0	200.0	200.0	200.0	200.0
5	Ram	55.0	65.0	75.0	85.0	95.0

Modify single value at specified positon- We can change individual value corresponding to column and row by providing column & row label index or
positional index using following ways-
DF.phy[2]=300 or DF.at[2,'phy']=300 or DF.iat[2,1]=300, will give the frame as-

	Name	Phy	Chem	Maths	Bio	IP
1	100	100.0	100.0	100.0	100.0	100.0
2	200	300.0	200.0	200.0	200.0	200.0
3	200	200.0	200.0	200.0	200.0	200.0
4	200	200.0	200.0	200.0	200.0	200.0
5	Ram	55.0	65.0	75.0	85.0	95.0

4. Deleting Existing Row and Column of Data Frame- We can delete row and column of data frame by two Methods-
del<DF OBJECT[<COLUMN LABEL>] # to delete single column
<DF OBJECT>.drop([row/column label],axis=0/1) where axis=1 for delete column and axis=0 for delete row
To delete the column 'Chem' from above DataFrame DF we will do as -
Del df['Chem'] or DF.drop(['Chem'],axis=1) , after that Frame will be -

	Name	Phy	Maths	Bio	IP
1	100	100.0	100.0	100.0	100.0
2	200	300.0	200.0	200.0	200.0
3	200	200.0	200.0	200.0	200.0
4	200	200.0	200.0	200.0	200.0
5	Ram	55.0	75.0	85.0	95.0

To delete the row 3 from above DataFrame DF we will do as -
DF.drop[3] , after that Frame will

	Name	Phy	Maths	Bio	IP
1	100	100.0	100.0	100.0	100.0
2	200	300.0	200.0	200.0	200.0
4	200	200.0	200.0	200.0	200.0
5	Ram	55.0	75.0	85.0	95.0

To delete the multiple row 2 to 4 from above DataFrame DF we will do as -
DF.drop ([2,4] ,axis=0)
To delete the Multiple Columns 'Maths' to ‘IP’ from above DataFrame DF we will do as -
DF.drop(['Maths','IP'] ,axis=1)

5. Commonly used Method in Data Frame - Head( ), Tail( ) &len( )
head(Num)- return top 5 value of data frame, if no value given inside the head function
tail(Num)- return bottom 5 value of data frame, if no value given inside the tail function.

len(DF)- return number of rows in data frame
suppose we have data frame DF like -

	Name	Phy	Maths	Bio	IP
1	100	100.0	100.0	100.0	100.0
2	200	300.0	200.0	200.0	200.0
3	200	200.0	200.0	200.0	200.0
4	200	200.0	200.0	200.0	200.0
5	Ram	55.0	75.0	85.0	95.0

(i) print (DF.head( )) will display -

	Name	Phy	Maths	Bio	IP
1	100	100.0	100.0	100.0	100.0
2	200	300.0	200.0	200.0	200.0
3	200	200.0	200.0	200.0	200.0
4	200	200.0	200.0	200.0	200.0
5	Ram	55.0	75.0	85.0	95.0

(ii) print (DF.head(3)) will display-

	Name	Phy	Maths	Bio	IP
1	100	100.0	100.0	100.0	100.0
2	200	300.0	200.0	200.0	200.0
3	200	200.0	200.0	200.0	200.0

(iii) print(DF.tail()) will display-

	Name	Phy	Maths	Bio	IP
1	100	100.0	100.0	100.0	100.0
2	200	300.0	200.0	200.0	200.0
3	200	200.0	200.0	200.0	200.0
4	200	200.0	200.0	200.0	200.0
5	Ram	55.0	75.0	85.0	95.0

(iv) print(DF.tail(2)) will display -

	Name	Phy	Maths	Bio	IP
4	200	200.0	200.0	200.0	200.0
5	Ram	55.0	75.0	85.0	95.0

(v) print(len(DF)) will display - 5

MCQ

To display the 3rd, 4th and 5th columns from the 6th to 9th rows of a dataframe you can write
(a) DF.loc[6:9, 3:5] (b) DF.loc[6:10, 3:6] (c) DF.iloc[6:10, 3:6] (d) DF.iloc[6:9, 3:5]
Ans- (c) DF.iloc[6:10, 3:6]
The head() function of dataframe will display how may rows from top if no parameter is passed.
(i) 1 (ii) 3 (iii) 5 (iv) None of these

Ans- (iii) 5
Which function is used to find values from a DataFrame D using the index number?
a) D.loc b) D.iloc c) D.index d) None of these

Ans- (b) D.iloc
Write the code to append df2 with df1
a.Df2=Df2.append(Df1) b. Df2=Df2+Df1
c. Df2=Df2.appendwith.Df1 d. Df2=Df1.append(Df1)
Ans- (a) Df2=Df2.append(Df1)
Which method is used to access vertical subset of a dataframe?
(i) iterrows( ) (ii) iteritems( ) (iii) itercolumns( ) (iv) itercols( )
Ans- (ii) iteritems ( )
Which attribute of a dataframe is used to get number of axis?
a.T b.Ndim c.Empty d.Shape
Ans- (b) Ndim
Display first row of dataframe 'DF'
(i) print(DF.head(1)) (ii) print(DF[0 : 1])
(iii)print(DF.iloc[0 : 1]) (iv)All of the above
Ans- (iv)All of the above

To delete a row from a DataFrame, you may use
(a) remove (b) del (c) drop (d) cancel
Ans- (c) drop
To get top 5 rows of a dataframe, you may use
(a) head( ) (b) head(5) (c) top( ) (d) top(5)
Ans- (a) head( ) & (b) head(5)
_____ method in Pandas can be used to change the index of rows and columns of a Series or Dataframe
(a) rename( ) (b) reindex( ) (c) reframe( ) (d) none of these
Ans- (b) reindex( )

REASON & ASSERTION QUESTIONS

Q11 and 15 are 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) : Dataframe has both a row and column index
Reason (R) : Dataframe is a two-dimensional labelled data structure like a table of Mysql.
Ans- (i) Both A and R are true and R is the correct explanation for A
Assertion (A) : The shape attribute returns the number of rows and number of columns available in dataframe.
Reason (R) : The shape attribute returns the values in the form of list.
Ans- (iii) A is True but R is False
Assertion (A) : After running the following code:

```
df= pd.DataFrame([11,46],index=['True','False'] )
print(df[True] )
```

Reason (R) : Dataframe does not support Boolean indexing.
Ans- (iii) A is True but R is False
Assertion (A) : We can add a new column in an existing dataframe using .at or .loc methods.
Reason (R) : When we assign new values to an existing column in a dataframe,the previous values are overwritten.
Ans- (iii) Both A and R are true and R is the not correct explanation for A
Assertion (A) : columns name in Dataframe can be change/rename.
Reason (R) : Dataframe the column name be changed through rename method.
Ans- (i) Both A and R are true and R is the correct explanation for A

CASE BASED QUESTIONS

Nidhi has created dataframe df1 as following , help her to perform following tasks and write the code to help her to

df1

	Student	Marks	Sports
I	Abc	24.5	Cricket
II	Def	27.5	Badminton
III	Ghi	Np.Nan	Football

(i) Displays the index (row labels) of DataFrame

a) print(df1.index) b) print(df1.name) c) print(df1.row) d) print(df1.index,row='values)

Ans- (a)

(ii) Remove the null value rows

a) df1.rowdelete( ) b) Df1.del(np.nan) c) Df1.drop(np.nan) d) df1.dropna()

Ans- (d)

(iii) Returns True/False to show if the DataFrame is empty

a) Print(df1.nan) b) Print(df1.null) c) print(df1.empty) d) print(df1.NULL)

Ans- (c)

Consider the following code and answer questions:

Riyaz is creating an application using pandas library in his program , his code is mentioned below. Fill in the blanks to help him

```
import _____ as pd #Statement A
d={'a':[1,2],'b':[2,3]}
d2={'a':[4,5],'b':[6,7]}
df1=pd.DataFrame(d)
df2=pd._____(d2) # Statement B
df3=pd._____([df1,df2]) # Statement C
```

Choose the right code from the following for statement A.

a) pandas b) df c) data d) pd

Ans- (a)

Choose the right code from the following for the statement B.

a) Dataframe b) DataFrame c) Series d) Dictionary

Ans- (b)

Choose the right code from the following for the statement C.

a) df.index b) df.shape( ) c) df.appenddf( ) d) df.concat( )

Ans- (d)

Mr. Ankit is working in an organization as data analyst. He uses Python Pandas and Matplotlib for the same. 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:

	Year	Month	Passengers
0	2010	Jan	25
1	2010	Mar	50
2	2012	Jan	35
3	2010	Dec	55
4	2012	Dec	65

Code to create the above data frame:

```
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)
Choose the correct statement/ method for the required output: (5,3)
i. df.index ii. df.shape() iii. df.shape iv. df.size
Ans- (iii) df.shape

He wants to print the details of "January" month along with the number of passengers, Identify the correct statement:

	Month	Passengers
0	Jan	25
2	Jan	35

i. df.loc[['Month','Passengers']][df['Month']=='Jan']
ii. df[['Month','Passengers']][df['Month']=='Jan']
iii. df.iloc[['Month','Passengers']][df['Month']=='Jan']
iv. df(['Month','Passengers']][df['Month']=='Jan')

Ans- (ii)
(c) Mr. Ankit wants to change the index of the Data Frame and the output for the same is given below. Identify the correct statement to change the index.

	Year	Month	Passenger
Air India	2010	Jan	25
Indigo	2010	Mar	50
Spice Jet	2012	Jan	35
Jet	2010	Dec	55
Emirates	2012	Dec	65

i. df.index[]=["Air India","Indigo","Spicejet","Jet","Emirates"]
ii. df.index["Air India","Indigo","Spicejet","Jet","Emirates"]
iii. df.index=["Air India","Indigo","Spicejet","Jet","Emirates"]
iv. df.index()=["Air India","Indigo","Spicejet","Jet","Emirates"]

Ans- (iii)

Importing/Exporting Data between CSV files and Data Frames.

Importing and Exporting Data between CSV Files and DataFrames
We can create a DataFrame by importing data from CSV files where values are separated by commas. Similarly, we can also store or export data in a DataFrame as a .csv file.

Importing a CSV file to a DataFrame
Let us assume that we have the following data in a csv file named ResultData.csv stored in the folder C:/NCERT. In order to practice the code while we progress, you are suggested to create this csv file using a spreadsheet and save in your computer.

RollNo	Name	Eco	Maths
1	Arnab	18	57
2	Kritika	23	45
3	Divyam	51	37
4	Vivaan	40	60
5	Aaroosh	18	27

We can load the data from the ResultData.csv file into a DataFrame, say marks using Pandas read_csv() function as shown below:

```
>>> marks = pd.read_csv("C:/NCERT/ResultData.csv",sep =",", header=0)
>>> marks
```

	RollNo	Name	Eco	Maths
0	1	Arnab	18	57
1	2	Kritika	23	45
2	3	Divyam	51	37
3	4	Vivaan	40	60
4	5	Aaroosh	18	27

• The first parameter to the read_csv() is the name of the comma separated data file along with its path.
• The parameter sep specifies whether the values are separated by comma, semicolon, tab, or any other character. The default value for sepis a space.
• The parameter header specifies the number of the row whose values are to be used as the column names. It also marks the start of the data to be fetched. header=0 implies that column names are inferred from the first line of the file. By default, header=0.
We can exclusively specify column names using the parameter names while creating the DataFrame using the read_csv() function. For example, in the following statement, names parameter is used to specify the labels for columns of the DataFrame marks1:

```
>>> marks1 = pd.read_csv("C:/NCERT/ResultData1.csv",sep=",",names=['RNo','StudentName', 'Sub1','Sub2'])
>>> marks1
```

	RNo	StudentName	Sub1	Sub2
0	1	Arnab	18	57
1	2	Kritika	23	45
2	3	Divyam	51	37
3	4	Vivaan	40	60
4	5	Aaroosh	18	27

Exporting a DataFrame to a CSV file
We can use the to_csv() function to save a DataFrame to a text or csv file. For example, to save the DataFrame ResultDF created in the previous section; we can use the following statement:

```
>>> ResultDF
Arnab Ramit Samridhi Riya Mallika
Maths          90    92     89    81    94
```

Science	91	81	91	71	95
Hindi	97	96	88	67	99

>>> ResultDF.to_csv(path_or_buf='C:/NCERT/ resultout.csv', sep=',')

This creates a file by the name resultout.csv in the folder C:/NCERT on the hard disk. When we open this file in any text editor or a spreadsheet, we will find the above data along with the row labels and the column headers, separated by comma. In case we do not want the column names to be saved to the file we may use the parameter header=False. Another parameter index=False is used when we do not want the row labels to be written to the file on disk. For example:

>>> ResultDF.to_csv('C:/NCERT/resultonly.txt',sep = '@', header = False, index= False)

If we open the file resultonly.txt, we will find the following contents:
90@92@89@81@94
91@81@91@71@95
97@96@88@67@99

Questions:
Question 1
Are the following two statements same ? Why/Why not?
(i) pd.read_csv('zoo.csv', sep = ',')
(ii) pd.read_csv('zoo.csv')
Answer
Yes, the two statements are same. The reason is that when we don't explicitly specify the sep parameter in pd.read_csv(), pandas assumes the default separator to be a comma (,). So, both statements are telling pandas to read the CSV file "zoo.csv" with comma-separated values.
Question 2
How are following two codes similar or different? What output will they produce?
(i)
df = pd.read_csv("data.csv", nrows = 5)
print(df)

(ii)
df = pd.read_csv("data.csv")
print(df)

Answer
The two codes are similar in that they both use pd.read_csv() to read a CSV file named 'data.csv' into a pandas DataFrame df. However, they differ in their usage of the nrows parameter. The first code uses the nrows parameter with a value of 5, indicating that it reads only the first 5 rows of the CSV file. On the other hand, the second code does not have the nrows parameter, so it reads the entire CSV file.
For code (i), the output will be a DataFrame containing the first 5 rows of the 'data.csv' file. For code (ii), the output will be a DataFrame containing all the rows of the 'data.csv' file.
Question 3
Write Python statement to export the DataFrame to a CSV file named data.csv stored at D: drive.
Answer
DataFrame.to_csv('D:\\data.csv')
Question 4
What is the difference between following two statements ?
(i)
df.to_sql('houses', con = conn, if_exists = 'replace')
(ii)

df.to_sql('houses', con = conn, if_exists = 'replace', index = False)
Answer
The difference between the two statements is whether the DataFrame's index is included as a separate column in the resulting SQL table. By default, when we use to_sql() without specifying the index parameter, index = True is assumed, meaning that the DataFrame's index will be included in the SQL table, as in the first statement. Setting index = False explicitly excludes the DataFrame's index from being saved as a separate column in the SQL table, as in the second statement.

Question 5
Write a program to read details such as Item, Sales made in a DataFrame and then store this data in a CSV file.
Solution

```
import pandas as pd
data = {'Item': ['Apple', 'Banana', 'Orange', 'Grapes'],
        'Sales': [100, 150, 80, 120]}
df = pd.DataFrame(data)
df.to_csv('one.csv', index = False)
```

Output

```
Item,Sales
Apple,100
Banana,150
Orange,80
Grapes,120
```

Question 6
Write a program to read data from a CSV file where separator character is '@'. Make sure that :
the top row is used as data, not as column headers.
only 20 rows are read into DataFrame.
Answer
Let the contents of the file bike.csv be the following:

```
Brand@Price
Honda@2500
Yamaha@2800
Suzuki@2100
Kawasaki@3200
Ducati@3500
BMW@4500
Harley-Davidson@5500
KTM@4000
Triumph@5300
Aprilia@4800
Indian@5700
Royal Enfield@3000
MV Agusta@4200
Moto Guzzi@4900
Victory@5600
Benelli@3900
Husqvarna@4800
Zero Motorcycles@6500
Energica@7500
Norton@5900
```

The program to read data from a CSV file is as follows:

```
import pandas as pd
d = pd.read_csv('one.csv', sep = '@', header = None, nrows = 20)
print(d)
```

Output

	0	1
0	Brand	Price
1	Honda	2500
2	Yamaha	2800
3	Suzuki	2100
4	Kawasaki	3200
5	Ducati	3500
6	BMW	4500
7	Harley-Davidson	5500
8	KTM	4000
9	Triumph	5300
10	Aprilia	4800
11	Indian	5700
12	Royal Enfield	3000
13	MV Agusta	4200
14	Moto Guzzi	4900
15	Victory	5600
16	Benelli	3900
17	Husqvarna	4800
18	Zero Motorcycles	6500
19	Energica	7500

Question 7

```
# To create and open a data frame using 'Student_result.csv' file using Pandas.
# To display row labels, column labels data types of each column and the dimensions
# To display the shape (number of rows and columns) of the CSV file.

import pandas as pd
import csv
#Reading the Data
df = pd.read_csv("student_result.csv")
# Display Name of Columns
print(df.columns)
# Display no of rows and column
print(df.shape)
# Display Column Names and their types
print(df.info())
```

7.IMPORTING/EXPORTING DATA FROM CSV FILE MULTIPLE CHOICE QUESTIONS-

CSV file can't be open in which software-
Calc b. Excel c. Notepad d. Word
Ans - Word
Which function is used to write dataframe's data into the csv file?
read_csv() b. to_csv() c. from_csv() d. None of these Ans- to_csv()
Which function is used to read data from CSV file and store in a dataframe?
read_csv() b. to_csv() c. from_csv() d. None of these Ans- read_csv()
Using read_csv(), if we want to avoid the first row as header,we use
Noheader=True b. skipheader=True c. header=None d. None of these Ans- header=None
To skip rows of a CSV file, which argument will be given in read_csv() ?
Skiprows b. skip_rows c. skip d. noread Ans – skiprows
Very Short Answered Questions-

Which argument is used to read specific number of rows from a csv file using read_csv()? Ans - nrows
Which argument is used to specify with read_csv() for separator character? Ans- sep
Write full form of csv ?
Ans – Comma Separated value
Which function is used to load the last row of a dataframe df? Ans – tail()
Which argument is used in read_csv() to specify your own headings? Ans - names
Can we skip more than one row of a csv file while loading into dataframe? Ans – Yes, by providing the row numbers in a list eg. Skiprows=[3,5,7]
Short Answered Questions-
What are the advantages of using CSV files? Ans –
Simple and compact format
Easily import and export mong all spreadsheets and databases.
Common format for interchange.
Which softwares are used to open a CSV file? Ans – MS Excel, Notepad, Calc etc.
Give the syntax of using read_csv() function?
Ans - <Dataframe_name>=pandas.read_csv(<path of csv file>)

Give the syntax of using to_csv() function?
Ans - <Dataframe_name>.to_csv(<path of csv file>, sep=',')

How can we use the column of a csv file as index label for the dataframe? Ans – By using the index_col argument in read_csv()
For eg. Df1=pd.read_csv("employee.csv",index_col="id")

Assertion(A) and Reasoning(R) based Question-
Mark the correct choice as

Both A and R are true and R is the correct explanation of A
Both A and R are true and R is not the correct explanation of A
A is true and R is False
A is false and R is True

Assertion(A): CSV files are mainly used in importing/exporting data for dataframe. Reason(R) : CSV files have common format for data interchange.
Ans - Both A and R are true and R is the correct explanation of A

Assertion: While displaying the contents of the CSV file, the header argument can be used to avoid the header line.
Reason: The value of the header argument will be "NaN" . Ans - A is true and R is False

Asssertion : we need to import pandas for using to_csv() in our program .to_csv() function is used to transfer data from dataframe to csv file.
Reason: to_csv() function is used to transfer data from dataframe to csv file.
Ans - Both A and R are true and R is the correct explanation of A

Case Based Question

Create a CSV file named as “student.csv” and do the following tasks given below- a.) Read the csv file and create a dataframe for it.
b.) Display the contents of the dataframe.
c.) Create a dataframe from the above CSV file and it should display the column header as 0,1,2,… rather than file’s column header.
Coding

```
import pandas as pd

Df1=pd.read_csv(“student.csv”) print(Df1)
df2=pd.read_csv(“student.csv”,header=None)
```

Create a CSV file named as “staff.csv” and do the following tasks given below- a.) Read the csv file and create a dataframe for it.

b.) Create a dataframe from the above CSV file and it should display the column headings as S_id, S_name,S_dept,S_salary rather than file’s column header.
c.) Display the highest salary from it.

Coding

```
import pandas as pd
Df1=pd.read_csv(“staff.csv”) print(Df1)
df2=pd.read_csv(“staff.csv”,names=[“S_id”,”S_name”,”S_salary”],skiprows=1) print(df2)
print(“highest salary::”,df2.S_salary.max())
```

Create a CSV file named as “Emp.csv” that contains 10 rows and do the following tasks given below- a.) Read the csv file and create a dataframe for it.

b.) Create a dataframe from the above CSV file and it should display the first 5 rows of the file.
c.) Display the 3rd ,4th and 5th lines of the csv file.
Coding

```
import pandas as pd
Df1=pd.read_csv(“Emp.csv”) print(Df1)
df2=pd.read_csv(“student.csv”,nrows=5) print(df2)
print(df2.tail(3))
```

Long Answer based Questions-

Write a python program that will read a CSV file named as “Exam.csv” containing the name and marks of 5 subjects of students as (M1,M2,M3,M4,M5)and store in a dataframe and add column as “Total_marks” and “Avg_marks” in dataframe that will display the sum and average of marks for each student and display the dataframe after adding these additional column.
Coding

```
import pandas as pd
Df1=pd.read_csv(“Exam.csv”,names=[‘Name’,’M1’,’M2’,’M3’,’M4’,’M5’]) print(Df1)
df1[‘Total_marks’]=df1[‘M1’]+ df1[‘M2’]+df1[‘M3’]+ df1[‘M4’]+ df1[‘M5]
df1[‘Avg_marks’]=df1[‘Total_marks’]/5
print(“dataframe after adding the columns”)
print(df1)
```

Write a python program that will read a CSV file named as “Student.csv” containing the Rollno, Name and Percentage of students. Create a dataframe that will load the contents of csv file and display it. Create another dataframe that will store the first 5 rows of the csv file and display it.
Coding

```
import pandas as pd
```

```
Df1=pd.read_csv(“Student.csv”, names=[‘Rollno’,‘Name’,’Percentage’])
print(Df1)
df2=pd.read_csv(“Student.csv”, nrows=5) print(“First five rows of the csv file are”)
print(df2)
```

Write a python code that will read a CSV file named as “Employee.csv” ,
containing the Empid, Name and Salary . Create a dataframe that will load the contents of csv file and display it. Create another dataframe that will store the last 5 rows of the csv file and display it.

Coding

```
import pandas as pd
Df1=pd.read_csv(“Employee.csv”, names=[‘Empid’,‘Name’,’Salary’])
print(Df1)
df2=pd.read_csv(“Student.csv”, sep=’,’,skiprows=1) print(“Last five rows of the csv file are”)
 print(df2.tail(5))
```

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.

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 plot

Data Visualization

"A picture is worth a thousand words". Most of us are familiar with this statement. Data visualization plays an essential role in the representation of both small and large-scale data. It especially applies when trying to explain the analysis of increasingly large datasets.

Data visualization is the discipline of trying to expose the data to understand it by placing it in a visual context. Its main goal is to distill large datasets into visual graphics to allow for easy understanding of complex relationships within the data.

Several data visualization libraries are available in Python, namely Matplotlib, Seaborn, and Folium etc.

Purpose of Data visualization:

o Better analysis
o Quick action
o Identifying patterns
o Finding errors
o Understanding the story
o Exploring business insights
o Grasping the Latest Trends

Plotting library:

Matplotlib is the whole python package/ library used to create 2D graphs and plots by using python scripts. pyplot is a module in matplotlib, which supports a very wide variety of graphs and plots namely - histogram, bar charts, power spectra, error charts etc. It is used along with NumPy to provide an environment for MatLab.

Pyplot provides the state-machine interface to the plotting library in matplotlib. It means that figures and axes are implicitly and automatically created to achieve the desired plot. For example, calling plot from pyplot will automatically create the necessary figure and axis to achieve the desired plot. Setting a title will then automatically set that title to the current axis object. The pyplot interface is generally preferred for non-interactive plotting (i.e., scripting).

Matplotlib – pyplot features:

Following features are provided in matplotlib library for data visualization.

• Drawing – plots can be drawn based on passed data through specific functions.
• Customization – plots can be customized as per requirement after specifying it in the arguments of the functions.Like color, style (dashed, dotted), width; adding label, title, and legend in plots can be customized.
• Saving – After drawing and customization plots can be saved for future use.

Steps to plot in matplotlib:

• Install matplotlib by pip command - pip install matplotlib in command prompt
• Create a .py & import matplotlib library in it using - import matplotlib.pyplot as plt statement
• Set data points in plot() method of plt object
• Customize plot through changing different parameters
• Call the show() method to display plot
• Save the plot/graph if required

Types of plot using matplotlib

• LINE PLOT
• BAR GRAPH
• HISTOGRAM etc.

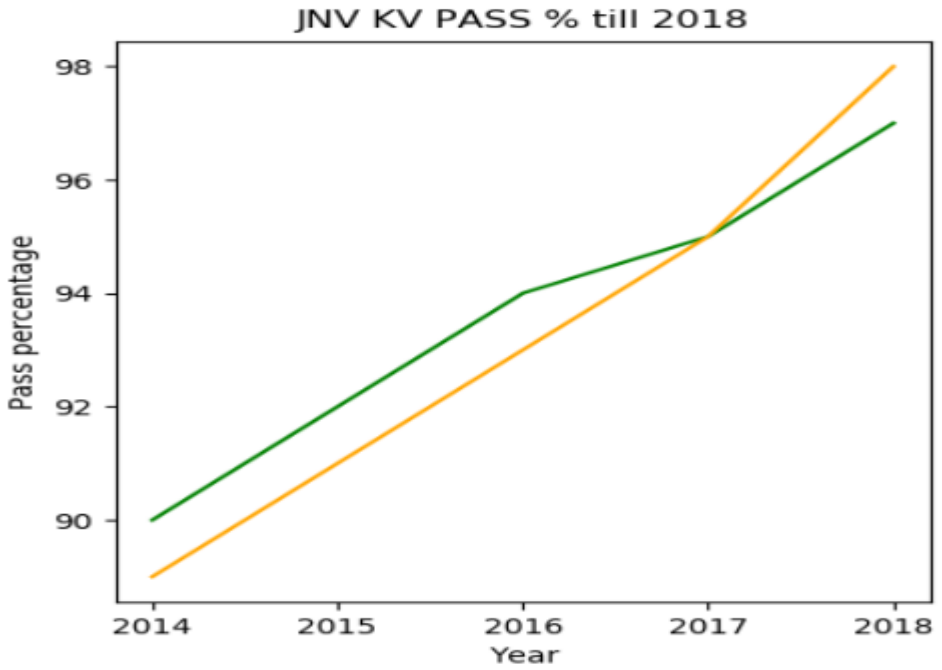
Line Plot

A line plot/chart is a graph that shows the frequency of data occurring along a number line. The line plot is represented by a series of datapoints connected with a straight line. Generally line plots are used to display trends over time. A line plot or line graph can be created using the plot() function available in pyplot library. We can, not only just plot a line but we can explicitly define the grid, the x and y axis scale and labels, title and display options etc.

e.g. PROGRAM

```
import numpy as np
import matplotlib.pyplot as plt
year = [2014,2015,2016,2017,2018]
jnvpasspercentage = [90,92,94,95,97]
kvpasspercentage = [89,91,93,95,98]
plt.plot(year, jnvpasspercentage, color='g')
plt.plot(year, kvpasspercentage, color='orange')
plt.xlabel('Year')
plt.ylabel('Pass percentage')
plt.title('JNV KV PASS % till 2018')
plt.show()
```

Note:- As many lines required call plot() function multiple times with suitable arguments.



Line Plot customization

• Custom line color

plt.plot(year, kvpasspercentage, color='orange')

Change the value in color argument.like 'b' for blue,'r','c',…..

• Custom line style

plt.plot([1,1.1,1,1.1,1], linestyle='-' , linewidth=4).

set linestyle to any of '-' for solid line style, '--' for dashed, '-.' , ':' for dotted line

• Custom line width

plt.plot('x', 'y', data=df, linewidth=22)

set linewidth as required

• Title

plt.title('JNV KV PASS % till 2018') – Change it as per requirement

• Lable - plt.xlabel('Year') - change x or y label as per requirement

• Legend - plt.legend(('jnv','kv'),loc='upper right',frameon=False)

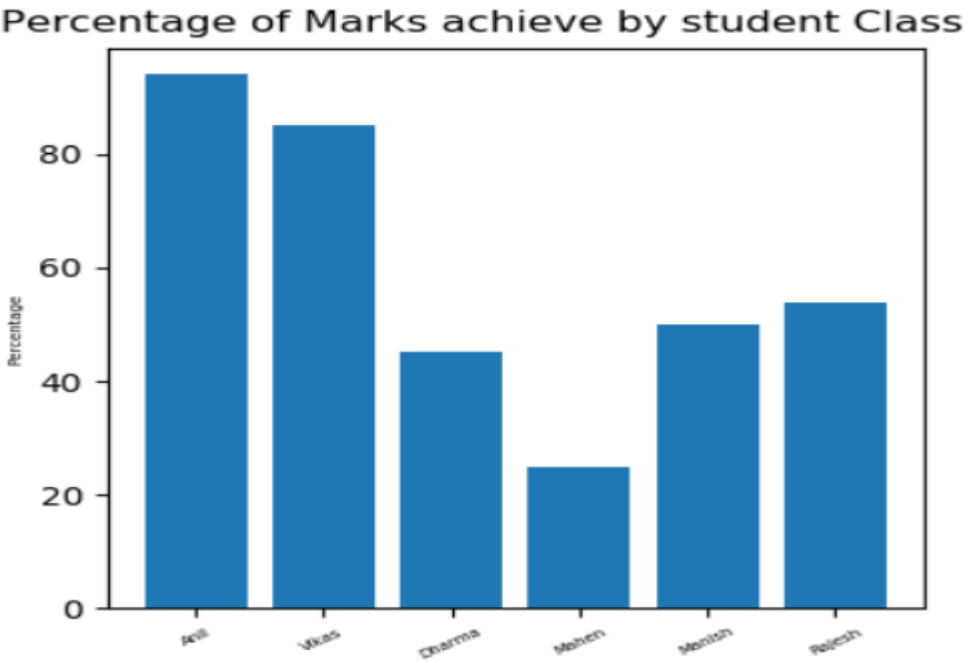
Change (),loc,frameon property as per requirement

Bar Graph

A graph drawn using rectangular bars to show how large each value is. The bars can be horizontal or vertical. A bar graph makes it easy to compare data between different groups at a glance. Bar graph represents categories on one axis and a discrete value in the other. The goal bar graph is to show the relationship between the two axes. Bar graph can also show big changes in data over time.

e.g program

```
import matplotlib.pyplot as plt
import numpy as np
label = ['Anil', 'Vikas', 'Dharma', 'Mahen', 'Manish', 'Rajesh']
per = [94,85,45,25,50,54]
index = np.arange(len(label))
plt.bar(index, per)
plt.xlabel('Student Name', fontsize=5)
plt.ylabel('Percentage', fontsize=5)
plt.xticks(index, label, fontsize=5, rotation=30)
plt.title('Percentage of Marks achieve by student Class XII')
plt.show()
#Note – use barh () for horizontal bars
```



Bar graph customization

• Custom bar color

```
plt.bar(index, per,color="green",edgecolor="blue")
```

Change the value in color,edgecolor argument.like ‘b’ for blue,’r’,’c’,…..

• Custom line style

```
plt.bar(index, per,color="green",edgecolor="blue",linewidth=4,linestyle='--')
```

set linestyle to any of '-‘ for solid line style, '--‘ for dashed, '-.‘ , ':‘ for dotted line

• Custom line width

```
plt.bar(index, per,color="green",edgecolor="blue",linewidth=4)
```

set linewidth as required

• Title

```
plt.title('Percentage of Marks achieve by student Class XII')
```

Change it as per requirement

• Lable - plt.xlabel('Student Name', fontsize=5)- change x or y label as per requirement

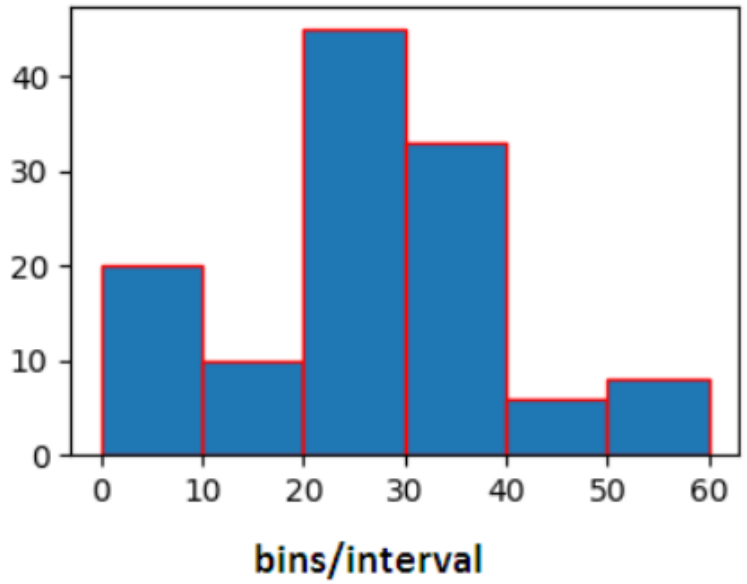
• Legend - plt.legend(('jnv','kv'),loc='upper right‘, frameon=False)

Change (),loc,frame on property as per requirement

HISTOGRAM

A histogram is a graphical representation which organizes a group of data points into user- specified ranges. Histogram provides a visual interpretation of numerical data by showing the number of data points that fall within a specified range of values (“bins”). It is similar to a vertical bar graph but without gaps between the bars.

```
import numpy as np
import matplotlib.pyplot as plt
data = [1,11,21,31,41]
plt.hist([5,15,25,35,45, 55], bins=[0,10,20,30,40,50, 60], weights=[20,10,45,33,6,8],
edgecolor="red")
plt.show()
```



Customization of Histogram

By default bars of histogram is displayed in blue color but we can change it to other color with following code.

```
plt.hist([1,11,21,31,41, 51], bins=[0,10,20,30,40,50, 60], weights=[10,1,0,33,6,8], facecolor='y', edgecolor="red")
```

In above code we are passing ‘y’ as facecolor means yellow color to be displayed in bars.

To give a name to the histogram write below code before calling show()

```
plt.title ("Histogram Heading")
```

Edge color and bar color can be set using following parameter in hist() method

edgecolor='#E6E6E6',color='#EE6666 .color value can be rgb in hexadecimal form

For x and y label below code can be written

```
plt.xlabel('Value')
plt.ylabel('Frequency')
```

For future use we have to save the plot.Tosave any plot savefig() method is used.plotscan be saved like pdf,svg,png,jpgfile formats.

```
plt.savefig('line_plot.pdf')
plt.savefig('line_plot.svg')
plt.savefig('line_plot.png')
```

Parameter for saving plots .e.g.

```
plt.savefig('line_plot.jpg', dpi=300, quality=80, optimize=True, progressive=True)
```

Which Export Format to Use?

The export as vector-based SVG or PDF files is generally preferred over bitmap-based PNG or JPG files as they are richer formats, usually providing higher quality plots along with smaller file sizes.

Case Study Based Questions

1. Consider the following program and answer any four question from (i) to (v) :

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

(i) Which Module will be imported in Line 1 for above code ?
(a) matplotlib (b) matplotlib.pyplot
(c) plotlib (d) None of these
Ans: (b)
(ii) Name the label that can be used to represent the bar chart in Line 2 .
(a) Data (b) Data Values
(b) Values for X axix (d) All of these
Ans: (d)
(iii) Which message is best suited for xlabel ?
(a) X values (b) Y values
(c) Legend (d) Vertical
Ans: (a)
(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.
Ans: (a)
(v) Choose the statement to be place at Line7 of the above code .
(a) Plt.print() (b) plt.show()
(c) Plt.display() (d) plot.show()
Ans: (b)

2. If you are given to plot a histogram using numpy array as per the code given below then answer any of four questions from (i) to (v)

```
from matplotlib import _____ as plt
import numpy as np
fig, ax = plt._____ (1, 1)
a= np.array([26,59,44,39,76,16,23,11,18,78])
ax.hist(a, bins=[0,10,20,30,40])
ax._____ ('Histogram')
ax.set_xticks ([0,10,20,30,40, ])
ax.set_xlabel('Percentage')
ax._______ ('Students')
_____
```

(i) Choose the correct option to import for given propgram:
(a) matplotlib (b) matplot
(c) pyplot (d) plot
Ans: (c)
(ii) Fill in the blank at Line 3
(a) subplots (b) subplot
(c) plot (d) subplt
Ans: (a)
(iii) Which statement is used to set title in Line 6 ?
(a) title (b) set_title
(c) set (d) Title
Ans: (b) set_title

(iv) How to set Y-axis label ?
(a) label() (b) set_y
(c) set_ylab () (d) set_ylabel
Ans: (d) set_ylabel
(v) To fill in blank on Line 10 for showing histogram what can bee used ?
(a) plt.show() (b) plt_show()
(c) plot_show() (d) plt.show
Ans: plt.show()
3. Consider the following case and answer the from (i) to (v)
import ……. as pd
import matplotlib. _____ as plt
data= {'Name' : ['Karan', 'Adi', 'Abhinav', 'Kirti', 'Rahul'],
'Height' : [60,61,63,65,61],
'Weight' : [47,89,52,58,50,47]}
df=pd. _____ (data)
df._____ (Kind ='hist', edgecolor = 'Green', linewidth =2, linestyle=':' , fill= False)
_____
(i) Fill in the blank in Line 1.
(a) numpy (b) pandas
(c) Python (d) matplot
Ans: (b) pandas
(ii) Fill in the blank in Line 2.
(a) pyplot (b) plot
(c) pyp (d) None of these
Ans: (a) pyplot
(iii) Which of the following is used in Line 6 to represent the data ?
(a) Series (b) Matplot
(c) DataFrame (d) Plot
Ans: (c) DataFrame
(iv) For blank of Line 7 command used may be :
(a) plt (b) pyplot
(c) plot (d) figure
Ans: (c)plot
(v) To show the above graph , which statement is used in Line 8 ?
(a) plot.show (b) plot.show()
(c) plt.show (d) plt.show()
Ans: (d) plt.show()

Long -answer type Questions

Q1.Write a python program to plot a line chart based on the given data to depict the pass percentage of students in CBSE exams for the years 2015 to 2018 as shown below.
Year=[2015,2016,2017,2018]
Pass_Percentage=[82,83,85,90]
Solution:

```
import matplotlib.pyplot as plt
Year=[2015,2016,2017,2018]
Pass_Percentage=[82,83,85,90]
plt. plot(Year,Pass_Percentage)
plt.xlabel("Year")
plt.ylabel("Pass_Percentage")
plt.show( )
```

Q2. Write a Python code to the following data for plotting the bar graph. Add the title, label for Xaxis, Y-axis.

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

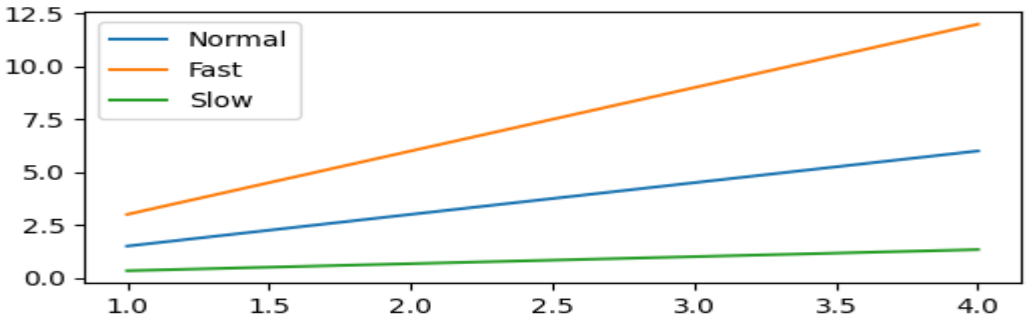
Solution:
```
import matplotlib.pyplot as pp
eng = [56,78,90,34]
sci = [65,77,54,32]
maths = [45,67,43,41]
pp.bar(eng,sci,maths)
pp.title('Subject Analysis')
pp.xlabel('Marks')
pp.ylabel('Subjects')
pp.show()
```

Q 3. Generate random numbers from 1 to 70 and plot it on the histogram. Change the outline color to black and the bar color should be yellow.
Solution:
```
import matplotlib.pyplot as m
import numpy as np
x=np.random.randn(70)
m.hist(x,20,edgecolor="black",facecolor="yellow")
m.show()
```

Short -answer type Questions

Q1. What changes will you make to the code so that the bars are visible for all four points? But do keep in mind that the x-axis must begin from the point -3.
```
a = [3, 6, 9, 12]
b = [30, 48, 54, 48]
plt.xlim(0, 5)
plt.bar(a,b)
plt.show()
```
Solution:
```
import matplotlib.pyplot as plt
a = [3, 6, 9, 12]
b = [30, 48, 54, 48]
plt.xlim(-3, 15)
plt.bar(a,b)
plt.show()
```

Q 2. Write a code to plot the speed of a passenger train as shown in the figure given below:\



Solution:
```
import matplotlib.pyplot as plt
```

```
import numpy as np
x= np.arange(1, 5)
plt.plot(x, x* 1.5, label = 'Normal')
plt.plot(x, x* 3.0, label = 'Fast')
plt.plot(x, x/3.0, label = 'Slow')
plt.legend()
plt.show()
```

Q 3. Write a Python program to display a bar chart of the number of students in a school.
Sample data:
Class: I,II,III,IV,V,VI,VII,VIII,IX,X
Strength: 38,30,45,49,37,53,48,44,36,46
Solution:

```
import matplotlib.pyplot as plt
a = ['I','II','III','IV','V','VI','VII','VIII','IX','X']
b = [38,30,45,49,37,53,48,44,36,46]
plt.bar(a,b)
plt.xlabel()
plt.show()
```

Very Short – answer type Questions

Q1. What is the purpose of a legend?
Solution: A legend is an area describing the elements of the graph. In the matplotlib library, there's a function called legend() which is used to Place a legend on the axes. The attribute Loc in legend() is used to specify the location of the legend. Default value of loc is loc="best" (upper left). The strings 'upper left', 'upper right', 'lower left', 'lower right' place the legend at the corresponding corner of the axes/figure.

2. Name the library and interface used to plot a chart in python.
Solution:Library – matplotlib
interface – pyplot

Q 3. Write a program to create a horizontal bar chart for India's medal tally.

Gold	**Silver**	**Bronze**	**Total**
3	6	17	26

Solution:

```
import matplotlib.pyplot as plt
medal= ['Gold','Silver','Bronze','Total']
num = [3,6,17,26]
plt.barh(num,medal)
plt.show()
```

Multiple Choice question

Q 1. Which function is used to save the output of pyplot in the form of image file?
A. savefig('filename')
B. save_fig('filename)
C. saveimg('filename')
D. save_img('filename')
Answer: A
Q 2. Which is a python package used for 2D graphics?
A. matplotlib.pyplot
B. matplotlib.pip
C. matplotlib.numpy
D. matplotlib.plt
Answer: A
Q 3. What is the default color for Matplotlib plots?

A. Red
B. Green
C. Orange
D. Blue
Answer: D
Q 4. The command used to give a heading to a graph is _____
A. plt.head()
B. plt.plot()
C. plt.xlabel()
D. plt.title()
Answer: D
Q 5. How to set Y-axis label in histogram.
A. plt.ylabel()
B. set_ylabel()
C. set_y()
D. set_yaxis()
Answer: B
Q 6. In Matplotlib, which command is used to display a plot?
A. plt.display()
B. plt.show()
C. plt.plot()
D. plt.view()
Answer: B
Q 7. Which of the following is NOT a valid plot type in Matplotlib?
A. Bar plot
B. line plot
C. Decision tree plot
D. Histogram
Answer: C
Q 8. Identify the right type of chart using the following hints.
Hint 1: This chart is often used to visualize a trend in data over intervals of time.
Hint 2: The line in this type of chart is often drawn chronologically.
A. Line chart
B. Bar chart
C. Pie chart
D. Scatter plot
Answer: A
Q 9. Which method is used to plot horizontal bar graph in pyplot?
A. horizontal_bar()
B. barh()
C. hbar()
D. bar()
Answer: C

Q 10. What is the purpose of the legend() function in Matplotlib?
A. To label the x and y axes of a plot
B. To label different lines or markers on a plot
C. To add a title to a plot
D. To add annotations to a plot

Answer: B

MULTIPLE CHOICE QUESTIONS-

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

A. savefig('filename')
B. save_fig('filename)
C. saveimg('filename')
D. save_img('filename')

Answer: A

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

A. matplotlib.pyplot
B. matplotlib.pip
C. matplotlib.numpy
D. matplotlib.plt

Answer: A

Q 3. What is the default color for Matplotlib plots?

A. Red
B. Green
C. Orange
D. Blue

Answer: D

Q 4. The command used to give a heading to a graph is

A. plt.head()
B. plt.plot()
C. plt.xlabel()
D. plt.title()

Answer: D

Q 5. How to set Y-axis label in histogram.

A. plt.ylabel()
B. set_ylabel()
C. set_y()
D. set_yaxis()

Answer: B

Q 6. In Matplotlib, which command is used to display a plot?

A. plt.display()
B. plt.show()
C. plt.plot()
D. plt.view()

Answer: B

Q 7. Which of the following is NOT a valid plot type in Matplotlib?

A. Bar plot
B. line plot
C. Decision tree plot
D. Histogram

Answer: C

Q 8. Identify the right type of chart using the following hints.
Hint 1: This chart is often used to visualize a trend in data over intervals of time. Hint 2: The line in this type of chart is often drawn chronologically.

A. Line chart
B. Bar chart
C. Pie chart
D. Scatter plot

Answer: A

Q 9. Which method is used to plot horizontal bar graph in pyplot?

A. horizontal_bar()
B. barh()
C. hbar()
D. bar()

Answer: C

Q 10. What is the purpose of the legend() function in Matplotlib?

A. To label the x and y axes of a plot
B. To label different lines or markers on a plot
C. To add a title to a plot
D. To add annotations to a plot

Answer: B

Assertion Reason Based Questions (1 Mark)

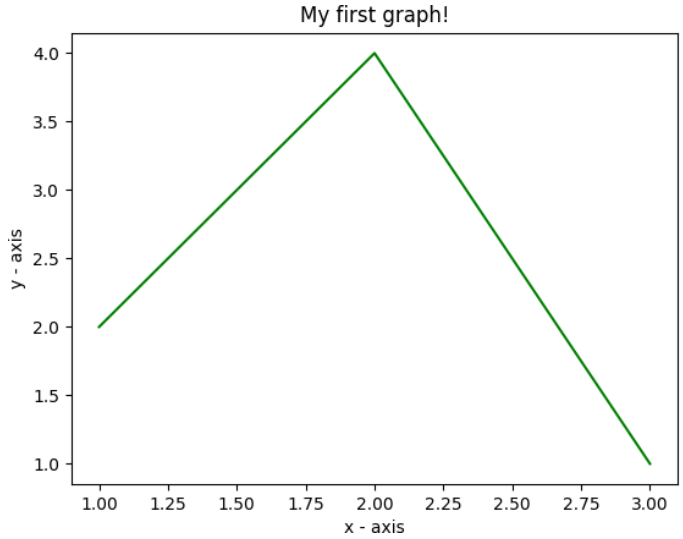
In each of the questions given below, there are two statements marked as Assertion (A) and Reason (R). Mark your answer as per the codes provided below:

A. A is true but R is false.
B. Both A and R are true
C. A is false but R is true.
D. Both A and R are false.

Q 1. ASSERTION(A): Data visualization refers to the graphical representation of information and data using visual elements like charts, graphs and maps etc.
REASON(R) : To install matplotlib library we can use the command pip install matplotlib.
Answer: B
Q 2. ASSERTION(A) : legend (labels = ['Text']) is used to give title to the graph
REASON(R) : plt.savefig("path") will save the current graph in png or jpeg format
Answer: C
Q 3. ASSERTION(A) : matplotlib.pyplot.show() is a method used to plot a line graph
REASON(R) : show() is method is defined in the library matplotlib.pip
Answer: D
Q 4. ASSERTION(A) :A line chart displays information as many series of data points called "Markers" connected by straight line segments.
REASON(R) : plot (), can not plot multiple lines in the same plot with different colour by default.
Answer: C
Q 5. ASSERTION(A) : The data point plotted on a graph are called markers.
REASON(R) : The width argument of plot() specifies the width of the line.
Answer: C

Case study Based Questions

Q 1. Mr. Pranav is trying to write a code to plot line graph shown in fig-1. Help Mr. Pranav to fill in the blanks of the code and get the desired output.



import matplotlib.pyplot as plt # statement 1 x = [1,2,3] # statement 2
y = [2,4,1] # statement 3
plt.plot(x, y, color='g') # statement 4
statement 5

_____
statement 6

giving a title to my graph
plt. ('My first graph!') # statement 7 # function to show the plot
statement 8

_____

Which of the above statement is responsible for plotting the values on canvas.

Statement 8
Statement 4
Statement 1
None of the above
Answer: b

Statements 5 & 6 are used to give names to x-axis and y-axis as shown in fig.1. Which of the following can fill those two gaps
plt.xlabel('x - axis') plt.ylabel('y - axis')
plt.xtitle('x - axis') plt.ytitle('y - axis')
plt.xlable('x - axis') plt.ylable('x - axis')
plt.xlabel('x axis') plt.ylabel('y axis')
Answer: a

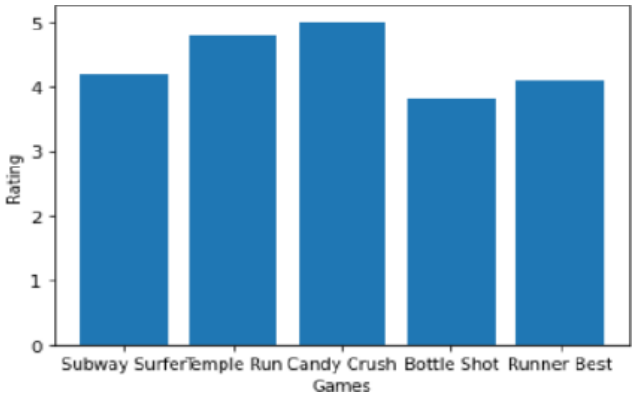
Raman has executed code with first 7 statements. But No output displayed. Which of the following statements will display the graph?
plt.display()
plt.show()
matplotlib.pyplot.show()

Both b & c
Answer: d

The number of markers in the above line chart are
zero
three
Infinite
One
Answer: b

Which of the following methods will result in displaying 'My first graph!' in the above graph
legend()
label()
title()
Both a & c
Answer: c

Q 2. Mr. Shashank is working in a game development industry and he was comparing the given chart on the basis of the rating of the various games available on the play store.



Write the python code for the above graph – each bar having a different color and X – axis and Y – axis having a suitable lable. Also give suitable python statement to save this chart.

Solution:
import matplotlib.pyplot as plt
Games=[“Subway Surfer”,”TempleRun”,”CandyCrush”,”BottleShot”,”RunnerBest”]
Rating=[4.2,4.8,5.0,3.8,4.1]
plt.bar(Games,Rating,color = [“green”,”red”,”yellow”,”cyan”,”magenta”]) plt.xlabel(“Games”)
plt.ylabel(“Rating”) plt.show() plt.savefig(“aa.jpg”)

Q3. Consider the following case and answer the questions from (i) to (v).
import as pd
import matplotlib as plt
data= {‘Name’ : [‘Karan’, ‘Adi’, ‘Abhinav’, ‘Kirti’, ‘Rahul’], ‘Height’ : [60,61,63,65,61], ‘Weight’ : [47,89,52,58,50,47]}
df=pd. (data)
df. (Kind =’hist’, edgecolor = ‘Green’, linewidth =2, linestyle=’:’ , fill= False)
Fill in the blank in Line 1.
(a) numpy (b) pandas
(c) Python (d) matplot

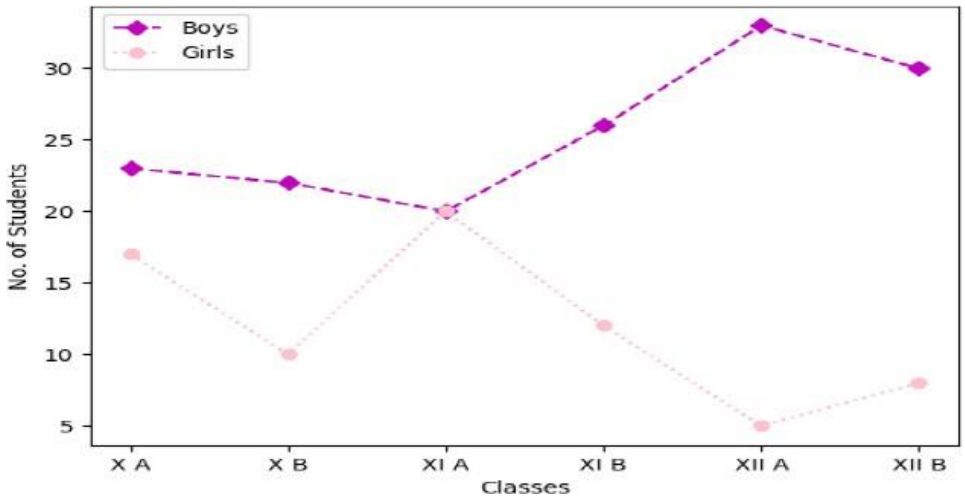
Ans: (b) pandas
Fill in the blank in Line 2.
(a) pyplot (b) plot
(c) pyp (d) None of these
Ans: (a) pyplot
Which of the following is used in Line 4 to represent the data?
(a) Series (b) Matplot
(c) DataFrame (d) Plot
Ans: (c) DataFrame
For blank of Line 5 command used may be:
(a) plt (b) pyplot
(c) plot (d) figure
Ans: (c)plot
To show the above graph which statement is used in Line 6?
(a) plot.show (b) plot.show()
(c) plt.show (d) plt.show()
Ans: (d) plt.show()

Q4. Consider that survey has to be done on how much distance the following vehicles have covered in a span of five days. Write suitable Python code to generate a Line Plot based on the given data, along with an appropriate chart title and both axis labels.

DAYS	BIKES			
	DISTANCE COVERED IN KMS			
	ENFIELD	HONDA	YAMAHA	KTM
DAY 1	50	80	70	80
DAY 2	40	20	20	20
DAY 3	70	20	60	20
DAY 4	80	50	40	50
DAY 5	20	60	60	60

Solution:
x=[1,2,3,4,5]
y=[50,40,70,80,20]
y2=[80,20,20,50,60]
y3=[70,20,60,40,60]
y4=[80,20,20,50,60]
plt.plot(x,y,'g',label='Enfield',linewidth=5) plt.plot(x,y2,'c',label='Honda',linewidth=5)
plt.plot(x,y3,'k',label='Yamaha',linewidth=5) plt.plot(x,y4,'y',label='KTM',linewidth=5) plt.title('bike details in line plot') plt.ylabel('Distance in kms') plt.xlabel('Days')
plt.legend() plt.show()

Q 5. Ms. Shubhangi is a coordinator in the senior section school. She represented data on number of students who passed the exam on line chart as follows:
She has written the following code but not getting the desired output. Help her by correcting her code.




```
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 1
plt.line(classes,no_of_girls) #Statement 2
plt.xtitle("No of Stduents") #Statement 3
plt.ytitle("Classes") #Statement 4
```

What will be the correct code for Statement 1 and Statement 2?
What is the correct function name for Statement 3 and Statement 4?
Write a method and parameter required to display legends?
Write the code for giving the graph 'Classroom visualisation' as title.
Write to save the figure as image.

Solution:
i)plt.plot plt.plot ii)plt.xlabel plt.ylabel iii)plt.legend()
iv)plt.title('Classroom visualisation') v)plt.savefig('d:/pypl/ .jpg')

03 Very Short Knowledge/Understanding Based Questions (2 Marks)

Q1. What is the purpose of a legend?
Solution: A legend is an area describing the elements of the graph. In the matplotlib library, there's a function called legend() which is used to Place a legend on the axes. The attribute Loc in legend() is used to specify the location of the legend. Default value of loc is loc="best" (upper left). The strings 'upper left', 'upper right', 'lower left', 'lower right' place the legend at the corresponding corner of the axes/figure.
Q 2. Name the library and interface used to plot a chart in python.
Solution:Library – matplotlib interface – pyplot

Q 3. Write a program to create a horizontal bar chart for India's medal tally.

Gold	Silver	Bronze	Total
3	6	17	26

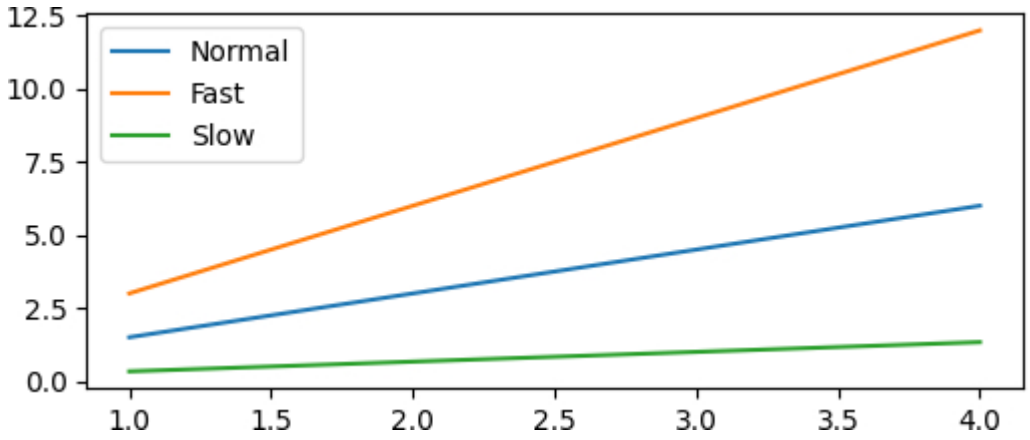
Solution:

```
import matplotlib.pyplot as plt
medal= ['Gold','Silver','Bronze','Total'] num = [3,6,17,26]
plt.barh(num,medal) plt.show()
```

03 Short Knowledge/Understanding Based Questions (3 Marks)

Q1. What changes will you make to the code so that the bars are visible for all four points? But do keep in mind that the x-axis must begin from the point -3.
a = [3, 6, 9, 12]
b = [30, 48, 54, 48]
plt.xlim(0, 5)
plt.bar(a,b) plt.show()
Solution:
import matplotlib.pyplot as plt a = [3, 6, 9, 12]
b = [30, 48, 54, 48]
plt.xlim(-3, 15)
plt.bar(a,b) plt.show()

Q 2. Write a code to plot the speed of a passenger train as shown in the figure given below:\



Solution:
import matplotlib.pyplot as plt import numpy as np
x= np.arange(1, 5)
plt.plot(x, x* 1.5, label = 'Normal') plt.plot(x, x* 3.0, label = 'Fast') plt.plot(x, x/3.0, label = 'Slow') plt.legend()
plt.show()

Q 3. Write a Python program to display a bar chart of the number of students in a school.
Sample data:
Class: I,II,III,IV,V,VI,VII,VIII,IX,X Strength: 38,30,45,49,37,53,48,44,36,46
Solution:
import matplotlib.pyplot as plt
a = [‘I’,’II’,’III’,’IV’,’V’,’VI’,’VII’,’VIII’,’IX’,’X’] b = [38,30,45,49,37,53,48,44,36,46]
plt.bar(a,b) plt.xlabel() plt.show()

03 Long Knowledge/Understanding Based Questions (4 Marks)

Q1.Write a python program to plot a line chart based on the given data to depict the pass percentage of students in CBSE exams for the years 2015 to 2018 as shown below.
Year=[2015,2016,2017,2018]
Pass_Percentage=[82,83,85,90]

Solution:
import matplotlib.pyplot as plt Year=[2015,2016,2017,2018]

```
Pass_Percentage=[82,83,85,90] plt.
 plot(Year,Pass_Percentage
plt.xlabel("Year")
plt.ylabel("Pass_Percentage") plt.show( )
```

Q2. Write a Python code to the following data for plotting the bar graph. Add the title, label for Xaxis, Y- axis.
English : 56,78,90,34
Science: 65,77,54,32
Maths: 45,67,43,41

Solution:

```
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.title('Subject Analysis') pp.xlabel('Marks') pp.ylabel('Subjects') pp.show()
```

Q 3. Generate random numbers from 1 to 70 and plot it on the histogram. Change the outline color to black and the bar color should be yellow.

Solution:

```
import matplotlib.pyplot as m import numpy as np
 x=np.random.randn(70)
m.hist(x,20,edgecolor="black",facecolor="yellow")
m.show()
```

UNIT 2: Database Query using SQL

Revision of database concepts and SQL commands covered in class XI

TOPIC COVERED
Revision of database concepts and SQL commands covered in class XI
GIST OF TOPICS:-
1-Introduction to database concepts and its need.
The database system is an excellent computer-based record-keeping system. A collection of data, commonly called a database, contains information about a particular enterprise. It maintains any information that may be necessary to the decision-making process involved in the management of that organization.
Need/Advantages of Database
Let us consider some of the benefits provided by a database system and see how a database system overcomes the above-mentioned problems:-
Reduces database data redundancy to a great extent
The database can control data inconsistency to a great extent
The database facilitates sharing of data.
Database enforce standards.
The database can ensure data security.
Integrity can be maintained through databases.
Therefore, for systems with better performance and efficiency, database systems are preferred.
2- Database Management System
A Database Management System (DBMS) is a software system that is designed to manage and organize data in a structured manner. It allows users to create, modify, and query a database, as well as manage the security and access controls for that database.
DBMS provides an environment to store and retrieve the data in convenient and efficient manner.
Examples:- MySQL,Oracle Database,MongoDB,IBM Db2 DBMS,Amazon RDS,PostgreSQL
3-Relational data model
The relational model uses a collection of tables to represent both data and the relationships among those data. Each table has multiple columns, and each column has a unique name. Tables are also known as relations.

4-Domain:-In database management, a domain is a set of values that can be stored in a column of a database table.

Table/Relation = Student

ROLL_NO	NAME	ADDRESS	PHONE	AGE
1	RAM	DELHI	9455123451	18
2	RAMESH	GURGAON	9652431543	18
3	SUJIT	ROHTAK	9156253131	20
4	SURESH	DELHI		18

5-Tuple: Each row in the relation is known as a tuple. The above relation contains 4 tuples, one of which is shown as:

1	RAM	DELHI	9455123451	18

6-Attribute: Attributes are the properties that define an entity. e.g.; ROLL_NO, NAME, ADDRESS
7- Degree and Cardinality
Degree: The number of attributes in the relation is known as the degree of the relation. The STUDENT relation defined above has degree
Cardinality: The number of tuples in a relation is known as Cardinality. The STUDENT relation defined above has cardinality 4.
8-Candidate key
A candidate key in a database management system (DBMS) is a unique identifier for a record within a table that can be chosen as the primary key. It possesses the essential characteristics required for a primary key: uniqueness and minimal redundancy. While multiple candidate keys may exist within a table
9-Primary key
The PRIMARY KEY constraint uniquely identifies each record in a table.
Primary keys must contain UNIQUE values, and cannot contain NULL values.
A table can have only ONE primary key; and in the table, this primary key can consist of single or multiple columns (fields).
10-Alternate key
An alternate key in a Database Management System (DBMS) serves as a candidate key that is not selected as the primary key. Its primary purpose is to provide an alternative unique identifier for a record within a table
11-Data Definition Language
12-DML
DML is an abbreviation for Data Manipulation Language. Represents a collection of programming languages explicitly used to make changes to the database.
such as: CRUD operations to create, read, update and delete data.
Examples of DML commands :- INSERT, SELECT, UPDATE, and DELETE

13-Introduction to MySQL
MySQL is a very popular open-source relational database management system (RDBMS).
What is MySQL?
MySQL is a relational database management system
MySQL is open-source
MySQL is free
MySQL is ideal for both small and large applications
MySQL is very fast, reliable, scalable, and easy to use
MySQL is cross-platform
MySQL was first released in 1995
MySQL is developed, distributed, and supported by Oracle Corporation
Who Uses MySQL?
Huge websites like Facebook, Twitter, Airbnb, Booking.com, Uber, GitHub, YouTube, etc.
Content Management Systems like WordPress, Drupal, Joomla!, Contao, etc.
A very large number of web developers around the world
4-Creating a database using MySQL
The CREATE DATABASE statement is used to create a new SQL database.
Syntax:-
CREATE DATABASE databasename;
eg- CREATE DATABASE testDB;
15-Data Types:-The data type of a column defines what value the column can hold: integer, character, money, date and time, binary, and so on.
Important data types
CHAR(size)-A FIXED length string (can contain letters, numbers, and special characters). The size parameter specifies the column length in characters - can be from 0 to 255. Default is 1
VARCHAR(size)-A VARIABLE length string (can contain letters, numbers, and special characters). The size parameter specifies the maximum column length in characters - can be from 0 to 65535
INT(size):-A medium integer. Signed range is from -2147483648 to 2147483647. Unsigned range is from 0 to

4294967295. The size parameter specifies the maximum display width (which is 255)
INTEGER(size)- Equal to INT(size)
DATE - A date. Format: YYYY-MM-DD. The supported range is from '1000-01-01' to '9999-12-31'
16-CREATE TABLE-The CREATE TABLE statement is used to create a new table in a database.
Syntax

```
CREATE TABLE table_name (
    column1 datatype,
    column2 datatype,
    column3 datatype,
   ....
);
```

The column parameters specify the names of the columns of the table.
The datatype parameter specifies the type of data the column can hold (e.g. varchar, integer, date, etc.).
Example:-

```
CREATE TABLE Persons (
    PersonID int,
    LastName varchar(255),
    FirstName varchar(255),
    Address varchar(255),
    City varchar(255)
);
```

17-DROP-The DROP TABLE statement is used to drop an existing table in a database.

Syntax:- DROP TABLE table_name;
Example:-DROP TABLE Persons;

18-ALTER Data Query:
19-BETWEEN
29-Logical operators
30-
NULL value
The value which is not known or unavailable is called a NULL value. It is represented by blank space.
By default, a column can hold NULL values.
NOT NULL
The NOT NULL constraint enforces a column to NOT accept NULL values.This enforces a field to always contain a value, which means that you cannot insert a new record, or update a record without adding a value to this field.

```
CREATE TABLE Persons (
    ID int NOT NULL,
    LastName varchar(255) NOT NULL,
    FirstName varchar(255) NOT NULL,
                                    );
```

It is not possible to test for NULL values with comparison operators, such as =, <, or < >.
We will have to use the IS NULL and IS NOT NULL operators instead.
IS NULL Syntax

```
SELECT column_names
FROM table_name
WHERE column_name IS NULL;
```

IS NOT NULL Syntax

```
SELECT column_names
FROM table_name
WHERE column_name IS NOT NULL;
```

31-INSERT
The SQL INSERT INTO Statement
The INSERT INTO statement is used to insert new records in a table.
INSERT INTO Syntax
INSERT INTO table_name
VALUES (value1, value2, value3, ...);
32-DELETE
The SQL DELETE Statement
The DELETE statement is used to delete existing records in a table.
DELETE Syntax
DELETE FROM table_name WHERE condition;
33-UPDATE
The UPDATE statement is used to modify the existing records in a table.
UPDATE Syntax
UPDATE table_name
SET column1 = value1, column2 = value2, …
WHERE condition;

TOPIC COVERED
Revision of database concepts and SQL commands covered in class XI
Database Concepts: Introduction to database concepts and its need, Database Management System. Relational data model: Concept of domain, tuple, relation, candidate key, primary key, alternate key Advantages of using Structured Query Language, Data Definition Language, Data Query Language and Data Manipulation Language, Introduction to MySQL, creating a database using MySQL,
Data Types Data Definition:
CREATE DATABASE, CREATE TABLE, DROP, ALTER Data Query:
SELECT, FROM, WHERE with relational operators, BETWEEN, logical operators, IS NULL, IS NOT NULL Data Manipulation: INSERT, DELETE, UPDATE

MCQ (01 Marks)	

1	Which of the following SQL queries is used to retrieve rows from the "customers" table where the "email" column contains NULL values?
	a. SELECT * FROM customers WHERE email = NULL;
	b. SELECT * FROM customers WHERE email IS NOT NULL;
	c. SELECT * FROM customers WHERE ISNULL(email);
	d. SELECT * FROM customers WHERE email IS NULL

2	Which of the following SQL queries is used to retrieve records having open_bal between 15000 to 20000 by selecting the right command: a. Select total from customer having open_bal between 15000 and 20000;; b. Select count(*) from customer where open_bal between 15000 to 20000;; c. Select * from customer where open_bal between 15000 and 20000; d. Select count(*) from customer order by open_bal;
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”;
4	Suggest a free software for managing the database a. Oracle b. MySQL c. Sybase d. Microsoft SQL Server
5	With reference to SQL, identify the invalid data type. i. Date ii. Integer iii. Varchar iv. Month

6	If column "Fees" contains the data set (5000,8000,7500,5000,8000), what will be the output after the execution of the given query? SELECT SUM (DISTINCT Fees) FROM student; i. 20500 ii. 10000 iii. 20000 iv. 33500
7	Fill in the blank: _____ command is used to remove primary key from a table in SQL. (a) update (b)remove (c) alter (d)drop
8	Which of the following commands will delete the table from MYSQL database? (a) DELETE TABLE (b) DROP TABLE (c) REMOVE TABLE (d) ALTER TABLE
9	Fill in the blank: _____ is a non-key attribute, whose values are derived from the primary key of some other table. (a) Primary Key (b) Foreign Key (c) Candidate Key (d) Alternate Key
10	Which of the following statements is FALSE about keys in a relational database? a. Any candidate key is eligible to become a primary key. b. A primary key uniquely identifies the tuples in a relation. c. A candidate key that is not a primary key is a foreign key. d. A foreign key is an attribute whose value is derived from the primary key of another relation.
Assertion-Reasoning (01 Marks) Q11,12 and 13 are ASSERTION AND REASONING based questions. Mark the correct choice as (a) Both A and R are true and R is the correct explanation for A (b)Both A and R are true and R is not the correct explanation for A (c) A is True but R is False (d)A is false but R is True	
11	ASSERTION:- If our database name is 'schooldb' and we want to drop this database , the query will work if we will write our database name in capital letters. REASON :- SQL is a not a case sensitive.
12	ASSERTION:- Drop command is used to delete a database. REASON :- Drop is an example of DDL.
13	ASSERTION :- Primary Key is a set of attributes (or attribute) which uniquely identify the tuples in relation or table. REASON :- There may be more than one primary key in a table.
Case- based Questions(03 Marks)	
14	A School in Delhi uses database management system to store student details. The school maintains a database 'school_record' under which there are two tables. Student Table : Maintains general details about every student enrolled in school. StuLibrary Table : To store details of issued books. BookID is the unique identification number issued to each book. Minimum issue duration of a book is one Day.

Student	
Field	**Type**
StuID	numeric
StuName	varchar(20)
StuAddress	varchar(50)
StuFatherName	varchar(20)
StuContact	numeric
StuAadhar	numeric
StuClass	varchar(5)
StuSection	varchar(1)

StuLibrary	
Field	**Type**
BookID	numeric
StuID	numeric
Issued_date	Date
Return_date	Date

a- The Primary Key for Student Table is/are …….
b- Write SQL Query that will fetch ID of those issued books which have not been returned?
c- Identify the SQL Query which displays the data of StuLibrary table in ascending order of StudentID.

i) Select * from StuLibrary Order By BookID
ii) Select * from StuLibrary Order By StuID
iii) Select * from StuLibrary Order By StuID ASC
iv) Select * from StuLibrary Order By StuID DESC

Choose the correct option:
a. Both Query i) and iv) will display the desired data.
b. Both Query i) and ii) will display the desired data.
c. Both Query iii) and iv) will display the desired data.
d. Both Query ii) and iii) will display the desired data.

15 Navdeep creates a table RESULT with a set of records to maintain the marks secured by students in Sem 1, Sem2, Sem3 and their division. After creation of the table, he has entered data of 7 students in the table.
Table: RESULT
Based on the data given table answer the following questions:

ROLL_NO	SNAME	SEM1	SEM2	SEM3	DIVISION
101	KARAN	366	410	402	I
102	NAMAN	300	350	325	I
103	ISHA	400	410	415	I
104	RENU	350	357	415	I
105	ARPIT	100	75	178	IV
106	SABINA	100	205	217	II
107	NEELAM	470	450	471	I

a-If two columns are added and 2 rows are deleted from the table result, what will be the new degree and cardinality of the above table?
b- Insert the following record into the table – Roll No- 108, NameAadit, Sem1- 470, Sem2-444, Sem3-475, Div –I
c- Increase the SEM2 marks of the students by 3% .

16 Tejasvi Sethi, 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 aprimary key, CARNAME, COMPANY, COLOR, COST (in lakh rupees) of the car and DOM which is the Date of Manufacture of the car.
Answer the questions based on the table CARMARKET .

CARCODE	CARNAME	COMPANY	COLOR	COST	DOM
C01	BALENO	SUZUKI	BLUE	5.90	2019-11-07
CO2	INDIGO	TATA	SILVER	12.90	2020-10-15
C03	GLC	MERCEDES	WHITE	62.38	2020-01-20
C04	A6	AUDI	RED	58.55	2018-12-29

a-To find details of records having cost between 20 to 50 .
b- Increase cost of Indigo by 10%
c-To Delete table CARMARKET table from database.

Very Short Questions (02 Marks)

17 Categorize the following commands as DDL or DML: INSERT, UPDATE, ALTER, DROP

18 Define Tuple and Attribute with respect to DBMS.

19 Differentiate between char(n) and varchar(n) data types with respect to databases.

Short Questions (03 Marks)

20 Consider the following records in 'Cars' table and answer the given questions:

CarID	Make	Model	Year	Color	Price
101	Toyota	Camry	2022	Blue	25000.00
102	Honda	Civic	2021	Black	22000.00
103	Ford	Mustang	2023	Brown	35000.00
104	Chevrolet	Equinox	2022	White	28000.00
105	BMW	X5	2023	Blue	45000.00
106	Volkswagen	Golf	2021	Black	20000.00

a. SELECT Make, Model FROM Cars WHERE Price > 30000.00;
b. SELECT COUNT(*) AS 'TotalCars' FROM Cars WHERE Year = 2022;
c. SELECT CarID, Make, Model FROM Cars where price<22000;

21 Write MySQL statements for the following:
i. To create a database named FOOD.
ii. To create a table named Nutrients based on the following specification:

Column Name	**Data Type**	**Constraints**
Food_Item	Varchar(20)	Primary Key
Calorie	Integer	

22 Based on the data given table Write the statements to:
a. Delete the record of students securing IV division.
b. Add a column REMARKS in the table with datatype as varchar with 50 characters.
c. Remove column Division.

ROLL_NO	SNAME	SEM1	SEM2	SEM3	DIVISION
101	KARAN	366	410	402	I
102	NAMAN	300	350	325	I
103	ISHA	400	410	415	I
104	RENU	350	357	415	I
105	ARPIT	100	75	178	IV
106	SABINA	100	205	217	II
107	NEELAM	470	450	471	I

Long Questions

23 Explain the use of 'Foreign Key' in a Relational Database Management System. Give example to support your answer.

24 Differentiate between Primary key and Candidate key with suitable example.

25 Differentiate between DDL and DML with suitable example.

Math functions()

MOD (). POWER (), ROUND

Text functions: UCASE ()/UPPER (), LCASE ()/LOWER (), MID ()/SUBSTRING ()/SUBSTR (), LENGTH (), LEFT (), RIGHT (), INSTR(), LTRIM (), RTRIM(), TRIM ().

Math Functions
Three commonly used numeric functions are POWER(), ROUND() and MOD(). Their usage along with syntax is given in table below :

Function	Description	Example
POWER(P,Q) or POW(P,Q)	Calculates P to the power Q.	mysql> SELECT POWER(2,4); Output: 16

ROUND(N,D)	Rounds off number N to D number of decimal places.
	Note: If D=0, then it rounds off the number to the nearest integer.
		mysql>SELECT ROUND(2912.564, 1);
		Output:
		2912.6
		mysql> SELECT ROUND(283.2);
		Output:
		283

MOD(X, Y)	Returns the remainder after dividing number X by number Y.	mysql> SELECT MOD(31, 3); Output: 1

Eg:

Example to use POW() function in a query
Let's assume we have a table numbers with the following structure and data:

id	base	exponent
1	2	3
2	5	2
3	7	0
4	3	4
5	10	2

We want to compute the power of base raised to exponent for each row. Here’s the query to achieve this:
SELECT id, base, exponent, POW(base, exponent) AS result FROM numbers;
The query will return:

id	base	exponent	result
1	2	3	8
2	5	2	25
3	7	0	1
4	3	4	81
5	10	2	100

Example to use ROUND() function in a query
Let's assume we have a table prices with the following structure and data:

id	product	price
1	Product A	123.456
2	Product B	78.912
3	Product C	45.6789
4	Product D	99.999
5	Product E	10.1234

We want to round the prices to 2 decimal places. Here’s the query to achieve this:
SELECT id, product, price, ROUND(price, 2) AS rounded_price FROM prices;
The query will return:

id	product	price	rounded_price
1	Product A	123.456	123.46
2	Product B	78.912	78.91
3	Product C	45.6789	45.68
4	Product D	99.999	100.00
5	Product E	10.1234	10.12

Example to use MOD() function in a query

Let's assume we have a table division with the following structure and data:

id	numerator	denominator
1	10	3
2	15	4
3	20	6
4	25	7
5	30	5

We want to calculate the remainder of each division using the MOD function. Here’s the query:
SELECT id, numerator, denominator, MOD(numerator, denominator) AS remainder FROM divisions;
The query will return:

id	numerator	denominator	remainder
1	10	3	1
2	15	4	3
3	20	6	2
4	25	7	4
5	30	5	0

String Functions
String functions in SQL are powerful tools for manipulating text data. They allow us to modify, extract, and format strings in various ways.

Function Name	Description	Example	Output
SUBSTRING(string, pos, n) or MID(string, pos, n) Or SUBSTR(string, pos, n)	Extracts a substring from a string	SELECT SUBSTRING('Hello World', 1, 5);	Hello
LENGTH(string) or LEN(string)	Returns the length of a string	SELECT LENGTH('Hello');	5
UCASE(string) OR UPPER(string)	Converts a string to uppercase	SELECT UPPER('hello');	HELLO
LOWER(string) OR LCASE(string)	Converts a string to lowercase	SELECT LOWER('HELLO');	hello
TRIM(string)	Removes leading and trailing spaces from a string	SELECT TRIM(' Hello ');	Hello
LTRIM(string)	Removes leading spaces from a string	SELECT LTRIM(' Hello');	Hello
RTRIM(string)	Removes trailing spaces from a string	SELECT RTRIM('Hello ');	Hello
INSTR(string, substring)	Returns the position of the first occurrence of a substring	SELECT INSTR('Hello World', 'World');	7
LEFT(string, N)	Returns the left part of a string with the specified number of characters	SELECT LEFT('Hello World', 5);	Hello
RIGHT(string, N)	Returns the right part of a string with the specified number of characters	SELECT RIGHT('Hello World', 5);	World

Eg:-

Let's create a table and then demonstrate the use of some of the functions above with a question and answer.

UPPER()

Table Employees

EmployeeID	FirstName	LastName	Department
1	John	Doe	Sales
2	Jane	Smith	Marketing
3	Michael	Brown	IT
4	Emily	Davis	HR
5	William	Wilson	Finance

Question:

Write an SQL query to convert each employee's first name to uppercase.

SQL Query:

```
SELECT EmployeeID, FirstName, UPPER(FirstName) AS FirstName_Upper FROM Employees;
```

Output:

EmployeeID	FirstName	FirstName_Upper
1	John	JOHN
2	Jane	JANE
3	Michael	MICHAEL
4	Emily	EMILY
5	William	WILLIAM

LOWER( )

Let's use the same Employees table and demonstrate the use of the LOWER() function with a question and answer.

Question:

Write an SQL query to convert each employee's last name to lowercase.

SQL Query:

SELECT EmployeeID, LastName, LOWER(LastName) AS LastName_Lower FROM Employees;

Output:

EmployeeID	LastName	LastName_Lower
1	Doe	doe
2	Smith	smith
3	Brown	brown
4	Davis	davis
5	Wilson	wilson

TRIM( )

Let's use the same Employees table and demonstrate the use of the TRIM() function with a question and answer.

Question:

Write an SQL query to trim leading and trailing spaces from each employee's first name and last name.

SQL Query:

SELECT EmployeeID, TRIM(FirstName) AS FirstName_Trimmed, TRIM(LastName) AS LastName_Trimmed FROM Employees;

Output:

EmployeeID	FirstName_Trimmed	LastName_Trimmed
1	John	Doe
2	Jane	Smith
3	Michael	Brown
4	Emily	Davis
5	William	Wilson

In this example, the TRIM() function ensures that any leading or trailing spaces in the FirstName and LastName columns are removed, providing clean data for display or further processing.

INSTR( )

Let's use a hypothetical Products table to demonstrate the use of the INSTR() function with a question and answer.

Table: Products

ProductID	ProductName	Description	Price
1	Laptop Stand	Adjustable laptop stand for desk	29.99
2	Wireless Keyboard	Bluetooth-enabled keyboard with backlight	49.99
3	Gaming Mouse	High-precision gaming mouse	39.99

ProductID	ProductName	Description	Price
4	Portable Charger	10000mAh power bank with fast charging	19.99
5	Smart Watch	Fitness tracker with heart rate monitor	79.99

Question :
Write an SQL query to find the position of the substring 'mouse' within each product's description.
SQL Query:
SELECT ProductID, ProductName, Description, INSTR(LOWER(Description), 'mouse') AS Position_of_Mouse FROM Products;
Output:

ProductID	ProductName	Description	Position_of_Mouse
1	Laptop Stand	Adjustable laptop stand for desk	0
2	Wireless Keyboard	Bluetooth-enabled keyboard with backlight	0
3	Gaming Mouse	High-precision gaming mouse	23
4	Portable Charger	10000mAh power bank with fast charging	0
5	Smart Watch	Fitness tracker with heart rate monitor	0

In the output, a position of 0 indicates that the substring 'mouse' was not found within the respective Description column.
The LOWER() function is used to ensure that the search for 'mouse' is case-insensitive, which is helpful when dealing with varied casing in textual data.

QUESTION BANK

What will the output of – select round(12345.678,0);
A.12345 B. 12346 C. 12350 D.12346.0
Ans :-. B. 12346
What does the MySQL function POWER(x, y) do?
A) Returns the product of x and y
B) Returns the square root of x raised to the power of y
C) Returns x raised to the power of y
D) Returns the logarithm of x to the base y
Ans :- C) Returns x raised to the power of y
3. If MOD(17, 4) is executed in MySQL, what would be the result?

A. 4
B. 3
C. 1
D. 0

Ans :- C) 1
4. Consider a table named 'products' with a column 'product_name'. If you want to retrieve all product names in uppercase, which query would you use?

A. SELECT product_name UPPER FROM products;
B. SELECT product_name AS UCASE FROM products;
C. SELECT UCASE(product_name) FROM products;
D. SELECT CONVERT(UCASE, product_name) FROM products;

Ans :- C) SELECT UCASE(product_name) FROM products;

5. Which of the following statements is true about LCASE()?
A) It only works with numeric values.
B) It cannot be used in WHERE clauses.
C) It preserves the original case of the string.
D) It returns a string in lowercase.
Ans :- D) It returns a string in lowercase
6. What is the output of the following MySQL query?
Select SUBSTRING (‘ Hello World’, 3,5) as Sub_String;
A. "llo W"
B. "lo Wo"
C. "lo Wo"
D. "Hello"

Ans :- A) "llo W"
7. Which of the following SQL statements correctly uses the LENGTH ( ) function?
A) SELECT LENGTH(name) FROM employees WHERE id = 10;
B) SELECT LENGTH FROM employees WHERE name = 'John';
C) SELECT name FROM employees WHERE LENGTH(id) = 5;
D) SELECT COUNT(LENGTH(name)) FROM employees;
Ans :- A) SELECT LENGTH(name) FROM employees WHERE id = 10;
8. What will be the output of the following MySQL query?
SELECT LEFT('MySQL Function', 5);
A) "MySQL"
B) "Funct"
C) "MySQ"
D) "Functi"
Ans :- A) "MySQL"
9. What does the MySQL function INSTR() return?
A) The position of the first occurrence of a substring within a string.
B) The length of the string.
C) The number of occurrences of a substring within a string.
D) The concatenation of two strings.
Ans :- A) The position of the first occurrence of a substring within a string

10. What does the MySQL function TRIM() do?
A) Removes leading and trailing spaces from a string
B) Removes all spaces from a string
C) Removes leading spaces from a string
D) Removes trailing spaces from a string
Ans :- A) Removes leading and trailing spaces from a string

Q11. Explain the functions UCASE( ) and UPPER( ) with suitable examples.
Ans :- Both UCASE() and UPPER() are SQL functions used to convert characters to uppercase within a query. They are typically used interchangeably depending on the specific SQL dialect you're working with.
UCASE( ) : This function converts all characters in a string to uppercase. It's commonly used in databases such as MySQL and Microsoft SQL Server.
Select UCASE (‘hello’) AS Result;
Output:
Result

HELLO
UPPER( ) : Similar to UCASE(), UPPER() also converts all characters in a string to uppercase. It's widely supported in various SQL databases, including Oracle, PostgreSQL, and SQLite.

Select UPPER (‘hello’) AS Result;
Output:

Result

HELLO
Both functions are helpful when you need to standardize the case of data for consistency or when performing case-insensitive searches. The choice between them usually depends on the specific SQL database you are using or your personal preference.
Q12. Explain the following Math functions with suitable examples.
a) POWER( ) b) ROUND( ) c) MOD( )

Ans A) POWER( )
The POWER( ) function in MySQL is used to raise a number to a specified power. It takes two arguments: the base number and the exponent. It returns the value of the base raised to the power of the exponent.

Syntax:

POWER (base, exponent)
For example, if you want to calculate 2 raised to the power of 3, you would use:
SELECT POWER(2,3) ;
This would return 8, because 2^3 is equal to 8.
B) ROUND( )
The ROUND( ) function in MySQL is used to round a numeric value to a specified number of decimal places. It accepts two arguments: the numeric value you want to round and the number of decimal places to round to.
Syntax:
ROUND (Number, Decimals)
Eg:- SELECT ROUND (123.456, 2) -------OUTPUT: 123.46
SELECT ROUND (123.456) -------OUTPUT: 123

In the first example,123.456 is rounded to two decimal places, resulting in123.46. In the second example, since the decimals argument is omitted,123.456 is rounded to 0 decimal places, resulting in 123.

The ROUND( ) function follows standard rounding rules: if the fractional part is exactly halfway between two integers, the result is the integer that is closer to zero. For example, ROUND (0.5) would result in 1, andROUND(-1.5) would result in -1.

C) MOD ( )
The MySQL function MOD( ) is used to find the remainder of a division operation. It takes two arguments: a dividend and a divisor. It returns the remainder after dividing the dividend by the divisor.
Syntax:
MOD (Dividend, Divisor)
Eg: SELECT MOD(10,3) ;
This query will return 1 because when you divide 10 by 3, the remainder is 1.
Q13. Differentiate between mysql functions mid( ) and substring( ) ?
Ans:- In MySQL, both the MID ( ) and SUBSTRING( ) functions are used to extract substrings from a string. However, there are some differences between them:
Syntax:
Mid(str, start, length) Extracts a substring from the specified str starting at the start position and with a length specified by length.
Eg:- SELECT MID("SQL Tutorial", 5, 3) -----OUTPUT- Tut

SUBSTRING(str, start [, length]) Extracts a substring from the specified str starting at the start position. The length parameter is optional and determines the number of characters to extract.
Eg:- SELECT SUBSTRING("SQL Tutorial", 5)------ OUTPUT- Tutorial
Overall, both functions serve similar purposes, but SUBSTRING( ) is more versatile and standard-compliant, while MID ( ) is specific to MySQL and might be preferred if you're specifically targeting MySQL databases and want to maintain compatibility with older code.
Q14. Differenciate between MYSQL functions LEFT( ) and RIGHT( ).
Ans: The LEFT( ) and RIGHT( ) functions in MySQL are used to extract a specified number of characters from the left or right side of a string, respectively.
Here's the differentiation:
LEFT( ) Function:
Syntax: LEFT (str , length)
Returns the leftmost characters from a string str up to a specified length.
Example: SELECT LEFT ('MYSQL' ,2); returns 'My'
RIGHT( ) Function:

Syntax: RIGHT (str , length)
Returns the rightmost characters from a string str up to a specified length .
Example: SELECT RIGHT ('MYSQL' ,2); returns 'QL'
Q15. Differentiate between the functions LTRIM( ), RTRIM( ). TRIM( ).
Ans: The functions LTRIM( ), RTRIM( ) and TRIM( ) are used to remove leading, trailing, or both leading and trailing spaces from a string, respectively.
LTRIM( ): This function removes any leading spaces from a string. It takes a single argument, which is the string to be trimmed.
Example:
SELECT LTRIM(' Hello World '); Output------- 'Hello World '
RTRIM( ) : This function removes any trailing spaces from a string. It takes a single argument, which is the string to be trimmed.
Example:
SELECT RTRIM(' Hello World '); Output------- ' Hello World'
TRIM( ) : This function removes leading, trailing, or both leading and trailing spaces from a string.
Example: SELECT TRIM(' Hello World '); Output------- 'Hello World'
These functions are useful for cleaning up string data, especially when dealing with user inputs or data that might have leading or trailing spaces.
Q 16. Assertion: The MySQL function ROUND() rounds a numeric value to a specified Number of decimal places or to the nearest integer.
Reasoning: The ROUND() function in MySQL takes two arguments: the number to be rounded and the number of decimal places to round to. If the second argument is omitted, ROUND() rounds to the nearest integer.
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
Ans i. Both A and R are true and R is the correct explanation for A
17. Assertion: The MySQL function TRIM( ) removes only the trailing spaces from a string.
Reasoning: It is used to sanitize input data by removing unnecessary whitespace characters, ensuring consistent data formatting and improving data integrity in database operations.
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
Ans iv. A is false but R is True

Q18. Assertion: The MySQL function Length( ) returns the number of characters in a string.
Reasoning: The Length( ) function in MySQL counts the number of bytes in a string rather than the number of characters.

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
Ans iii. A is True but R is False

Q19. Assertion: The MySQL function power( ) can be used to calculate the exponential power of a given number.
Reasoning: The power( ) function in MySQL takes two arguments: a base number and an exponent.

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
Ans ii. Both A and R are true and R is not the correct explanation for A

Q-20 Assertion: The MySQL function mod( ) returns the remainder of a division operation.
Reasoning: The MOD() function takes two arguments: a dividend and a divisor. It divides the dividend by the divisor and returns the remainder. If the dividend is evenly divisible by the divisor, the remainder is 0. Otherwise, the remainder is the value left after the division operation.

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
Ans i. Both A and R are true and R is the correct explanation for A

Q21. Based on the SQL table CAR_SALES, write output of the folowing queries :

NUMBER	SEGMENT	FUEL	QT1	QT2
1	Compact HatchBack	Petrol	56000	70000
2	Compact HatchBack	Diesel	34000	40000
3	MUV	Petrol	33000	35000
4	MUV	Diesel	14000	15000
5	SUV	Petrol	27000	54000
6	SUV	Diesel	18000	30000
7	Sedan	Petrol	8000	10000
8	Sedan	Diesel	1000	5000

```
SELECT LEFT(SEGMENT,2) FROM CAR_SALES WHERE FUEL= "PETROL";
SELECT UPPER(FUEL) FROM CAR_SALES;
SELECT SEGMENT FROM CAR_SALES WHERE INSTR ( SEGMENT, 'M' );
SELECT SUBSTRING ( FUEL,2,3) FROM CAR_SALES WHERE NUMBER=1;
SELECT LENGTH ( SEGMENT ) FROM CAR_SALES WHERE NUMBER=2;
```

Answer :
OUTPUT
a)Co
MU
SU
Se

b) PETROL
DIESEL

PETROL
DIESEL
PETROL
DIESEL
PETROL
DIESEL

C) Compact HatchBack
Compact HatchBack
MUV
MUV

d) etr

e)17

Date Functions

NOW(), DATE (), MONTH(), MONTHNAME (), YEAR (), DAY (), DAYNAME (). Aggregate Functions: MAX(), MIN (), AVG (), SUM (), COUNT (); using COUNT (*).

DATE AND AGGREGATE FUNCTION

MCQ :

Which of the following is the standard format the MySQL displays DATE values.

A. YYYY-MM-DD
B. DD-MM-YYYY
C. YY-MM-DD
D. MM-DD-YYYY

What will be returned by the given query ?

SELECT month('2020-05-11')

a)5
b)11
c)may
d)November

3) Write SQL commands command to display the the current month :

a. select month(curdate())
b. select monthname(curdate())
c. select nameofmonth(curdate())
d. All of these

4) Which MySQL function returns the current date and time?

A. NOW()
B. DATE()
C. TODAY()
D. TIMESTAMP()

5) which of the following function returns only the day number from month of selected date ?

a. DAY(date)
b. DAYNO(date)
c. DAY_NUMBER(date)
d.DATE(date)

6). which of the function returns only date part from the given date/time arguments :

a. DATE()
b. CURDATE()
c. DATECUR()
d. None of these

7. If on '1990-01-22', it was Monday, what will be the output of the following statement :

SELECT dayname('1990-01-22')+1;

a.Error b. 1 c. 7 d. Monday

8. find the output of the following SQL statement :

SELECT MONTH ('2014-04-12')

a. 4 b. 12 c. 16 d. Error

9. the return type of DAYOFMONTH function is _____.

a. char
b. String
c. integer
d. date

10. Aggregate functions are also known as :

a. scalar functions
b. single row function

c. multiple row functions
d. hybrid functions

11. Which of the following are correct aggregate functions in SQL ?
    a. average()
    b. max()
    c. count()
    d. total()

ASSERTIONS AND REASONS

DIRECTIONS : In each of the questions given below, there are two statements marked as Assertion (A) and Reason (R). Mark your answer as per the codes provided below:
Both A and R are true and R is the correct explanation of A.
Both A and R are true but R is not the correct explanation of A.
A is true but R is false.
A is false but R is true.
Both A and R are false.
Assertion. Multirow functions when applied on a column in a table,yield values which are not equal to number of rows in the table.
Reason . Multple rows functions do not work with all the rows in the table
Answer - 3. A is true but R is false.
Assertion. Multiple rows functions when applied on a column in a table yield values which are not equal to number of rows in the table.
Reason . The multi-row functions work with data of multiple rows at a time and return aggregated value.
Answer – 1.Both A and R are true and R is the correct explanation of A.
Assertion . The count(*) will yield a single value while round() will yield number of values equal to the cardinality of the table.
Reason. The count(*) is a multiple rows function and round() is a single row function.
Answer – 1.Both A and R are true and R is the correct explanation of A.
Very short questions :
Write any two aggregate function used in SQL.
max(), avg(),count()
Differentiate between count() and count(*).
Count() is used with column name passed as arguments whereas count(*) returns the count of all rows in the table.
Write SQL command to display
Today, the date is <current date>
CURDATE()
Short type questions :
Write a query to get the minimum salary from employees table.
Sample table: employees

EMPLOYEE_ID	FIRST_NAME	LAST_NAME	EMAIL	PHONE_NUMBER
100	Steven	King	SKING	515.123.4567
101	Neena	Kochhar	NKOCHHAR	515.123.4568
102	Lex	De Haan	LDEHAAN	515.123.4569
103	Alexander	Hunold	AHUNOLD	590.423.4567

SELECT MIN(salary) from employees ;
Based on the SQL table CAR_SALES, write suitable queries for the following:

NUMBER	SEGMENT	FUEL	QT1	QT2
1	Compact HatchBack	Petrol	56000	70000

2	Compact HatchBack	Diesel	34000	40000
3	MUV	Petrol	33000	35000
4	MUV	Diesel	14000	15000
5	SUV	Petrol	27000	54000
6	SUV	Diesel	18000	30000
7	Sedan	Petrol	8000	10000

i. Display fuel wise average sales in the first quarter.
ii. Display segment wise highest sales in the second quarter.

(i) SELECT FUEL, AVGCQTl) FROM CAR_SALES GROUP BY FUEL;
(ii) SELECT SEGMENT, MAX (QT2) FROM CAR_SALES GROUP BY SEGMENT;

Write a query to show the current date and time.

Long answer type :

Consider the following table named SBOP with details of account holders. Write commands of MySql for following :

TABLE SBOP :

Accountno	Name	Balance	DataOfopen	Transaction
SB-1	Mr. Anil	15000.00	2011-02-24	7
SB-2	Mr. Amit	23567.89		8
SB-3	Mrs. Sakshi	45000.00	2012-02-04	5
SB-4	Mr. Gopal	23812.35	2013-09-22	
SB-5	Mr. Dennis	63459.80	2009-11-10	15

(i) To display the month day with reference to DateOfopen for all the account holders.
(ii) SELECT COUNT (*) FROM SBOP;

Answer:

(i) SELECT DAY0FM0NTH(DateOfopen), Name FROM SBOP:
(ii) 5

2 Consider the table SUPPLIER given below. Write commands in MySQL

TABLE SUPPLIER

Scode	Pname	Supname	Qty	City	Price
101	Coffee	Nestle	200	Kolkata	55.00
102	Biscuit	Hide and Seek	100	Delhi	10.00
103	Jam	Kissan	110	Kolkata	25.00
104	Maggi	Nestle	150	Mumbai	10.00
105	Chocolate	Cadbury	170	Delhi	25.00
106	Sauce	Maggi	56	Mumbai	55.00
107	Cake	Britania	72	Delhi	10.00

i) To count distinct City in the table.
(ii) SELECT COUNTCDISTINCT City) FROM SUPPLIER;
(iii) SELECT MAX(Price) FROM SUPPLIER WHERE City = 'Kol kata';

Answer : i) SELECT COUNT(DISTINCT City) FROM SUPPLIER;
ii) 3
iii)55

3.Consider the table STUDENT given below. Write commands in MySQL

TABLE STUDENT

No.	StudentName	Class	Stream	AggMarks	Grade
1.	Anubhav Gupta	XII	Science	84	A2
2.	Prateek Jaiswal	XII	Commerce	92	A1
3.	Amit Agarwal	XI	Commerce	76	B1
4.	Mayank Agarwal	XII	Humanities	85	A2
5.	Shailabh Khandelwal	XI	Commerce	89	A2
6.	Junius Pereira	XII	Science	84	A2

(i) To count the number of students to Science Stream.
(ii) SELECT AVG(AggMarks) FROM STUDENT WHERE Stream='Science';
(iii) SELECT COUNT (DISTINCT Stream) FROM STUDENT;
(iv) SELECT MIN(AggMarks) FROM STUDENT;
Answer - (i) SELECT COUNT(*) FROM STUDENT WHERE Stream = 'Science';
(ii)84
(iii)3
(iv)76

Querying and manipulating data using Group by, Having, Order by.

Working with two tables using equi-join

ORDER BY

The ORDER BY clause is used to sort result sets by some column(s). To select all the persons from the already familiar Customers table and order the result by date of birth, use the following statement:
SELECT * FROM Customers ORDER BY DOB;
For Ascending order
The result of the above expression will be -

FirstName	LastName	Email	DOB	Phone
John	Smith	John.Smith@yahoo.com	2/4/1968	626 222-2222
Steven	Goldfish	goldfish@fishhere.net	4/4/1974	323 455-4545
Paula	Brown	pb@herowndomain.org	5/24/1978	416 323-3232
James	Smith	jim@supergig.co.uk	20/10/1980	416 323-8888

For Descending order :
SELECT * FROM Customers ORDER BY DOB DESC;
The result of the above query will be:

FirstName	LastName	Email	DOB	Phone
James	Smith	jim@supergig.co.uk	20/10/1980	416 323-8888
Paula	Brown	pb@herowndomain.org	5/24/1978	416 323-3232
Steven	Goldfish	goldfish@fishhere.net	4/4/1974	323 455-4545
John	Smith	John.Smith@yahoo.com	2/4/1968	626 222-2222

GROUP BY

The GROUP BY statement is used along with the aggregate functions like SUM.AVG etc. to provide means of grouping the result dataset by certain table column(s).
The following table called EmployeeHours storing the daily hours for each employee of a company

Employee	Date	Hours
John Smith	5/6/2004	8
Allan Babel	5/6/2004	8
Tina Crown	5/6/2004	8
John Smith	5/7/2004	9
Allan Babel	5/7/2004	8
Tina Crown	5/7/2004	10
John Smith	5/8/2004	8
Allan Babel	5/8/2004	8
Tina Crown	5/8/2004	9

If the company wants to get the simple sum of all hours worked by all employees, execute the following statement
SELECT SUM (Hours) FROM EmployeeHours;
But what if the company wants to get the sum of all hours for each of his employees use the GROUP BY statement
SELECT Employee, SUM (Hours) FROM EmployeeHours GROUP BY Employee;
The result of the expression will be the following

Employee	Hours
John Smith	25
Allan Babel	24
Tina Crown	27

The GROUP BY clause can be used with other aggregate functions, for example

SELECT Employee, AVG(Hours) FROM EmployeeHours GROUP BY Employee;
The result of the statement will be-

Employee	Hours
John Smith	8.33
Allan Babel	8
Tina Crown	9

To find out what is the total number of hours worked on each of the dates -
SELECT Date, SUM(Hours) FROM EmployeeHours GROUP BY Date;
The result of the above expression is-

Date	Hours
5/6/2004	24
5/7/2004	27
5/8/2004	25

HAVING

The HAVING clause is used to restrict conditionally the output of a statement, by a aggregate function used in SELECT list of columns
The HAVING clause is used to specify a condition for an aggregate function which is used in query
SELECT Employee, SUM (Hours) FROM EmployeeHours GROUP BY Employee HAVING SUM (Hours) > 24
The above statement will select all employees and the sum of their respective hours, as long as this sum is greater than 24. The result of the HAVING clause is given below-

Employee	Hours
John Smith	25
Tina Crown	27

JOIN

JOIN clause is used to combine rows from two or more tables, based on a common field between them. While querying for a join, more than one table is considered in FROM clause. The process/function of combining data from multiple tables is called a JOIN.

EQUI JOIN

An Equi join is a simple SQL join condition that uses the equal to sign (=) as a comparison operator for defining a relationship between two tables on the basis of a common field.
Syntax for Equi Join:
SELECT <column1>, <column2>,....
FROM <table1>, <table2> WHERE <table1.column1> =
<table2.column2>;
For example,
mysql> SELECT student.Rollno, Name, fee FROM Student , fees WHERE student.Rollno = fees.Rollno;

Questions on Group by, Order by,
Having clause & Equi-join (WITH ANSWERS)

MCQs

The following SQL is which type of join-
MySQL> select customer.cust_id, order.cust_id, name, order_id from customer,order where customer.cust_id,=order.cust_id
Equi-join (b) Natural join (c) outer join (d) Cartesian product
2. SQL applies conditions on the groups through_____clause after groups have been formed:
(a) group by (b) with (c) where (d) having
3. Which clause is used to show data in ascending or descending order?
(a) group by (b) order by (c) where (d) having

TRUE/ FALSE QUESTIONS

4. The having clause acts like a where clause, but it identifies groups that meet a criterion, rather than rows.
(True / False)
5. Order by clause can be combined with the select statements. (True / False)
6. The keyword Group by is used to group rows those have the different values in a column.
(True / False)

VERY SHORT ANSWER TYPE QUESTIONS.

Find the degree of following SQL query
select deptno, empname from EMPL order by deptno desc;
Ans. 2
By which clause we sort the data in SQL.
Ans. Order by
What is attribute in a table.
Any column or field of a table is called attribute.

Short Answer type questions-

Q1. What is the difference between Where & Having clause?

Where Clause	Having Clase
WHERE Clause is used to filter the records from the table based on the specified condition.	HAVING Clause is used to filter record from the groups based on the specified condition.
WHERE Clause can be used without GROUP BY Clause	HAVING Clause cannot be used without GROUP BY Clause
Syntax:- Select * from table_name Where condition Group by col_name;	Select * from table_name Group by col_name Having condition;

Q2. Explain equi-join ?
The join, in which columns are compared for equality is called Equi-Join. A non-equi join specifies condition with non-equality operator. In equi-join we put (*) in the select list therefore the common column will appear twice in the output.
To understand the output, let's take 2 table one for employee (contains employee detail with deptno) and another for department contains deptno and other department details.

```
mysql> select * from emp;
+-------+---------+--------+--------+
| empno | ENAME   | DEPTNO | salary |
+-------+---------+--------+--------+
|     1 | alam    |     10 |  10300 |
|     2 | srijeeta|     20 |   6220 |
|     3 | bhaskar |     30 |  11320 |
|     4 | emely   |     10 |  20500 |
|     5 | freddy  |     30 |  11320 |
|     7 | chanop  |     10 |  51100 |
|     8 | akshay  |     20 |  30700 |
|     9 | manish  |     20 |  46000 |
|    10 | nitin   |     20 |  78100 |
|    11 | naveen  |     20 |   9000 |
|    12 | Kirti   |     20 |   9000 |
|    13 | Gabbar  |     30 |  12100 |
|    14 | sunny   |     20 |   NULL |
+-------+---------+--------+--------+
13 rows in set (0.03 sec)

mysql> select * from dept;
+--------+------------+---------+
| deptno | dname      | dhead   |
+--------+------------+---------+
|     10 | Sales      | Ritika  |
|     20 | HR         | Ankit   |
|     30 | Production | Abuzair |
|     40 | IT         | Mesha   |
+--------+------------+---------+
4 rows in set (0.00 sec)
```

```
mysql> select * from emp, dept where emp.deptno = dept.deptno;
+-------+---------+--------+--------+--------+------------+---------+
| empno | ENAME   | DEPTNO | salary | deptno | dname      | dhead   |
+-------+---------+--------+--------+--------+------------+---------+
|     1 | alam    |     10 |  10300 |     10 | Sales      | Ritika  |
|     2 | srijeeta|     20 |   6220 |     20 | HR         | Ankit   |
|     3 | bhaskar |     30 |  11320 |     30 | Production | Abuzair |
|     4 | emely   |     10 |  20500 |     10 | Sales      | Ritika  |
|     5 | freddy  |     30 |  11320 |     30 | Production | Abuzair |
|     7 | chanop  |     10 |  51100 |     10 | Sales      | Ritika  |
|     8 | akshay  |     20 |  30700 |     20 | HR         | Ankit   |
|     9 | manish  |     20 |  46000 |     20 | HR         | Ankit   |
|    10 | nitin   |     20 |  78100 |     20 | HR         | Ankit   |
|    11 | naveen  |     20 |   9000 |     20 | HR         | Ankit   |
|    12 | Kirti   |     20 |   9000 |     20 | HR         | Ankit   |
|    13 | Gabbar  |     30 |  12100 |     30 | Production | Abuzair |
|    14 | sunny   |     20 |   NULL |     20 | HR         | Ankit   |
+-------+---------+--------+--------+--------+------------+---------+
13 rows in set (0.02 sec)

mysql>
```

Q3. Explain order by clause with the help of SQL queries?

The ORDER BY keyword is used to sort the result-set in ascending or descending order.

The ORDER BY keyword sorts the records in ascending order by default. To sort the records in descending order, use the DESC keyword.

ORDER BY Syntax:-

SELECT column1, column2, ...

FROM table_name ORDER BY column1, column2, ... ASC|DESC;

TABLE- INVENTORY

CarId	CarName	Price	Model	YearManufacture	FuelType	FinalPrice
D001	Dzire	582613.00	LXI	2017	Petrol	652526.6
D002	Dzire	673112.00	VXI	2018	Petrol	753885.4
D003	Dzire	567031.00	Sigma	NULL	NULL	635074.7
E001	EECO	647858.00	Delta1	2017	CNG	397829.6
S001	SWIFT	514000.00	5 STR	2018	CNG	725601.0

Example:-
->Selects details of all the Inventory in ascending order of their Price.
SELECT * FROM INVENTORY
ORDER BY Price;
*By default Price values arrange in ascending order

CarId	CarName	Price	Model	YearManufacture	FuelType	FinalPrice
S001	SWIFT	514000.00	5 STR	2018	CNG	725601
D003	Dzire	567031.00	Sigma	NULL	NULL	635074.7
D001	Dzire	582613.00	LXI	2017	Petrol	652526.6
E001	EECO	647858.00	Delta1	2017	CNG	397829.6
D002	Dzire	673112.00	VXI	2018	Petrol	753885.4

Assertion and Reason Based Questions

Q1. Assertion(A). SQL SELECT's GROUP BY clause is used to divide the result in groups.
Reason(R). The GROUP BY clause combines all those records that have identical values in a particular field or in group by fields.
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.

Q2. Assertion(A). The join, in which columns are compared for equality, is called Equi-join.
Reason(R). The join queries only produce combined rows from tables having some common column, when compared for equality.
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.

Q3. Assertion(A). A GROUP BY query can also include functions.
Reason(R). ALL SQL functions can be used in a GROUP BY query.
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.

Q4. Assertion(A) - Having Clause is used with Group by Clause
Reason(R) - Group By clause used to group the result based on distinct values in a column and having is used to filter the Groups
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.

Q5. Assertion(A)- The ORDER BY keyword by default sort the result-set in ascending order.
Reason(R). Alphabetically Ascending comes first then descending.

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.

CASE BASED QUESTIONS

Q1 . Mr. X is having data of his company in the given table EMPL-
Table - EMPL

Deptno	Empname	Sal
101	SUMIT KUMAR	15000
103	RAJESH KUMAR	20000
101	HARISH	25000
102	DEVESH	12000
103	RAMESH SINGH	13000
104	SURAJ	15000
102	KUNAL	20000

Considering above table EMPL write SQL queries for the following-
Mr . X wants to show department wise total number of employees and total salary paid to each department.

```
MySql> select deptno, count(*), sum(sal) from EMPL group by deptno;
```

Mr . X wants to show department wise total number of employees in which total number of employee is less than 2 .

```
MySql> select deptno, count(*) from EMPL group by deptno having count(*)<2;
```

He wants to show all information of each employee in increasing order of salary paid.

```
MySql> select *from EMPL order by sal;
```

He wants to show department number and name of employee in descending order of department number

```
MySql> select  deptno, empname from  EMPL order by deptno desc;
```

Mr. X wants to display the difference of highest and lowest salary of each department having maximum salary>13000.

```
Select max(sal)-min(sal) from empl group by deptno having max(sal)>13000;
```

Q2 Consider the following WORKER tables. Write SQL queries for (i) to (iv)
WORKER

WNO	NAME	DOJ	DOB	GENDER	DCODE
1001	George K	2013-09-02	1991-09-01	MALE	D01
1002	Ryma Sen	2012-12-11	1990-12-15	FEMALE	D03
1003	Mohitesh	2013-02-03	1987-09-04	MALE	D05
1007	Anil Jha	2014-01-17	1984-10-19	MALE	D04
1004	Manila Sahai	2012-12-09	1986-11-14	FEMALE	D01
1005	R SAHAY	2013-11-18	1987-03-31	MALE	D02
1006	Jaya Priya	2014-06-09	1985-06-23	FEMALE	D05

(i) To display WNO, NAME, GENDER from the table WORKER in descending order of WNO.
(ii) To display the NAME of all the FEMALE workers from the table WORKER.
(iii) To display the WNO and NAME of those workers from the table WORKER, who are born between '1987-01-01' and '1991-12-01'
(iv) To count and display MALE workers who have joined after '1986-01-01'

Ans: - (i)SELECT WNO, NAME, GENDER FROM WORKER ORDER BY WNO DESC;
(ii) SELECT NAME FROM WORKER WHERE GENDER ="FEMALE";

(iii) SELECT WNO, NAME FROM WORKER WHERE DOB BETWEEN '1987-01-01' AND '1991-12-01';
(iv) SELECT COUNT(*) FROM WORKER WHERE GENDER= "MALE" AND DOJ > '1986-01-01';

Q3

Consider the tables PRODUCT and BRAND given below:

Table: PRODUCT

PCode	PName	UPrice	Rating	BID
P01	Shampoo	120	6	M03
P02	Toothpaste	54	8	M02
P03	Soap	25	7	M03
P04	Toothpaste	65	4	M04
P05	Soap	38	5	M05
P06	Shampoo	245	6	M05

Table: BRAND

BID	BName
M02	Dant Kanti
M03	Medimix
M04	Pepsodent
M05	Dove

Write SQL queries for the following:
(i)Display product name and brand name from the tables PRODUCT and BRAND.
(ii) Display the structure of the table PRODUCT.
(iii) Display the average rating of Medimix and Dove brands
(iv) Display the name, price, and rating of products in descending order of rating.

ANSWERS

(i)SELECT PName, BName FROM PRODUCT P, BRAND B WHERE P.BID=B.BID;
(ii) DESC PRODUCT;
(iii) SELECT BName, AVG(Rating) FROM PRODUCT P, BRAND B WHERE P.BID=B.BID GROUP BY BName HAVING BName='Medimix' OR BName='Dove';
(iv) SELECT PName, UPrice, Rating FROM PRODUCT ORDER BY Rating DESC;

UNIT 3: Introduction to Networks Computer

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.

EXPLANATION CONTENT

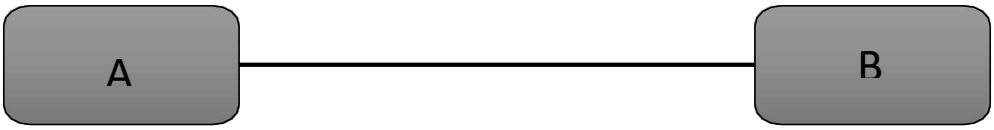
LEARNING OBJECTIVE

- Learning about Internet
- Learning about expansion of network to make internet
- Learning about how internet works
- Learning about difference between internet and web
- Learning about Applications of Web, Web-terminologies

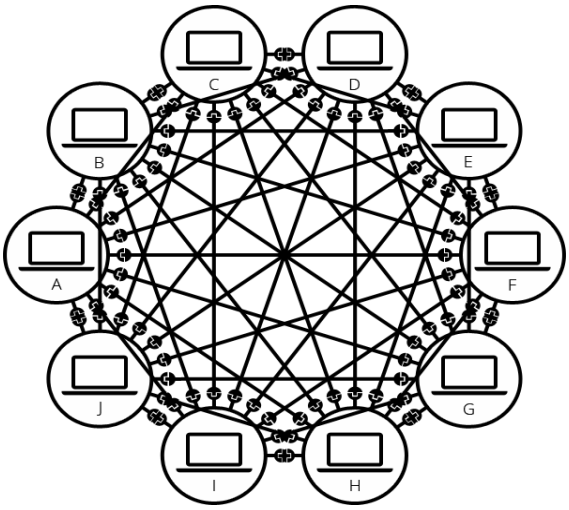
INTERNET

The Internet is the backbone of the Web, the technical infrastructure that makes the Web possible. At its most basic, the Internet is a large network of computers which communicate all together.

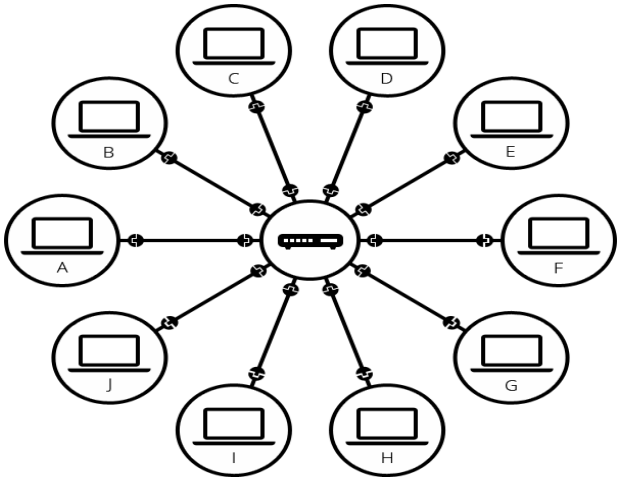
When two computers need to communicate, you have to link them, either physically (usually with an Ethernet cable) or wirelessly (for example with WiFi or Bluetooth systems)



A network is not limited to two computers. You can connect as many computers as you wish. But it gets complicated quickly. If you're trying to connect, say, ten computers, you need 45 cables, with nine plugs per computer!

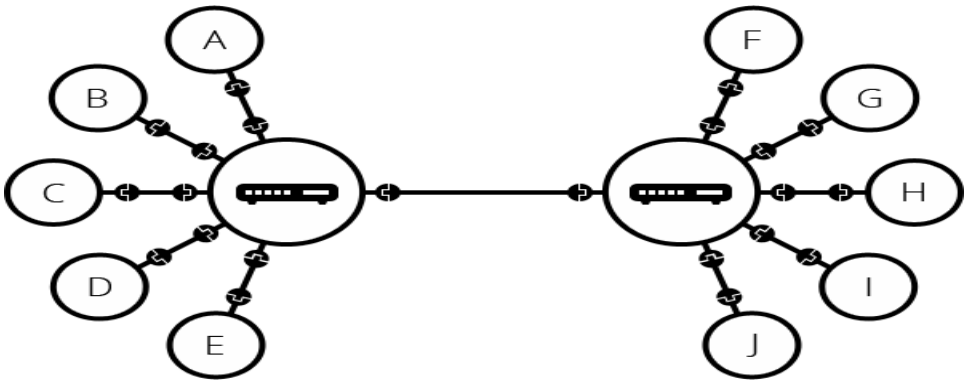


To solve this problem, each computer on a network is connected to a special device called a router. This router makes sure that a message sent from a given computer arrives at the right destination computer. To send a message to computer B, computer A must send the message to the router, which in turn forwards the message to computer B and makes sure the message is not delivered to computer C.

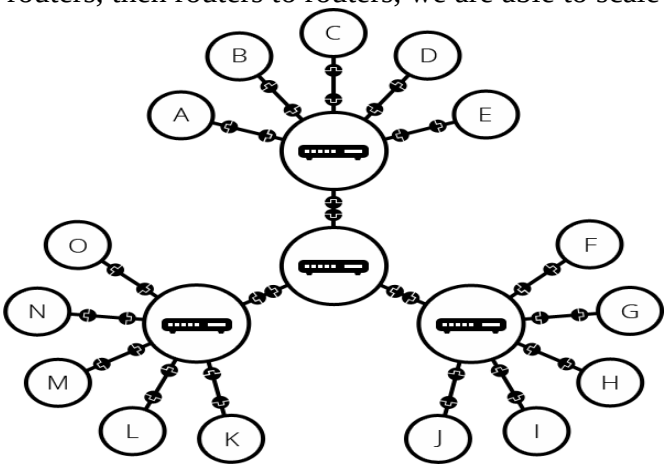


Once we add a router to the system, our network of 10 computers only requires 10 cables: a single plug for each computer and a router with 10 plugs.

So far so good. But what about connecting hundreds, thousands, billions of computers? Of course a single router can't scale that far, but, we can connect two routers...



By connecting computers to routers, then routers to routers, we are able to scale infinitely.



World Wide Web

The World Wide Web (WWW), commonly known as the Web, is an information system where documents and other web resources are identified by Uniform Resource Locators (URLs, such as https://www.example.com/), which may be interlinked by hypertext, and are accessible over the Internet.

The resources of the WWW are transferred via HTTP/HTTPs, hosted by a web server and may be accessed by users by a software application called a web browser.

The Internet is an infrastructure, whereas the Web is a service built on top of the infrastructure.

Uniform Resource Locator(URL)

A Uniform Resource Locator (URL), sometimes also referred as a web address is a reference to a web resource that specifies its location on a computer network and a mechanism for retrieving it.

Applications of WWW

Email: Electronic mail (email or e-mail) is a method of exchanging messages ("mail") between people using electronic devices. Messages are exchanged between hosts using the Simple Mail Transfer Protocol with software programs called mail transfer agents (MTAs); and delivered to a mail store by programs called mail delivery agents (MDAs, also sometimes called local delivery agents, LDAs). Accepting a message obliges an MTA to deliver it, and when a message cannot be delivered, that MTA must send a bounce message back to the sender, indicating the problem.

Users can retrieve their messages from servers using standard protocols such as POP or IMAP,

VoIP: Voice over Internet Protocol (VoIP), also called IP telephony, is a method and group of technologies for the delivery of voice communications and multimedia sessions over Internet Protocol (IP) networks, such as the Internet. It is a best-effort network without fundamental Quality of Service (QoS) guarantees.

Chat: Online chat may refer to any kind of communication over the Internet that offers a real-time transmission of text messages from sender to receiver. Chat messages are generally short in order to enable other participants to respond quickly.

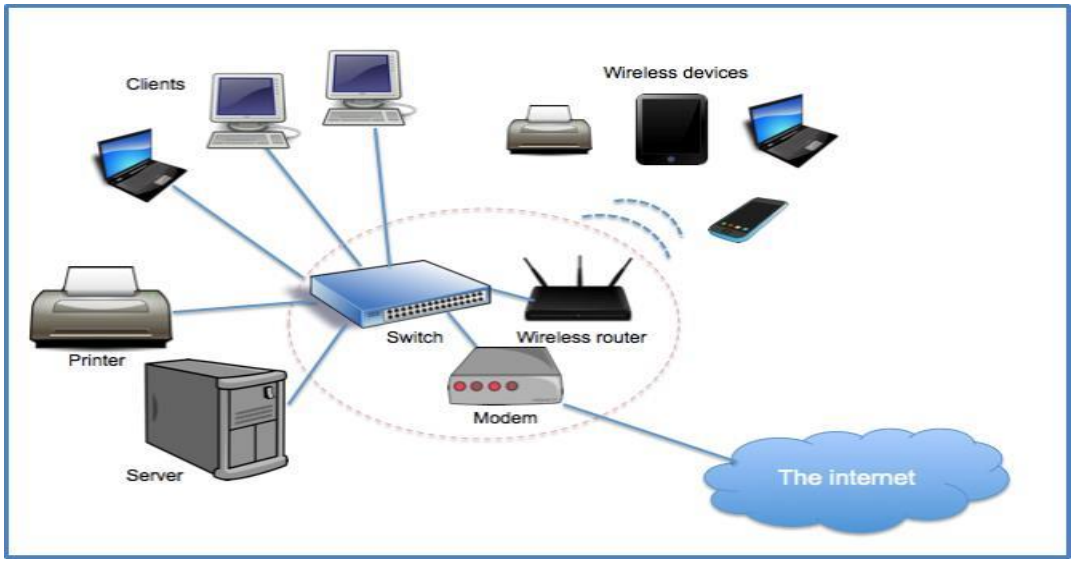
The examples of chatting software are MSN Messenger, Yahoo Messenger, IRC (Internet Relay Chat) etc.

LEARNING OBJECTIVE

- What is a network?
- Advantages of a network
- Classification of networks based on area covered.

COMPUTER NETWORK

A computer network is a collection of interconnected computers and other devices to share data and other resources (hardware and software resources).

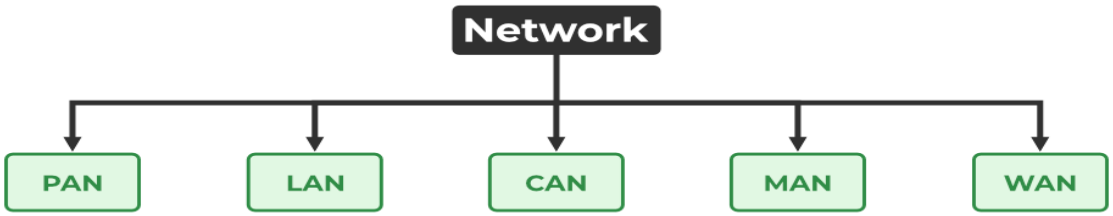


Networks have several advantages which are described below:

1. **Information sharing**: Sharing of Information In a network, the users can share information, data and text easily to other users. Different users can share the same database, having different levels of access control.
2. **Resource Sharing:** Sharing of Peripherals The computers, in a network, can share common peripherals,e.g. one highly speed common printer can be used for all computers in a network.
3. **Improved Communication**: Communication In a network environment, communication between different users or computers is possible. By which we can send messages, documents (text), data files, graphics, videos, images or an e-mail to different users over the network.

4. **Remote Access:** Accessing Remote Database We can access the remote database and retrieve information according to our requirement in a network. We can booked tickets for airlines and trains or even we can book a room in a hotel at any destination by a network.
5. **Central Storage of Data**: Files can be stored on a central server that can be shared and made available to each and every user in an organization. With centralized processing, data is stored and retrieved from a single central location. Thus, there is no duplication of data and almost no data redundancy.

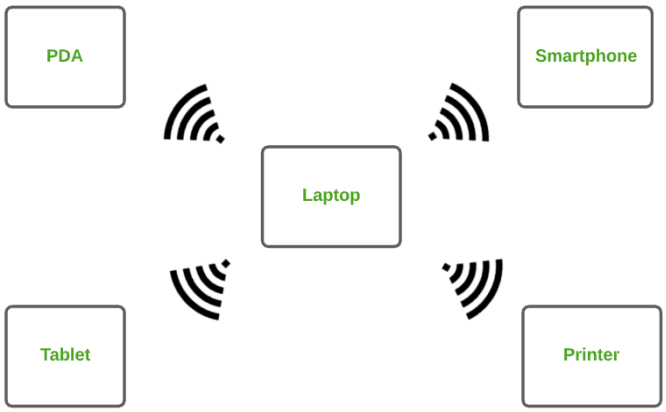
TYPES OF NETWORK



1.

Personal Area Network (PAN)

PAN is the most basic type of computer network. This network is restrained to a single person, that is, communication between the computer devices is centered only on an individual's workspace. PAN offers a network range of 1 to 100 meters from person to device providing communication. Its transmission speed is very high with very easy maintenance and very low cost. This uses Bluetooth, IrDA, and Zigbee as technology. Examples of PAN are USB, computer, phone, tablet, printer, PDA, etc.



Advantages of PAN

- PAN is relatively flexible and provides high efficiency for short network ranges.
- It needs easy setup and relatively low cost.
- It does not require frequent installations and maintenance
- It is easy and portable.
- Needs fewer technical skills to use.

Disadvantages of PAN

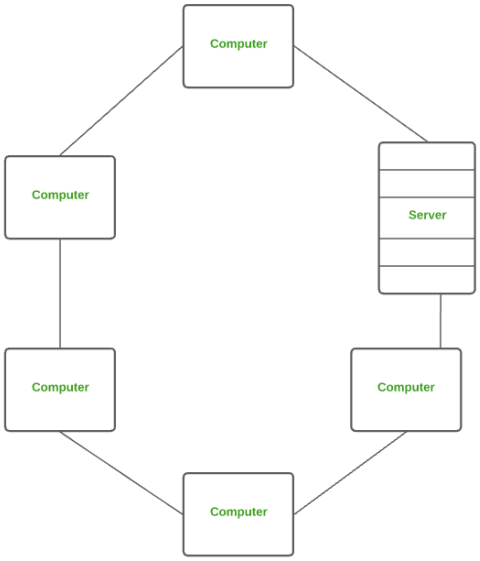
- Low network coverage area/range.
- Limited to relatively low data rates.
- Devices are not compatible with each other.
- Inbuilt WPAN devices are a little bit costly.

Applications of PAN

- Home and Offices
- Organizations and the Business sector
- Medical and Hospital
- School and College Education
- Military and Defense

2. Local Area Network (LAN)

LAN is the most frequently used network. A LAN is a computer network that connects computers through a common communication path, contained within a limited area, that is, locally. A LAN encompasses two or more computers connected over a server. The two important technologies involved in this network are Ethernet and Wi-fi. It ranges up to 2km & transmission speed is very high with easy maintenance and low cost. Examples of LAN are networking in a home, school, library, laboratory, college, office, etc.



Advantages of a LAN

- **Privacy:** LAN is a private network, thus no outside regulatory body controls it, giving it a privacy.
- **High Speed:** LAN offers a much higher speed(around 100 mbps) and data transfer rate comparatively to WAN.
- **Supports different transmission mediums**: LAN support a variety of communications transmission medium such as an Ethernet cable (thin cable, thick cable, and twisted pair), fiber and wireless transmission.

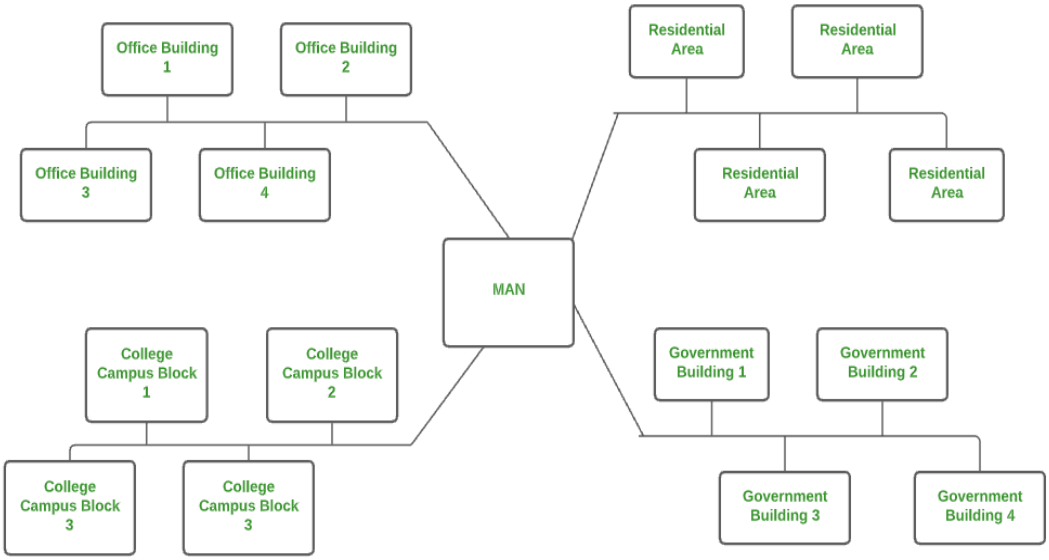
Inexpensive and Simple: A LAN usually has low cost, installation, expansion and maintenance and LAN installation is relatively easy to use, good scalability.

Disadvantages of LAN

- The initial setup costs of installing Local Area Networks is high because there is special software required to make a server.
- Communication devices like an ethernet cable, switches, hubs, routers, cables are costly.
- LAN administrator can see and check personal data files as well as Internet history of each and every LAN user. Hence, the privacy of the users are violated
- LANs are restricted in size and cover only a limited area
- Since all the data is stored in a single server computer, if it can be accessed by an unauthorized user, can cause a serious data security threat.

3. **Metropolitan Area Network (MAN)**

A MAN is larger than a LAN but smaller than a WAN. This is the type of computer network that connects computers over a geographical distance through a shared communication path over a city, town, or metropolitan area. Examples of MAN are networking in towns, cities, a single large city, a large area within multiple buildings, etc.



Advantages of MAN

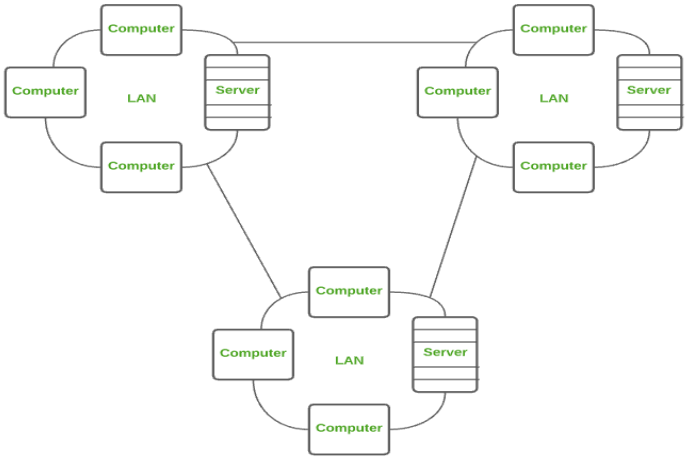
- MAN offers high-speed connectivity in which the speed ranges from 10-100 Mbps.
- MAN can serve multiple users at a time with the same high-speed internet to all the users.
- MAN allows for centralized management and control of the network, making it easier to monitor and manage network resources and security.

Disadvantages of MAN

- The architecture of MAN is quite complicated hence, it is hard to design and maintain.
- This network is highly expensive because it required the high cost to set up fiber optics.
- The Data transfer rate in MAN is low when compare to LANs.

5. Wide Area Network (WAN)

WAN is a type of computer network that connects computers over a large geographical distance through a shared communication path. It is not restrained to a single location but extends over many locations. WAN can also be defined as a group of local area networks that communicate with each other with a range above 50km. Its transmission speed is very low and it comes with very high maintenance and very high cost. The most common example of WAN is the Internet.



Advantages of WAN

- It covers large geographical area which enhances the reach of organisation to transmit data quickly and cheaply.
- The data can be stored in centralised manner because of remote access to data provided by WAN.
- WAN enables a user or organisation to connect with the world very easily and allows to exchange data and do business at global level.

Disadvantages of WAN

- Traffic congestion in Wide Area Network is very high.
- Noise and error are present in large amount due to multiple connection point.
- The data transfer rate is slow in comparison to LAN because of large distances and high number of connected systems within the network.

COMPARISON AMONG PAN, LAN, MAN AND WAN

Parameter	PAN	LAN	MAN	WAN
Area covered	Small area (up to 10 m radius)	A building or campus (up to 10 km)	A city (up to 100 km radius)	Entire country, continent or globe
Networking cost	Negligible	Inexpensive	Expensive	Very expensive
Transmission speed	High speed	High speed	Moderate speed	Low speed
Error rate	Lowest	Lowest	Moderate	Highest
Network devices used	WLAN, USB Dongle	LAN/WLAN, Hub/ Switch, Repeater, Modem	Router, Gateway	Router, Gateway
Technology/ media used	Infrared, Bluetooth	Ethernet, Wi-Fi	Optical fibre, Radio wave, Microwave	Microwave Satellite

LEARNING OBJECTIVE

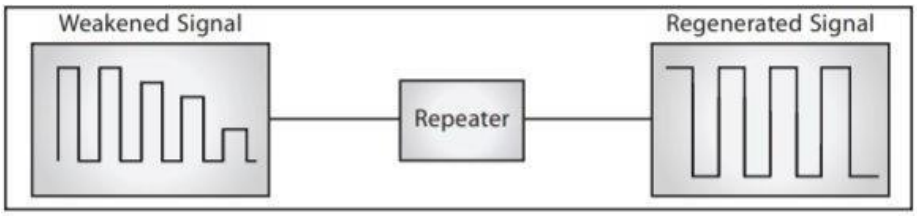
- Learning about different network devices
- Learning about the difference of working of different devices

NETWORK DEVICES

Network devices, also known as networking hardware, are physical devices that allow hardware on a computer network to communicate and interact with one another. For example, Repeater, Hub, Bridge, Switch, Routers, Gateway and NIC, etc.

1.Repeater – A repeater operates at the physical layer. Its job is to amplify (i.e., regenerates) the signal over the same network before the signal becomes too weak or corrupted to extend the length to which the signal can be

transmitted over the same network. When the signal becomes weak, they copy it bit by bit and regenerate it at its star topology connectors connecting following the original strength. It is a 2-port device.



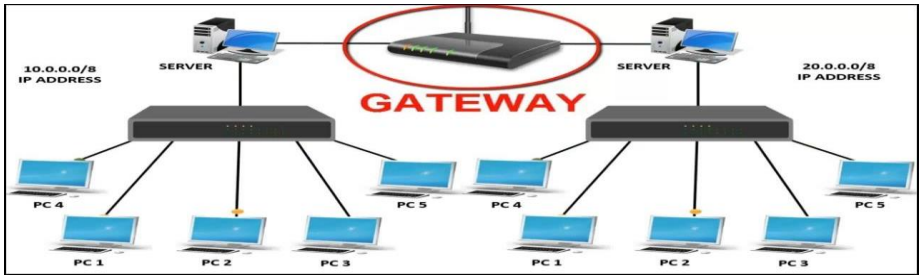
2. Hub – A hub is a basically multi-port repeater. A hub connects multiple wires coming from different branches, for example, the connector in star topology which connects different stations. Hubs cannot filter data, so data packets are sent to all connected devices. Also, they do not have the intelligence to find out the best path for data packets which leads to inefficiencies and wastage.

3. Bridge – A bridge operates at the data link layer. A bridge is a repeater; with add on the functionality of filtering content by reading the MAC addresses of the source and destination. It is also used for interconnecting two LANs working on the same protocol. It has a single input and single output port, thus making it a 2-port device.
4. Switch – A switch is a multiport bridge with a buffer and a design that can boost its efficiency and performance. A switch is a data link layer device. The switch can perform error checking before forwarding data, which makes it very efficient as it does not forward packets that have errors and forward good packets selectively to the correct port only.

5. Router – A router is a device like a switch that routes data packets based on their IP addresses. The router is mainly a Network Layer device. Routers normally connect LANs and WANs and have a dynamically updating routing table based on which they make decisions on routing the data packets.

A router is a physical or virtual device that passes information between two or more computer networks. A router inspects a given data packet's destination Internet Protocol address (IP address), calculates the best way for it to reach its destination and then forwards it accordingly

6. Gateway – A gateway, as the name suggests, is a passage to connect two networks that may work upon different networking models. They work as messenger agents that take data from one system, interpret it, and transfer it to another system.
Gateways are also called protocol converters and can operate at any network layer. They are generally more complex than switches or routers. A gateway is also called a protocol converter. Gateways are network points that acts as an entrance to another network.



7.**NIC – NIC or network interface card** is a network adapter that is used to connect the computer to the network. It is installed in the computer to establish a LAN. It has a unique id that is written on the chip, and it has a connector to connect the cable to it. The cable acts as an interface between the computer and the router or modem.
8. MODEM - Modem (Modulator-Demodulator), is a network device that allows a computer or another device, such as a router or switch, to connect to the Internet. The first modems were "dial-up," meaning they had to dial a phone number to connect to an ISP. These modems operated over standard analog phone lines and used the same frequencies as telephone calls, which limited their maximum data transfer rate to 56 Kbps. Modern modems are typically DSL or cable modems, which are considered "broadband" devices. DSL modems operate over standard telephone lines, but use a wider frequency range.

QUESTION BANK
MCQ (TYPES OF NETWORK AND NETWORK DEVICES)

1. The main computer in any network is called as
   a) Client
   b) Server
   c) Hub
   d) Switch

2. What is the full form of NIC.?
   a) Network Interchange Card
   b) Net Interconnect Card
   c) Network Interface Card
   d) Network Interconnection Card

3. Which is called a smart HUB?
   a) HUB with high speed ports
   b) Switch
   c) Router
   d) All of the Above

4. IP Stands for
   a) Internet Protocol
   b) Intranet Protocol
   c) Internet Practice
   d) Intranet Practice

5. Which of this is not a part of URL?
   a) IP Address
   b) Port Number
   c) Domain Name
   d) None of these

6. Which of the following is a browser?
   a) Chrome
   b) Whatsapp
   c) Twitter
   d) All of them

7. Repeaters work on the_____layer
   a) Network Layer
   b) Physical Layer
   c) Application Layer
   d) All of the Above

8. Which device is used to transfer Communication Signal to Long Directions
   a) Amplifier
   b) Repeater
   c) Router
   d) All of the Above

9. The device with smartly controls the flow of data over the network by hoping is
   a) Router
   b) Gateway

c) Switch
d) None of them

10. The backbone of internet is
a) WAN Network
b) Fibre optical networks across long distances like intercontinental or intra continental
c) Wireless networks
d) All of them

11. URL stands for:
a) Uniform Run Line
b) Uniform Resource Line
c) Uniform Resource Location
d) Uniform Resource Locator

VERY SHORT QUESTION ANSWER
(TYPES OF NETWORKS AND NETWORK DEVICES)

1. What is the need for a network?
Ans- Network is the interconnection between systems for resource sharing like printing and internet sharing.
2. FULL FORMS OF THE FOLLOWING:
- NIC:-Network Interface Card
- ICT:-Information and Communication Technology
- PCB:-Printed Circuit Board
- DND:-Do Not Disturb Directory
- STP:-Shielded Twisted Pair
- UTP:-Un-Shielded Twisted Pair
- CRT:-Cathode Ray Tube
- TFT:-Thin Film Transistor
- LED:-Light Emitted Diode
- Expand WAN and MAN

  WAN – WIDE AREA NETWORK / MAN – METROPLITON AREA NETWORK
- Expand LAN and PAN

  LAN- LOCAL AREA NETWORK / PAN – PERSONAL AREA NETWORK

3. Why in NIC needed in the computer?
Ans. NIC is the card that create an interface between the computer and the internet or network medium
4. How internet is difference from LAN or Networks?
Ans. Internet is the network of networks and LAN is only a single network
5. To protect the data in the network from unauthorized access what device is used?
Ans. Firewall is used to save the network from un-authorised access
6. What is the use of modem?
Ans. Modem is used to connect Digital computer to Analog Line for Digital data Transfer
7. What is the use of router?
Ans. Router is used to connect all the different networks together. It also forwards and receives different data packets from different places
8. What do you mean by URL
Ans. URL (Uniform Resource Locator) is the human understandable format for website address.
9. What is an absolute URL
Ans. Absolute URL is the complete website address with protocol and landing page details also

SHORT TYPE QUESTION ANSWERS
(TYPES OF NETWORK AND NETWORK DEVICES)

1. What do you mean by WWW? Explain with example?

Ans- WWW is world wide web and it is the protocol to define the website or web address.e.g. http://www.google.co.in. This address defines that the website is in the internet.

2. What is difference between a website and a webpage?

Ans- Website is a single software and web portal is a combination of both online and offline services given by the web portal. Like www.google.co.in is a website and www.ola.com is a web portal.

3. What is a gateway and why is it used?

Ans. Gateway is the computer used to connect different networks to one network.

4. Router is needed for internet to work? Explain if true or false?

Ans. Router is a dynamic device to connect different networks in real time. Internet cannot work without routers.

5. When can an HUB be used in place of Switch?

Ans. Hub is a device that broadcast all the signals so Hub is used in fewer computers with a limited speed or bandwidth requirements

LONG QUESTION ANSWERS
(TYPES OF NETWORK AND NETWORK DEVICES)

1. What is the difference between Hub, Switch, and Router?

Hub	Switch	Router
Hub is least expensive, least intelligent and least complicated of the three. It broadcast all data to every port which may cause serious security and reliability concern	Switches work similarly like Hubs but in a more efficient manner. It creates connections dynamically and provides information only to the requesting port	The router is smartest and most complicated out of these three. It comes in all shapes and sizes. Routers are similar like little computers dedicated for routing network traffic
In a Network, Hub is a common connection point for devices connected to the network. Hub contains multiple ports and is used to connect segments of LAN	Switch is a device in a network which forwards packets in a network	Routers are located at gateway and forwards data packets

2. Explain various types of networks based on their sizes?

Answer: The size of the network is defined as the geographic area and the number of computers covered in it. Based on the size of the network they are classified as below:

Local Area Network (LAN): A network with a minimum of two computers to a maximum of thousands of computers within an office or a building is termed as LAN. Generally, it works for a single site where people can share resources like printers, data storage, etc.

Metropolitan Area Network (MAN): It is larger than LAN and used to connect various LANs across small regions, a city, campus of colleges or universities, etc which in turn forms a bigger network.

Wide Area Network (WAN): Multiple LANs and MAN's connected together form a WAN. It covers a wider

area like a whole country or world

3. Why switch is called intelligent hub?

Answer: A switch is more intelligent than a hub. Like a hub, a switch is the connection point for the computers (and other devices) in a network. However, a switch is more efficient at passing along traffic. It records the addresses of the computers connected to it in a table. When traffic comes through, the switch reads the destination address and sends that traffic to the appropriate computer rather than sending it to all the connected computers. If the destination address is not in the table, the switch sends the traffic to all the connected computers.

4. What is Modem?

Answer: A modem (modulator-demodulator) is a device that modulates an analog signal to digital information. It also decodes carrier signals to demodulates the transmitted information.

The main aim of the Modem is to produce a signal that can be transmitted easily and decoded to reproduce the digital data in its original form. Modems are also used for transmitting analog signals, from Light Emitting Diodes (LED) to radio.

5. What are the important differences between MAC address and IP address

Answer: Here, are some differences between MAC and IP address:

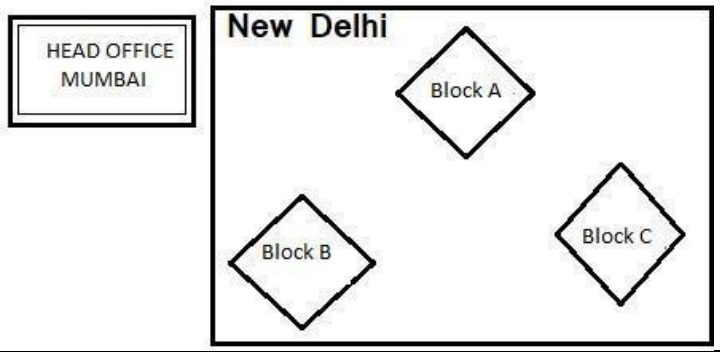
MAC	IP address
1. The MAC address stands for Media Access Control Address.	IP addressstands for Internet Protocol Address
2. It consists of a 48-bit address.	It consists of a 32-bit address.
3. MAC address works at the link layer of the OSI model.	IP address works at the network layer of OSI model.
4. It is referred to as a physical address.	It is referred to as a logical address

6. Differentiate between a router, a hub, and a switch.

HUB	SWITCH	ROUTER
Connects two or more Ethernet devices	Connects two or more LAN devices	Can connect devices or a LAN and WAN
Does not perform filtering	Filters packets before forwarding them	Highly configured to filter and send packets
Least intelligent, least expensive and least complex	Similar to a hub, but more effective	Extremely smart and complex

CASE BASED STUDY QUESTIONS

1. SHRI consultants are setting up a secured network for their office campus at Gurgaon. They are planning to have connectivity between 3 blocks and the head office at Mumbai. Answer the questions (a) to (d) after going through the block positions in the campus and other details, which are given below:



Distances between various buildings:

Block A to Block C 120m

Block A to Block B 55m

Block B to Block C 85m

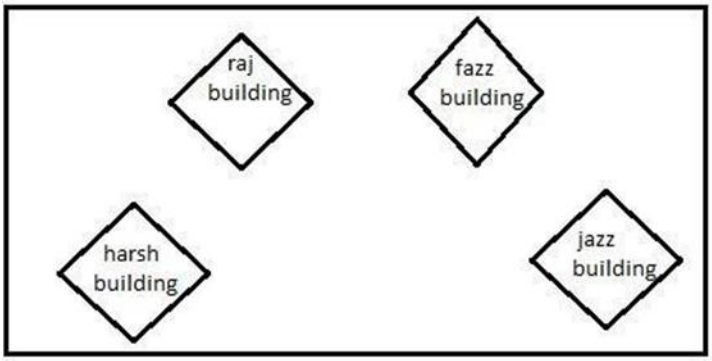
New Delhi Campus to Head office 2060 Km

Number of computers:-	
Block A	32
Block B	150
Block C	45
Head office	10

a. Suggest the most suitable place to house the server with justification.
b. Suggest a connection medium to connect Gurgaon campus with head office.
c. Suggest the placement of the following devices with justification:
i) Switch ii) Repeater
d. 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?
i) Optical Fibre ii)Co-axial Cable iii)Ethernet Cable

Answer :
a. Block C because of the higest no of computer
b. VPN in Internet or Satellite communication can be use
c. Switch in Block A, B and C. repeater in Block C or Head Office
d. Optical Fiber

2. Zetking industries has set up its new center at Ambikapur for its office and web based activities. The company compound has 4 buildings as shown in the diagram below:



Center to center distances between various buildings is as follows:	
harsh building to raj building	50m
raj building to fazz building	60m
fazz building to jazz building	25m
jazz building to harsh building	170m
harsh building to fazz building	125m
raj building to jazz building	90m

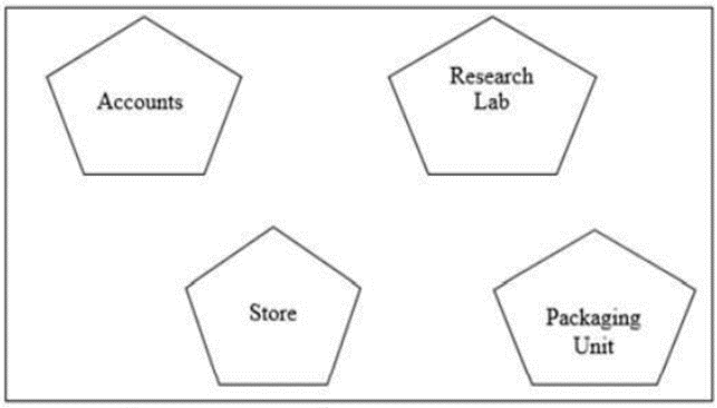
Number of computers in each of the buildings is as follows:	
harsh building	15
raj building	150
fazz building	15
jazz building	25

a. Suggest the most suitable place to house the server of this organization with a suitable reason.
b. Suggest the placement of the following devices with justification.
i) Internet connecting device ii)switch
c. The organization is planning to link its sale counter situated in various parts of the same city, which type of network out of LAN, MAN or WAN will be formed? Justify your answer.
d. If there will be connection between all building using mesh topology, suggest where need to place repeater.

Answer:

a. Raj Building because of Max Number of Computers
b. Both in Raj Building
c. MAN
d. Jazz

3. RAJKUMAR Medicos Centre has set up its new Building centre in Bilaspur. It hasfour buildings as shown in the diagram given below



Distances between various buildings are as follows:

Accounts to Research Lab	55 m
Accounts to Store	150 m
Store to Packaging Unit	160 m
Packaging Unit to Research Lab	60 m
Accounts to Packaging Unit	125 m
Store to Research Lab	180 m

Number of Computers

Accounts	25
Research Lab	100
Store	15
Packaging Unit	60

As a network expert, provide the best possible answer for the following queries:
a. Suggest the most suitable place (i.e. buildings) to house the server of this organization.
b. Suggest the placement of the following device with justification
i. Repeater ii. Hub/Switch
c. Suggest a system (hardware/software) to prevent unauthorized access to or from the network

Answer:

Research Lab
i. Repeater between stores to research lab ii. Hub/switch in all buildings
Firewall

Network Topologies

Star, Bus, Tree, Mesh. Introduction to Internet, URL, WWW, and its applications- Web, email, Chat, VoIP.

Network Topologies:

A network topology is the physical and logical arrangement of nodes and connections in a network. It defines how

devices are connected to each other and how data flows through the network. In other words, Network topology defines the way to group computers and other devices to form a network.

Types of topology:

- Star Topology.
- Bus Topology.
- Tree Topology.
- Mesh Topology.

Star Topology:

A star topology is a topology for a Local Area Network (LAN) in which all nodes are individually connected to a central connection point, like a hub or a switch. It allows each machine on the network to have a point-to-point connection to the central hub/switch.

STAR Topology

Advantages of Star Topology

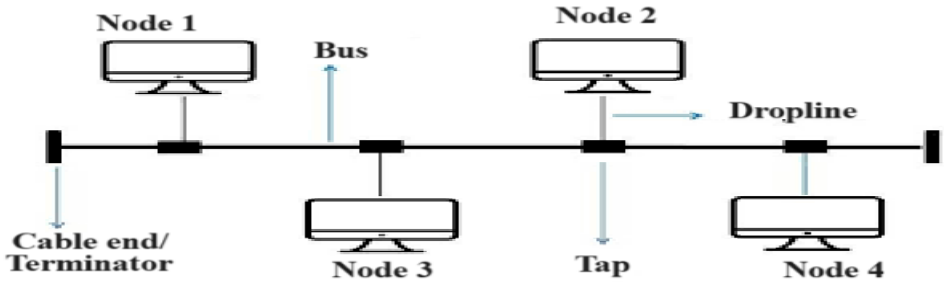
a) Installation and maintenance of network is easy and takes less time.
b) It is easy to detect faults in this network.
c) The rate of data transfer is fast.
d) Any problem in one node does not hamper the performance of other nodes in the network.
e) Removal or addition of any node in Star topology can take place easily without affecting the entire performance of the network.

Disadvantages of Star Topology

a) All node of star topology are dependent on Central node and ,therefore, any problem in the central node makes the entire network shutdown.
b) Performance of the entire network is directly dependent on the performance of the Central node. If the central node is slow it will cause the entire network to slow down.

Bus topology:

Bus topology is a type of network topology in which all the devices are connected to a single cable which is called the backbone of the network which makes it cheaper and easier to maintain.



BUS Topology

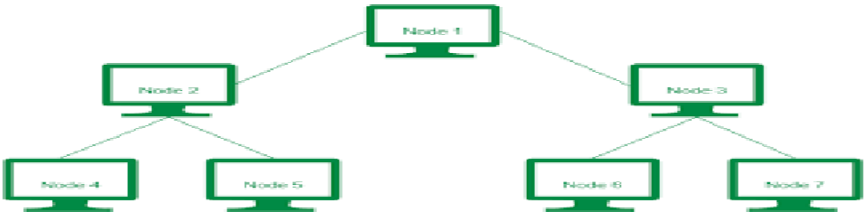
Advantages of Bus Topology

a) Nodes can be connected or removed easily from the bus network.
b) It requires less cable length than a star topology.
c) Bus network is easy to implement and can be extended up to a certain limit.
d) It works well for small network.

Disadvantages of Bus Topology

a) If there is a fault or break in the main cable, the entire network shutdown.
b) Terminators are required at both ends of the backbone cable.
c) Fault isolation is difficult to detect if the entire network shutdown.
d) When the network is required in more than one building, bus network cannot be used.
e) The signal becomes weaker if number of nodes becomes large.

Tree topology:
A computer network topology in which all nodes are either directly or indirectly connected to the main bus cable is known as Tree topology. Bus and Star topologies are combined to create tree topology.

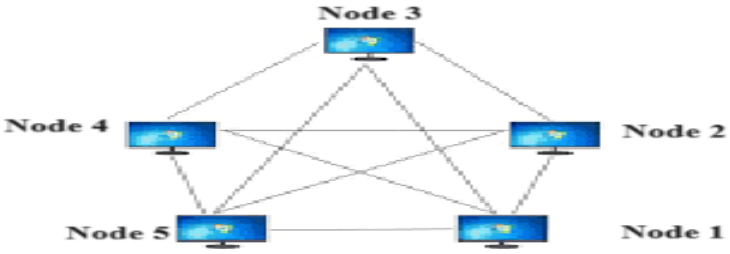


TREE Topology

Advantages of Tree Topology
a) When one of the node stops working, it does not impact other nodes.
b) Fault identification is easy.
c) Failing of one segment does not affect the rest of the network..
d) It works well for small network.

Disadvantages of Tree Topology
a) If the backbone line breaks, the entire segment goes down.
b) There is a need for huge cabling.
c) A lot of maintenance is needed even if it is easier.

d) Mesh topology:
Mesh topology is a network configuration where devices are interconnected in a decentralized manner. Instead of relying on a central hub or switch, each device connects directly to multiple other devices, forming a mesh-like structure. This topology setup allows for most transmissions to be distributed even if one of the connections goes down. It is a topology commonly used for wireless networks.



MESH Topology

Advantages of Mesh Topology
a) Failure during a single device won't break the network.
b) There is no traffic problem as there is a dedicated point to point links for every computer.
c) Fault identification is straightforward.
d) It provides high privacy and security.
e) Data transmission is more consistent because failure doesn't disrupt its processes.
f) Adding new devices won't disrupt data transmissions.

Disadvantages of Mesh Topology

a) It's costly as compared to the other network topologies.
b) Installation is extremely difficult in the mesh.
c) Power requirement is higher.
d) Complex process.
e) There is a high risk of redundant connections.

Introduction to Internet

- Internet is a type of Wide Area Network spread over the entire glob. It is a very large network of thousands of smaller networks.
- At present internet is the fastest mean of sending and exchanging information and data among computers across the world.

History of Internet:-

Internet was developed by U.S. Department of Defence under the project named ARPANET (Advanced Research Projects Agency Network). The basic purpose of ARPANET was to provide communication among the various bodies of Government. A protocol suite named TCP/IP was developed for better communication over network.

Advantages of Internet:-

- Availability of Information:- Because of Internet, we can access lots of information within a click, gather knowledge and learn so many things easily.
- Easy Communication:- Internet avail a facility to communicate with anyone no matter how far the person is.
- Platform to Publish:- Internet provide a platform where anyone can publish their book, story, web series etc.
- Valuable Resources:- Internet provide valuable resources like contacts for various business related firms or other such information helpful for individual as well as business. Internet provide platform to online shopping companies.
- Banking:- Now a days banking facilities is very easy to access just because of Internet.
- Entertainment:- It provides various source of entertainment like YouTube, Netflix etc.

Disadvantages of Internet:-

- Cyber Frauds:- People may lost their money if internet banking is not used properly. Sometime hackers may get into your account and transfer money.
- Unsuitable Contents:- Some notorious people may publish unsuitable material on internet which may adversely affect the moral of society.
- Computer Virus:- Internet sometimes become a channel to transmit virus into our computer. Which may damage our files and programs.
- Depression, Loneliness and social isolation:- Now a days people are using internet unnecessarily which causes depression

URL:-

- URL stands for Uniform Resource Locator. A URL is an address of a website on World Wide Web. Each URL points to a unique website on a web server.
- We use URL to access any required website through a special software called "Web Browser".

Elements of URL:-

A website's URL have three main parts-

(i) **Type of server / Protocol**:- This element of URL specifies that which protocol is used by that website. Generally it is HTTP.

(ii) **The name / address of server on internet**:- This element of URL specifies the unique name of website

on world wide web. Example:- https://facebook.com here "facebook.com" is the name or address of facebook server.

(iii) **Location of file on server:-** This element of URL specifies the path of web page on a particular web server.

Word Wide Web:-

World Wide Web is collection of information that can be accessed by internet and other tools. This information is stored in variety formats like text, PPT, Video, Images, GIF files, Audio files etc.

Large computers having higher capacity to store and process data known as server are used to store information of WWW. Some dedicated organisations have their dedicated data centres to store and maintain large amount of data of WWW.

WEB

Web 2.0:-Web 2.0 refers to added features and application that make the web more interactive, support easy online-information exchange and interoperability. Some noticeable features of web 2.0 are blogs, wikis, video-sharing websites, social networking websites etc.

Web 3.0 :- It refers to the 3rd Generation of web where user will interact by using artificial intelligence and with 3-D portals. Web 3.0 supports semantic web which improves web technologies to create, connect and share content through the intelligent search and the analysis based on the meaning of the words, instead of on the keywords and numbers.

Email

- Email or electronic mail is a paperless method of sending messages saved on a computer/mobile device from one user to one or more users via the Internet.
- E-mail address is an individual name which is used to send and receive email on the internet.
- E-mail address is used to identify source and destination of an email message. The format of email address is:
- username@domainname, where username is a unique username and domain name identifies the mail server. eg xyz@gmail.com

Most commonly used email protocols on internet are:

a) **POP3(Post Office Protocol):**

It is a standard mail protocol used to receive emails from remote server to a local client

b) **IMAP (Internet Message Access Protocol):**

It is a mail protocol for accessing email on a remote web server from a local client.

c) **SMTP (Simple Mail Transfer Protocol):**

Protocol for sending emails across internet

Chat: Chatting or instant messaging over the Internet means communicating to people at different geographic locations in real time through text message(s).

Applications such as WhatsApp, Snapchat, Skype, Yahoo Messenger, Google Talk, facebook Messenger, Google Hangout, etc., are examples of instant messengers.

VoIP (Voice over Internet Protocol):

It is a technology that allows you to make voice calls using a broadband internet connection instead of a regular phone line. VoIP works on the simple principle of converting the analogue voice signals into digital and then transmitting them over the broadband line. These services are either free or very economical. Common examples of VoIP apps include Skype, WhatsApp, Viber, Google Hangouts, Facebook Messenger, etc.

Network Terminology-

ABBREVIATION	FULL FORM

- LAN — Local Area Network
- WAN — Wide Area Network
- MAN — Metropolitan Area Network
- FTP — File Transfer Protocol
- SMTP — Simple Mail Transfer Protocol
- IMAP — Internet Mail Access Protocol
- MODEM — Modulator - Demodulator
- WWW — World Wide Web
- RPC — Remote Procedure Call
- NFS — Network File System
- HTML — Hyper Text Markup Language
- DHTM — Dynamic Hyper Text Markup Language
- HTTP — Hypertext Transfer Protocol
- TCP/ IP — Transmission Control Protocol/ Internet Protocol
- SLIP — Serial Line Internet Protocol
- PPP — Point To Point Protocol
- SIM — Subscriber's Identification Module
- 3G — 3rd Generation of Mobile Communication Technology
- SMS — Short Message Service
- E-mail — Electronic Mail
- NFS — Network File System
- WLL — Wireless in Local Loop
- CDMA — Code Division Multiple Access
- FRA — Fixed Radio Access
- GSM — Global system For Mobile Communication
- ARPANET — Advanced Research Project Agency Network
- XML — Extensible Markup Language
- HTML — Hypertext Markup Language
- URL — Uniform Resource Locater
- ISP — Internet Service Provider
- DNS — Domain Name System
- VSNL — Videsh Sanchar Nigam Limited
- MTNL — Mahanagar Nigam Telephone Limited
- WAIS — Wide Area Information Services
- SLIP — Serial Line Internet Protocol
- TCP — Transmission Control Protocol

Questions Based on Topic

	MCQ
Q.1	Which network topology has a central device, which brings all signals together: a. Bus b. Star c. Ring d. Hybrid ANS: b. Star
Q.2	Which topology in general uses less wire length compare to other? a. Star topology b. Ring topology c. Bus topology d. All use same length of wire ANS: c Bus Topology
Q.3	Which term identifies a specific computer on the web and the main page of the entire site?

	a. WWW b. link c. SQL d.URL ANS: d URL
Q.4	Which topologies have two or more Combination: a) multigrid b)Star Topology c)Bus Topology d)Ring topology e)Hybrid ANS: e) Hybrid
Q.5	A collection of hyperlinked documents on the internet forms the a. World Wide Web (WWW) b. Email system c. Mailing list d. Hypertext Mark-up Language ANS:a WWW
Q.6	Which among the following is not an example of browser. a. Chrome b. Firefox c. Avast d. edge ANS: c AVAST
Q.7	For web pages where the information is changed frequently, for example, stock prices, weather information which out of the following options would you advise. a. static webpage b. dynamic webpage c. both a and b d. none of the above ANS: b. Dynamic Webpage
Q.8	Physical or logical arrangement of network refers to as _____ a. Routing b. Looping c. Topology d. Networking ANS: c. Topology
Q.9	An e-mail stands for _____ a. Effective mail b. Electromagnetic mail c. Electronic Mail d. Electric mail ANS: c. Electronic Mail
Q.10	The SMTP protocol is used to send _____ over the internet.. a) text b) message c) data d) e-mail ANS: d) e-mail
	REASON ASSERTION BASED QUESTIONS
	In the following questions a statement of assertion (A) is followed by a statement of Reason(R) Mark the correct choice as: 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 and 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
Q1.	Assertion(A): VoIP stands for Voice over Internet Protocol. Reason (R): It is a technology that allows you to make voice calls using a broadband internet connection in stead of a regular phone line.
Ans	A
Q2.	Assertion(A): Cookies are plain text files Reason (R): Cookies store the profile picture on social media.
Ans	C
Q3.	Assertion(A): Static webpage contains content that do not change Reason(R): They may only change if the actual HTML file is manually edited.
Ans	A
	VERY SHORT ANSWER TYPE
Q1.	What is an ISP?
Ans	ISP (Internet Service Provider) are the companies which provide internet related service to its users.
Q2.	Deepika has to send an email to Geeta. She also wants to send the same email to Vineeta but does

not want Geeta to know about it. Which option out of CC and BCC should Deepika use to enter the email address of Vineeta?

Ans BCC (Blind Carbon Copy)

Q4. a) Expand the following terms :-

I) FTP II) GSM

b) Kishore has to share the data among various computers of his two offices branches situated in the same city. Name the type of network which is being formed in this process.

Ans i) File Transfer Protocol ii) Global System for Mobile communication

MAN

Q4. When a user browses a website the web server sends a text file to the web browser. What is the name of the file?

Ans Cookies

SHORT ANSWER TYPE

Q1. How is a domain name different from URL?

Ans Domain names are used in URLs to identify particular web servers. for example in the URL http ://www.cbse.nic.in/welcome.htm , the domain name is www.cbse.nic.in

Q2. Explain VoIP.

Ans VoIP stands for Voice Over Internet Protocol that allows us to have voice call over internet. i.e., the voice transmission over a computer network rather than through the regular telephone network.

Q3. Differentiate between static and dynamic web pages on at least two points.

Ans

Static web page	Dynamic web page
Content of this type of webpage cannot be changed at run time.	Content of this type of webpage can be changed at run time.
No interaction with server in case of static web pages.	Interaction with server database is possible in case of dynamic web pages.

Q4. David who is a class X student has just started understanding the basics of internet and web technologies. He is a bit confused in between the terms World Wide Web and Internet. Help him in understanding both the terms with the help of suitable examples of each.

Ans

INTERNET	WWW
It is a global network of networks.	It stands for world wide web
It is a means of connecting a computer to any other computer anywhere in the world.	It is a collection of information which is accessed via internet.
It can be viewed as a big book store	It can be viewed as collection of books on that store.

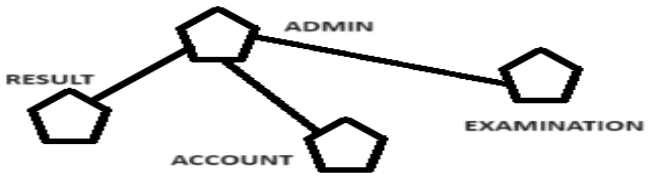
LONG ANSWER TYPE

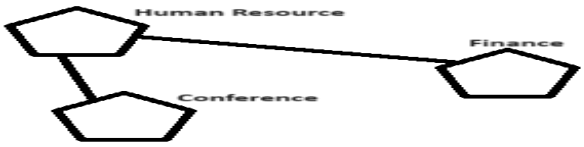
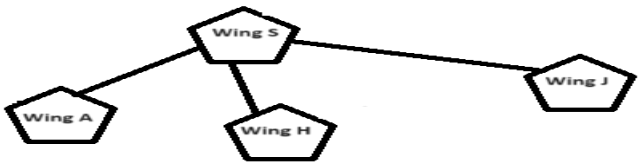
Q1. You as a network expert have to suggest the best network related solutions for their problems raised in (i) to (v), keeping in mind the distances between the buildings and other given parameters.

Shortest distances between various buildings

MUMBAI CAMPUS:

ADMIN TO ACCOUNTS	55 m
ADMIN TO EXAMINATION	90 m
ADMIN TO RESULT	50 m
ACCOUNTS TO EXAMINATION	55 m
ACCOUNTS TO RESULT	50 m

	EXAMINATION TO RESULT 45 m DELHI Head Office to MUMBAI campus 2150 km Number of computers installed at various buildings are as follows: ADMIN 110 ACCOUNTS 75 EXAMINATION 40 RESULT 12 DELHI HEAD OFFICE 20 (i) Suggest the most appropriate location of the server inside the MUMBAI campus (out of the four buildings) to get the best connectivity for maximum number of computers. Justify your answer. (ii) Suggest and draw cable layout to efficiently connect various buildings within the MUMBAI campus for a wired connectivity. (iii) Which networking device will you suggest to be procured by the company to interconnect all the computers of various buildings of MUMBAI campus? (iv) Company is planning to get its website designed which will allow students to see their results after registering themselves on its server. Out of the static or dynamic, which type of website will you suggest? (v) Which of the following will you suggest to establish the online face to face communication between the people in the ADMIN office of Mumbai campus and Delhi head office? a) Cable TV b) Email c) Video conferencing d) Text chat
Ans	ADMIN Building, as it has maximum no of computers. Following Layout is suggested:  HUB/SWITCH DYNAMIC Website Video conferencing
Q2.	Rising Sun Corporation is a professional IT company. The company is planning to set up their new offices in India with its hub at Hyderabad. The company has 03 Blocks named Conference Block, Finance Block, and Human Resource Block. Suggest them the best available solutions based on the queries (i) to (v) as mentioned below : Block to Clock distance in Meters : Human Resource to Conference Block – 55 mtr. Human Resource to Finance – 110 mtr Conference to Finance – 90 mtr. No. of computers to be installed in each block :- Human Resource – 150 Finance - 45 Conference – 75 (i) What will be the most appropriate block, where RSC should plan to house the server? (ii) Suggest the cable layout to connect all the buildings in the most appropriate manner for efficient communication. (iii) What will the best suitable connectivity out of the following to connect the offices in Bangalore with its New York based office. (a) Infrared (b) Satellite Link (c) Ethernet Cable

	(iv) Suggest the placement of the following devices with justification. (a) Hub / Switch (b) Repeater (v) Which service / protocol will be most helpful to conduct the live interactions of Experts from New York to Human Resource Block?
Ans	Human Resource Block Layout to be suggested:  Satellite Link a) Hub/Switch will be installed in every block to connect computers. b) Repeater should be place between Human Resource and Finance (as the distance between these two blocks is more) VoIP
Q3.	Excel Public School, Coimbatore is setting up the network between its different wings of school campus. There are 4 wings namely SENIOR(S), JUNIOR (J), ADMIN (A) and HOSTEL (H). Distances between various wings are given below: Wing A to Wing S 100m Wing A to Wing J 200m Wing A to Wing H 400m Wing S to Wing J 300m Wing S to Wing H 100m Wing J to Wing H 450m Number of Computers installed at various wings are as follows: Wings Number of Computers Wing A 20 Wing S 150 Wing J 50 Wing H 25 (a) Suggest the the topology or layout to connect various wings of Excel Public School, Coimbatore. (b) Name the most suitable wing to house the server. Justify your answer. (c) Suggest placement of HUB/SWITCH in the network of the School. (d) Suggest a device that can provide wireless Internet access to all smartphone/laptop users in the campus of Excel Public School, Coimbatore. (e) What should be the Network type among all blocks of the organization : (i) LAN (ii) MAN (iii) WAN (iv) Any of these
ANS	a.Layout: (Star Topology)  b.Wing S : as this wing has most no of computers. c.Hub/Switch is required in each block to connect computers. d.Router e.LAN

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.

Gist / Main points of chapter:

Website – One of the most common reasons for us to be using Internet every day is the information it is loaded with. The information is generated by multiple sources and is carefully organized in the form of files and web pages, which, when grouped together to form a single entity, become a website. So, 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".

WEBSITE IMPORTANCE AND USES – The websites are utilized for various purposes like Web surfing, Email and chatting, Social Networking, Videos, Online Business, Searching Jobs, News and Information, Classified Ads, Blogs, Downloads, Online payments, Online Banking, File sharing, Online games etc.

- ➢ Open for Business 24 Hours a Day.
- ➢ Reach New Markets With a Global Audience.
- ➢ Improved Customer Service.
- ➢ Save Money on Printing and Distribution Costs.
- ➢ Create A Product Or Service Showcase.
- ➢ Sell Your Products and Services Online.

Components of a good website

- ❖ Easy navigation
- ❖ Secured contents
- ❖ Proper layout
- ❖ Proper links
- ❖ Effective color scheme
- ❖ Fast load time
- ❖ Mobile friendly
- ❖ Font that suits website
- ❖ Good quality images with less size
- ❖ Consistency of design among all pages

Some examples of websites

- ▪ wikipedia.org,
- ▪ google.com,
- ▪ amazon.com,
- ▪ cbse.nic.in
- ▪ Facebook.com
- ▪ Yahoo.com
- ▪ Flipkart.com

Web page -or webpage is a document or html document commonly written in HTML, which is viewed in an Internet browser. A web page can be accessed by entering a URL address into a browser's address bar. A web page may contain text, graphics, and hyperlinks to other web pages and files. A web page is often used to provide information to its visitor, including pictures or videos to help illustrate important topics. A web page may also be used as a method to sell products or services to visitors.

Difference between website and web page

Webpage	**Website**
Single document on the internet	A collection of related webpages linked together under same domain

Development requires minimum amount of time	Development takes a long time
Webpage has content about a single entity	Has content about several entities
Address of the URL of webpage depends on website	URL of website does not depends upon webpage
It is the content that is to be displayed on a website	Website is a place used to display the content
Web page URL has an extension Like cbseacademic.nic.in/index.html	No extension used in URL of a website. Ex. cbseacademic.nic.in

Static web page –Static Web pages are very simple pages written in languages such as HTML, JavaScript, CSS, etc. When a server receives a request for a static web page, then the server sends the response to the client without doing any additional process. And these web pages are seen through a web browser as these were designed. In static web pages, Pages will remain the same until someone changes it manually and deploy these on the webserver.
Dynamic web page –Dynamic Web Pages are written in languages such as JSP,ASP,.NET,PHP etc. In dynamic web pages, the Content of pages varies as per the requirement of its visitor. For e.g. if we login to any web site then our name is displayed similarly if other person login on the same site his name will be displayed. It takes more time to load than the static web page. Dynamic web pages are used where the information is changed frequently, for example, stock prices, weather information, etc

Difference between static webpage and dynamic web page

SL. NO	STATICWEBPAGE	DYNAMICWEBPAGE
1.	Pages will remain same until someone changes it manually.	Content of pages are different for different visitors.
2.	Static webpages are written in languages such as: HTML, JavaScript, CSS, etc.	Dynamic webpages are written in languages such as: CGI, AJAX, ASP, ASP.NET, etc.
3.	Less complexity.	Complicated .
4.	Information change rarely.	Information change frequently.
5.	Less time for loading	More time for loading.
6.	Database is not used.	Database is used.

Web Server -Web server is a computer where the web content is stored. Basically web server is used to host the web sites and deliver the resources requested through web browser.
Features of a Web Server –

- Secure
- Fast in speed means high bandwidth
- Able to mitigate bandwidth congestion
- Maximum uptime-means always response
- Support most of server site scripting languages
- Easy user interface
- Virtual hosting

Functions of a Web Server –

- Stores and secures website data
- Provides web database access

- Serve the end user requests
- Bandwidth controlling to regulate network traffic
- Virtual hosting
- Server side web scripting

Web hosting - Web hosting is the place where all the files of your website live. It is like the home of our website where it actually lives.
A good way to think about this is if the domain name is the address of our house, then web hosting is the actual house that address points to. All websites on the internet, need web hosting.
Domain names and web hosting are two different services. However, they work together to make websites possible.It is possible with the system known as DNS.
Web browser –A browser, short for web browser, is the software application that is used to search for, reach and explore websites.
The primary function of a web browser is to render HTML code (the code used to design or "mark up" webpages). Each time a web browser loads a web page received from web server, it processes the HTML, which may include text, links, and references to images and other items, such as cascading style sheets and JavaScript functions. The browser processes these items, then renders them in the browser window
Major functions of a typical Web browser –

- Send and receive internet resources
- Access web pages ,render and display them
- Select and save our favorite pages
- Print documents
- Keep records of our activity
- Store information in the cloud
- Install applications

Commonly Used web browsers –

- Google Chrome
- Mozilla Firefox
- Apple Safari
- Internet Explorer
- Opera

<u>Web Browser Settings-</u>
Google chrome browser settings –
1. No More Notification Requests - chrome://settings/content/notifications
2. Get Around Ad Blocker Blocking - chrome://settings/content/javascript
3. Font and Sizing - chrome://settings/fonts
4. Review wer Passwords - chrome://settings/passwords
5. Customize wer Startup Pages - chrome://settings/onStartup
6. Send a Do Not Track Request - chrome://settings/privacy
7. Set Flash to Ask First - chrome://settings/content
8. Mic and Camera Access - chrome://settings/content
9. Send Reports to Google - chrome://settings/syncSetup

Mozilla firefox browser settings –
1. Homepage,font&color,downloads – //option/general
2. Searchbar and search engine - //option/search
3. Forms, passwords, history, cookies, security - //option/privacy and security
4. Firefox account - //option/firefox account

Internet explorer browser settings –
1. Homepage, browsing history, appearance(font color)– //tools/internet options/general

2. Security level for zones (internet, localinternet,trustedsites,restricted sites) - //tools/internet options/security
3. Privacy,popup blocker - //tools/internet options/privacy
4. Parental control,autocomplete- //tools/internet options/content
5. Setup internet connections - //tools/internet options/connections
6. Default web browser,add-ons- //tools/internet options/programs
7. Accessibilit,browsing,multimedia,security - //tools/inetnet options/advanced/settings

Opera browser settings –

1. Homepage,popup,language - //settings /preferences/general
2. Password manager - //settings /preferences/forms
3. Search engine - //settings /preferences/search
4. Font,color,zoom - //settings /preferences/webpages
5. History,cookies,security,storage,network,notification- //settings /preferences/advanced

Add-ons/Extensions

Add-ons are tools which integrate into our browser. They're similar to regular apps or programs, but only run when the browser runs. Add- ons can allow the viewing of certain types of Web content, such as Microsoft's Silverlight necessary for Netflix movies.

Add-ons manager in

- Google chrome - /more tools/extensions
- Mozilla firefox -/add-ons option or ctrl+shift+A
- Internet explorer - /tools/manage add-ons
- Opera - https://addons.opera.com/en/extensions/

Plug-in: A plug-in is a piece of software that acts as an add-on to a web browser and gives the browser additional functionality. Plugins can allow a web browser to display additional content it was not originally designed to display. An example of a plugin is the free Macromedia Flash Player, a plugin that allows the web browser to display animations using the Flash format.

Difference between add-ons and plugins

Plug-in is a complete program and add-on is not a program. For example Flash is a plug-in made by adobe is required to play a video in flash player. Also Java is a plug-in made by Sun Microsystem which is used to run programs based on Java. Plug- in is not bounded for browsers only. Flash can be installed in computers to play flash files. Similarly Java can be installed to run Java files.

On the other hand add-on is not a complete program. It is used to add a particular functionality to a browser. If we suppose to install add-on on other work environment, say, wer operating system, we can’t do it. It means, add-ons are limited to a certain boundary.

Cookies - are small bits of data stored as text files on a browser. Websites use those small bits of data to keep track of users and enable user-specific

Q. What's in a Cookie?

Ans- Each cookie is effectively a small lookup table containing pairs of (key, data) values. Once the cookie has been read by the code on the server or client computer, the data can be retrieved and used to customize the web page appropriately.

QUESTION BANK

Expand the following abbreviations:

a) SMTP : Simple Mail Transfer Protocol
b) FTP : File Transfer Protocol
c) TCP/IP : Transmission Control Protocol/ Internet Protocol
d) PPP : Point to Point Protocol
e) POP : Post Office Protocol
f) VoIP : Voice over Internet Protocol
g) http : Hypertext Transfer Protocol
h) WWW : World Wide Web
i) URL : Uniform Resource Locator
j) VPN : Virtual Private Network
k) DNS : Domain Name System
l) IMAP : Internet Message Access Protocol
m) WiFi : Wireless Fidelity
n) MAC : Media Access Control
o) CDMA : Code Division Multiple Access
p) NIC : Network Interface Cards
q) HTML : Hypertext Mark-up Language

FILL IN THE BLANKS:

1. The language used to develop web pages is called ----------
   Scripting language .
2. A network of networks is known as ----------
   Internet .
3. In a network, a machine is identified by unique address called _____
   IP Address
4. The site which stores web pages is called ---------

   Web site .
5. The unique address of web page on the web is called --------
   -----
   URL .
6. _____ was the predecessor to the internet.
   ARPANET
7. The_____ is the method used to make hypertext document readable on the WWW.
   Web Designing
8. ……is a device that converts data from digital bit stream into an analog signal and vice-versa.
   MODEM
9. A …… is a set of data or information which is designed to be viewed as part of a website.
   Web content
10. The software which helps to view the websites is called ----------
    Web browser

11. All computers connected to the internet and wanting to use it for sending/receiving data mustfollow a common set of rules for communication called ----------.

    Protocol

12. E mail denotes ----------.

    Electronic mail

13. ---------- Protocol tells each system how to form mail messages and transfer them between computers.

    SMTP

14. Internet began in year ------

    1991

15. Network speed is measured as ----------.

    Bits per second

16. The domain name for educational institutions is ----------.

    .edu

17. DNS denotes ----------.

    Domain name system

18. The domain name for commercial businesses is ----------.

    .com

19. The domain name for miscellaneous organizations is ----------.

    .org

Very Short Answer Question

1. What are the basic functions of email?

   Ans- E-mail stands for Electronic Mail or Electronic Mailer. The most commonly used feature of the networks in the field of communication is e-mail. It is the transmission of messages from one computer to another. Communication can take place between two to many users. It not only sends the message in text format, but also we can add images, and documents in the form of PDFs, videos, or other attachments.

2. Define WWW.

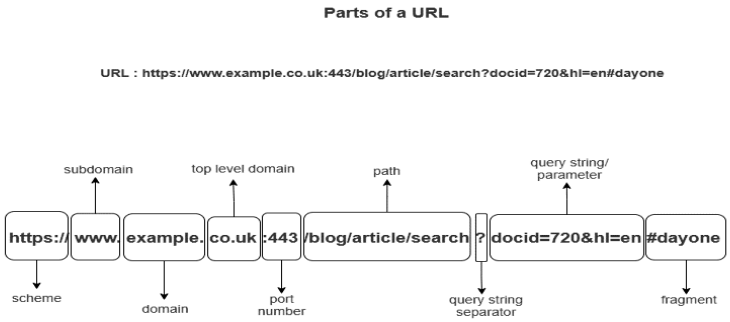
   Ans- The World Wide Web (WWW), commonly known as the Web, is an information system where documents and other web resources are identified by Uniform Resource Locators, which may be interlinked by hypertext, and are accessible over the Internet. World Wide Web was invented in 1989 by Tim Berners Lee.

3. What is the web browser? Name some commonly used web browser.

   Ans- Web Browser Definition: A software application used to access information on the World Wide Web is called a Web Browser. When a user requests some information, the web browser fetches the data from a web server and then displays the webpage on the user's screen.Some commonly used web browser are Google Chrome, Safari, Microsoft edge, Internet explorer etc.

4. What is a URL? What are its components?

   Ans- URL is an acronym for Uniform Resource Locator and is a reference (an address) to a resource on the Internet.



5. What do you mean by TELNET?
Ans- Telnet (short for "teletype network") is a client/server application protocol that provides access to virtual terminals of remote systems on local area networks or the Internet. It is a protocol for bidirectional 8-bit communications.

6. What is a link?
Ans- In a website, a hyperlink (or link) is an item like a word or button that points to another location. When you click on a link, the link will take you to the target of the link, which may be a webpage, document or other online content.

7. Define web browser and webserver.
Ans- A web browser is basically the software that we use for browsing on the internet and displaying pages. Conversely, a web server refers to the software that provides its users with the documents they request via their web browsers

8. Differentiate between XML and HTML.

Parameter	**HTML**	**XML**
Purpose	Markup language used for creating web pages	Markup language used for storing and transporting data
Presentation	Designed to define the structure and presentation of web content	Designed to define the structure of data, with no predefined presentation semantics
Tags	Contains predefined tags for structuring web content	Allows the creation of custom tags based on the specific data being represented
Semantics	Provides semantic meaning to web content elements	No inherent semantics; meaning is defined by the user or the application
Document Type	Must adhere to predefined document type definitions (DTDs) or schemas	Does not have strict document type requirements
Data Interchange	Primarily used for displaying web content in browsers	Used for storing and exchanging data between different systems
Extensibility	Limited extensibility with predefined tag structure	Highly extensible; allows the creation of custom tags and structures
Validation	HTML documents can be validated against predefined DTDs or HTML5 specifications	XML documents can be validated against XML schemas or Document Type Definitions (DTDs)
Popular Applications	Web development, creating web pages and web applications	Data storage, data interchange, configuration files, data representation in various domains
Examples	Heading Paragraph	<person><name>John Doe</name><age>30</age></person>

9. What is web hosting?
Ans- Web hosting is an online service that allows you to publish your website files onto the internet. So, anyone who has access to the internet has access to your website.

10. What is hacking?
Ans- Hacking is the act of compromising digital devices and networks by gaining unauthorized access to an account or computer system.

11. What are cookies?
Ans- A cookie is a piece of data from a website that is stored within a web browser that the website can retrieve at a later time. Cookies are used to tell the server that users have returned to a particular website.

12. Differentiate between cracking and hacking.
Ans- Hacking is the act of compromising digital devices to gain unauthorized access. Although the media commonly uses the term "hacking" to refer to illegal activities, people in the hacking community generally consider themselves the good guys, while crackers are the bad guys.
This is because, in the hacking community, the goal of hacking is to improve or alter security systems and programs.
There is an often quoted line in the community:
" Hackers build, crackers break."
For example, many companies hire white hat hackers to check their security systems and make them as hack-proof as possible.
Cracking, on the other hand, is any kind of hacking that's done for personal gain or other malicious reasons. Crackers, also referred to as black hat hackers, might take control over a system to destroy or steal information for profit, attempt to scam people, or just cause damage for the sake of it.

13. What is web scripting?
Ans- The process of creating and embedding scripts (dynamic content through code) in a web page is known as web-scripting.

14. Name some web scripting languages.
Ans- Java Script, PHP, Python ,Perl, Ruby

15. What is the difference between static and dynamic web pages?

Ans- Difference between Static and Dynamic Web Pages:

SL.NO	Static Web Page	Dynamic Web Page
1.	In static web pages, Pages will remain same until someone changes it manually.	In dynamic web pages, Content of pages are different for different visitors.
2.	Static Web Pages are simple in terms of complexity.	Dynamic web pages are complicated.
3.	In static web pages, Information are change rarely.	In dynamic web page, Information are change frequently.
4.	Static Web Page takes less time for loading than dynamic web page.	Dynamic web page takes more time for loading.
5.	In Static Web Pages, database is not used.	In dynamic web pages, database is used.

SL.NO	Static Web Page	Dynamic Web Page
6.	Static web pages are written in languages such as: HTML, JavaScript, CSS, etc.	Dynamic web pages are written in languages such as: CGI, AJAX, ASP, ASP.NET, etc.
7.	Static web pages does not contain any application program.	Dynamic web pages contains application program for different services.
8.	Static web pages require less work and cost in designing them.	Dynamic web pages require comparatively more work and cost in designing them.

16. What is the difference between add-ons and plug-ins.

Ans- Difference between add ons and plugins

Plug-in is a complete program and add-on is not a program. For example Flash is a plug-in made by adobe is required to play a video in flash player. Also Java is a plug-in made by Sun Microsystem which is used to run programs based on Java. Plugin is not bounded for browsers only. Flash can be installed in computers to play flash files. Similarly Java can be installed to run Java files.

On the other hand add-on is not a complete program. It is used to add a particular functionality to a browser. If we suppose to install add-on on other work environment, say, operating system, we can't do it. It means, add-ons are limited to a certain boundary.

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)

SOCIETAL IMPACT

Societal impact is the effect of research in the real world – a change or benefit beyond academia to the economy, society, culture, public policy or services, health, and the environment or quality of life.

A digital footprint – sometimes called a digital shadow or an electronic footprint – refers to the trail of data you leave when using the internet. It includes websites you visit, emails you send, and information you submit online. A digital footprint can be used to track a person's online activities and devices.

A digital society is a society that uses digital technologies to communicate, collaborate, create, and share information.

A netizen is a citizen of the internet who uses the internet responsibly, ethically, and respectfully.

Net etiquettes are the rules of conduct that netizens should follow when using the internet or digital devices.

Communication etiquettes are the norms of polite and respectful communication that netizens should follow when interacting with others online.

Social media etiquettes are the guidelines for appropriate and responsible behavior that netizens should follow when using social media platforms.

Intellectual property rights (IPR) are the legal privileges granted to the inventor or creator to safeguard their work for a specific period of time.

Plagiarism is the act of using or stealing someone else's intellectual work, ideas etc. and passing it as your own work. In other words, plagiarism is a failure in giving credit to its source.

A license is a type of contract or a permission agreement between the creator of an original work permitting someone to use their work, generally for some price whereas

copyright is the legal rights of the creator for the protection of original work of different types.

FREE SOFTWARE

It means software is freely accessible, can be free to use, changed, improved, copied and distributed, there is no need to any payments.

Open Source Software (OSS)

The term ‘open source’ refers to software, which is available with its source code. These software are free of cost in terms of making modification according to requirements, but a company that makes a business model around the open source software may receive payments for providing support to or further development of the business model.

Some features of open source software are as follows:

Freedom to run and use the software.

Modify the program.

It can be downloaded from Internet.

Right to redistribute copies of either original or modified program (without paying royalties to previous developers).

Multiple Choice Questions:

Q1. Digital footprints are stored _____

a. Temporarily (for few days)

b. Permanently

c. for 7 days only

d. for 3 days

Ans: b. Permanently

Q2. There are _____ kinds of Digital footprints.

a. 1

b. 2

c. 3

d. 4

Ans. b. 2

Q3. Which of the following are Net Etiquette?
a. Be Ethical
b. Be Respectful
c. Be Responsible
d. All of the above
Ans. d. All of the above
Q4. _____ are websites or applications that enable users to participate by creating and sharing content with others in the community.
a. Social media
b. Social channel
c. Social networking
d. None of the above
Ans. a. Social media
Q5. Q30. Every information available on internet is always correct(T/F)
a. True
b. False
Ans. b. False
Q6. Intellectual Property is legally protected through ____
a. copyright
b. patent
c. registered trademark
d. All of the above
Ans. d. All of the above
Q7. To use copyrighted material, one needs to obtain a license from owner.(T/F)
a. True
b. False
Ans. a. True
Q8. A _____ provide an exclusive right to prevent others from using, selling, or distributing the protected invention
a. copyright
b. trademark
c. patent
d. All of the above
Ans. a. copyright
Q9. Licensing and copyrights are same terms.(T/F)
a. True
b. False
Ans. b. False
Q10. A _____ is a type of contract between the creator of an original work permitting someone to use their work, generally for some price.
a. Agreement
b. License
c. Patent
d. Copyright
Ans. b. License
Q11. Presenting someone else's idea or work as one's own idea or work is called _____
a. Plagiarism
b. Copyright infringement
c. Patent infringement
d. None of the above
Ans. a. Plagiarism
Q12. Ravi copy some contents from Internet, but do not mention the source or the original creator. This is an act of _____

a. Plagiarism
b. Copyright Infringement
c. Trademark Infringement
d. Licence Infringement
Ans. a. Plagiarism
Q13. Which of the following is not a cyber crime?
a. Phishing
b. Ransomware
c. Hacking
d. Tracking
Ans. d. Tracking
Q14. Ravi downloaded software from internet (free of cost) and moreover the source code of the software is also available which can be modified. What category of software is this?
a. Shareware
b. Freeware
c. FOSS
d. Malware
Ans. c. FOSS
Reason-Assertion question
Q1. Assertion (A) : An Internet troll is a person who deliberately sows discord on the Internet by starting quarrels or upsetting people.
Reason (R) : We can download and use any material available on the Internet.
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
Ans C

Q2. Assertion (A) : Digital footprint is the trail of data we leave behind when we visit any website (or use any online application or portal) to fill-in data or perform any transaction.
Reason (R) : While online, all of us need to be aware of how to conduct ourselves, how best to relate with others and what ethics, morals and values to maintain.
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
Ans B
Q3. Assertion (A) : Social media are websites or applications that enable their users to participate in social networking but they cannot create and share content with others in the community.
Reason (R) : We should not waste precious time in responding to unnecessary emails or comments unless they have some relevance for us.
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
Ans D
CASE STUDY QUESTIONS
Q1. Rishika found a crumpled paper under her desk. She picked it up and opened it. It contained some text which was struck off thrice. But she could still figure out easily that the struck off text was the email ID and password of Garvit, her classmate. What is ethically correct for Rishika to do?

a) Inform Garvit so that he may change his password.
b) Give the password of Garvit's email ID to all other classmates.
c) Use Garvit's password to access his account.
Ans: a.
Q2. After practicals, Atharv left the computer laboratory but forgot to sign off from his email account. Later,his classmate Revaan started using the same computer. He is now logged in as Atharv. He sends inflammatory email messages to few of his classmates using Atharv's email account. Revaan's activity is an example of which of the following cyber crime?
a) Hacking
b) Identity theft
c) Cyber bullying
d) Plagiarism
Ans: b.
Q3.. Prathyush has to prepare a project on "Cyber Jaagrookta Diwas".He decides to get information from the Internet. He downloads three web pages (webpage1, webpage 2, webpage 3) containing information on the given topic.
1. He read a paragraph from webpage 1 and rephrased it in his own words. He finally pasted the rephrased paragraph in his project. And he put a citation about the website he visited and its web address also.
2. He downloaded three images of from webpage 2. He made a collage for his project using these images.
3. He also downloaded an icon from web page 3 and pasted it on the front page of his project report.
(i) Step1 is an act of.....
(a) Plagiarism
(b) copyright infringement
(c) Intellectual Property right
(d) None of the above
(ii) Step 2 is an act of _____.
(a) plagiarism
(b) copyright infringement
(c) Intellectual Property right
(d) Digital Footprints
(iii) Step 3 is an act of _____.
(a) Plagiarism
(b) Paraphrasing
(c) copyright infringement
(d) Intellectual Property right
(iv) _____is a small piece of data sent from a website and stored in a user's web browser while a user is browsing a website.
(a) Hyperlinks
(b) Web pages
(c) Browsers
(d) Cookies
(v) The process of getting web pages, images and files from a web server to local computer is called?
(a) FTP
(b) Uploading
(c) Downloading
(d) Remote access
Ans: i) d ii) a iii) c iv) d v) c
. Explain very Short Answer Questions:
1. License

Ans: It is a type of contract between the creator of an original work permitting someone to use their work, generally for some price.

2. Explain Patent:

Ans: A patent is usually granted for inventions. Unlike copyright, the inventor needs to apply (file) for patenting the invention. When a patent is granted, the owner gets an exclusive right to prevent others from using, selling. A patent protects an invention for 20 years, after which it can be freely used.

3. Name any 03 ways through which IPR is Violated?

Ans: 1. Plagiarism

2. Copyright Infringement

3. Trademark Infringement.

SHORT ANSWERS

Q1. Explain Intellectual Property rights?

Ans: Intellectual Property rights, means providing property rights through patents, copyrights and trademarks. Holders of intellectual property rights have a monopoly on the usage of property or items for a specified time period.

Q2. Explain Data Protection?

Ans: Data protection is the process of safeguarding your data from unauthorized access, use, modification, or disclosure. Data protection can be achieved by using various methods, such as encryption, backup, firewall, antivirus, password, etc.

Data protection also involves respecting the intellectual property rights (IPR) of others who create or own data.

Q3.Explain Cyber Crime:

Ans: Cyber crime is defined as a crime in which computer is the medium of crime (hacking, phishing, spamming), or the computer is used as a tool to commit crimes (extortion, data breaches, theft).

LONG ANSWER TYPE QUESTIONS

Q1. Explain the following terms:

1. Digital Footprint

Ans: Digital Footprints:

Whenever we surf the Internet using smartphones, tablets, computers, etc., we leave a trail of data reflecting the activities performed by us online is called our digital footprint.

There are two kinds of digital footprints.

Active digital footprints: The digital data trail we leave online intentionally. for example emails we write, or posts we make on different websites.

Passive digital footprints: The digital data trail we leave online unintentionally. for example when we visit a website, use a mobile App, browse Internet, etc.

Q2. Explain difference between Proprietary Software vs FOSS(Free and Open Source Software).

Free and Open Software	Proprietary Software
The term "Open-Source" refers to software in which the source code is available and can be accessed, modified by anybody	The term "Proprietary Software" refers to software that is owned by the person who produced it.
Examples of free software are : Linux, Ubuntu, Libre Office, Mozilla Firefox etc	Examples of Proprietary Software are Microsoft Windows, MS Office etc

Q3. What do you understand by Net Ettiquetes? Explain any two such ettiquetes.

Answer. Net Ettiquets refers to the proper manners and behaviour we need to exhibit while being online.

These include:

1. No copyright violation: we should not use copyrighted materials without the permission of the creator or owner. We should give proper credit to owners/creators of open source content when using them.

2. Avoid cyber bullying: Avoid any insulting, degrading online behaviour like repeated posting of rumours, giving threats online, posting the victim's personal information, or comments aimed to publicly ridicule a victim.

Q4. Mention some Digital Footprints examples?
Ans: Some of the examples of digital footprints are:
Visiting Websites and Online Shopping
Online Searching
Posting on social media, blogs, etc.
Online Image and Video Upload
Communicating Online (Ex: - Chat, Email, etc.)
Any activity you perform Online etc.
Q5. Explain the different types of Digital Footprints:
Ans: Types of Digital Footprints are
Active and Passive Digital Footprints.
Active digital footprints: -Active digital footprints are those data trails that a person leaves intentionally on the Web.
Ex: - Twitter, blog posts, Facebook, social network connections, image and video uploaded on Internet, phone calls, email, and chats are among the ways people create active digital footprints.
Passive digital footprints: - This suggests that a passive footprint would be defined as the unintentional traces of data that an individual creates on the Web.
Ex: -Website visits and actions, searches, and online purchases are among the activities that add passive data traces to a digital footprint.
Positive and Negative Digital Footprints.
Positive digital Footprints: -That reflects your
Positive Personality.
Increased opportunity
Higher profits
Less risk
Gentler treatment
Negative digital footprints: - Things that reflect your Negative Personality sort of a drunken photo, a silly comment, logging on to an inappropriate website.
Fewer Opportunities (like Admission, Job, etc.)
Negative Personal Image
Q6. How Digital Footprints can affect you?
Ans: Digital Footprint affects us in many ways like:-
Privacy Issues: Digital footprints are a privacy concern because they're a group of traceable actions, contributions, and concepts shared by users. They are often tracked and may allow internet users to find out about human actions.
Cyber Vetting: where interviewers could research about the applicants before the interview based on their online activities on the Web.
Target advertisement: It is used by marketers so as to seek out what products a user is curious about or to inspire ones' interest during a certain product that supported similar interests.
Less/More Opportunities depends upon your Positive/Negative Digital Footprints.
Q7. How can you manage your Digital Footprint?
Ans: Though it is not possible to fully hide your digital footprints, you can follow some of the given techniques to manage your digital footprints.
You can search your name on different search engines and they provide you facilities where you can set up an alert for future notifications when your name searched online.
Have different email addresses, so professional and private accounts aren't automatically related to each other
You can change privacy settings on social media accounts where you do not make more things public. But you should not trust them completely because your data is still with those platforms.
Exercise caution altogether our activities, and refrain from oversharing
Q8. What should Net Etiquettes follow?
Ans: Net Etiquettes should follow.

Be Ethical

❖ No copyright violation: we should not use copyrighted materials without the permission of the creator or owner

❖ Share the expertise: it is good to share information and knowledge on internet so that others can access it.

Be Respectful

❖ Respect privacy: We should respect this privacy of other as we care for our privacy and should not share that such information without each other's consent.

❖ Respect diversity: We should respect the diversity of the people in terms of knowledge, experience, culture, beliefs and other aspects.

Be Responsible

❖ Avoid cyber bullying:

▪ Cyber Bullying implies repeatedly targeting someone with intentions to hurt or embarrass.

▪ It includes insulting, degrading or intimidating online behaviour such as posting of rumours, giving threats online, posting the victim's personal information, sexual harassment or comments aimed to publicly ridicule a victim.

❖ Don't feed the troll:

▪ Cyber Trolling is a form of online harassment that involves intentionally posting provocative, offensive, or inflammatory comments on social media platforms, discussion forums, or blogs with the intention of causing emotional distress or anger.

▪ The best way to discourage trolls is not to pay any attention to their comments.

Q9. Explain Communication Etiquettes

Ans: 1. Digital communication includes email, texting, instant messaging, talking on the cell phone, audio or video conferencing, posting on forums, social networking sites.

2. Being a good digital citizen (netizen), we must abide by following Communication Etiquettes.

➢ Be Precise

Respect time:

▪ Don't waste stime in responding to unnecessary emails.

▪ Don't expect an instant response as the recipient may have other priorities.

Respect data limits:

▪ Avoid large attachment

▪ Send data through storage such as Google Drive, Microsoft OneDrive, DropBox etc.

Be Polite: We should be polite, non-aggressive and non-abusing in our communication even if we don't agree with their point of view.

Be Credible: We should be cautious while making a comment, replying or writing an email or forum post as such acts decide our credibility over a period of time.

Q10. Explain how to Protect Data.

Ans: To protect these data from substantial harm, embarrassment, inconvenience and unfairness to an individual.Sensitive data like biometrics information such as fingerprint, health information, financial information, or other personal data like documents, photos, audio clips, videos are required to be protected.

The data protection can be implemented by using one of the following methods:

1. Encryption: It is a method of representing in such a way that only authorized parties or systems can understand the data patterns. In this technique, the text data will be converted into ciphertext. Ciphertext refers to converting user-readable data into incomprehensible data.

2. Authentication: Authentication involves the user's identity using different credentials like username and password, security keys, different sensor locking systems, OTP and other

verification methods.

Q11. Explain Intellectual property Right.

Ans: Intellectual Property refers to inventions, literary and artistic expressions, designs and symbols, names and logos.The Intellectual Property Right gives ownership to the creator of the Intellectual Property holder.

By this, they can get recognition and financial benefits from their property.

These intellectual properties are legally protected by copyrights, patents, trademarks, etc.

Q12. Explain Copyrights

Ans: Copyrights refers to the legal rights to use a material like writing, articles, photographs, audios, videos, software or any other literacy or artistic work.

Copyrights are automatically granted to the creators or the owners.

The right includes the right to copy, reproduce, distribution of the work or content.

If a person needs to use copyrighted materials, then the needs to obtain a license or written permission of the creators.

There are some CC (Creative Common) license and GNU GPL license.

They allow to use their creation as loyalty free materials

Q13..Explain Licensing.

Ans:

A license refers to a contract or permission or agreement given to any party by a creator to use their product or service or creation.

A license can be purchased by paying money. License is the term that gives special rights to the user to use the copyrighted material.

Similarly, a software license is an agreement that provides legal rights to the authorised use of digital material.

All the software, digital documents or games you are downloading from the internet provides the license agreement to use the material. If anyone is not following will be considered a criminal offence.

Cybercrime and cyber laws, hacking, phishing, cyber bullying, overview of Indian IT Act

TOPICS: cybercrime and cyber laws hacking, phishing, cyber bullying, overview of Indian IT act
Cyber Crime:
Cyber crime or computer- oriented crime is a crime that includes a computer and a network. The computer may have been used in the execution of a crime or it may be the target. It is the use of a computer as a weapon for committing crimes such as committing fraud, identity theft or breaching privacy. It especially through the Internet, has grown in importance as the computer has become central to every field like commerce, entertainment and government. It may endanger a person or a nation's security and financial health.

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

Cybercrime encloses a wide range of activities but these can generally be divided in to two categories: • Crimes that aim at computer networks or devices. These types of crimes involves different threats (like virus, bugs etc.) and denial-of-service(DoS) attacks. • Crimes that use computer networks to commit other criminal activities. These types of crimes include cyber stalking, financial fraud or identity theft.

So Cyber Crime is any criminal or illegal activity through an electric channel or through any computer network is counted under cyber-crime.
- Crimes Against People Cyber harassment and stalking, distribution of child pornography, various types of spoofing, credit card fraud, human trafficking, identity theft etc. –
- - - Crimes Against Property These crimes include DDOS attacks, hacking, virus transmission, computer vandalism, copyright infringement, and IPR violations. Crimes Against Government It includes hacking, accessing confidential information, cyber warfare, cyber terrorism, and pirated software.

Classification of Cyber Crime:
1. Cyber Terrorism: Cyber terrorism is the use of the computer and internet to perform violent acts that result in loss of life. This may include different type of activities either by software or hardware for threatening life of citizens. In general, Cyber terrorism can be defined as an act of terrorism committed through the use of cyberspace or computer resources.
2. Cyber Extortion: Cyber extortion occurs when a website, e-mail server or computer system is subjected to or threatened with repeated denial of service or other attacks by malicious hackers. These hackers demand huge money in return for assurance to stop the attacks and to offer protection.
3. Cyber Warfare: Cyber warfare is the use or targeting in a battle space or warfare context of computers, online control systems and networks. It involves both offensive and defensive operations, threat of cyber-attacks, espionage and sabotage.
4. Internet Fraud: Internet fraud is a type of fraud or deceit which makes use of the Internet and could include hiding of information or providing incorrect information for the purpose of deceiving victims for money or property. Internet fraud is not considered a single, distinctive crime but covers a range of illegal and illicit actions that are committed in cyberspace.
5. Cyber Stalking: This is a kind of online harassment wherein the victim is subjected to a barrage of online messages and emails. In this case, these stalkers know their victims and instead of offline stalking, they use the Internet to stalk. However, if they notice that cyber stalking is not having the desired effect, they begin offline stalking along with cyber stalking to make the victims' lives more miserable.
Prevention of Cyber Crime:
Below are some points by means of which we can prevent cybercrime:
1. Use strong password: Maintain different password and username combinations for each account and resist the temptation to write them down. Weak passwords can be easily cracked using certain attacking methods like Brute force attack, Rainbow table attack etc. .
2. Use trusted antivirus in devices: Always use trustworthy and highly advanced antivirus software in mobile and

personal computers. This leads to the prevention of different virus attack on devices.
3. Keep social media private: Always keep your social media accounts data privacy only to your friends. Also make sure only to make friend who are known to you.
4. Keep your device software updated: Whenever you get the updates of the system software, update it at the same time because sometimes the previous version can be easily attacked.

Hacking: The act of unauthorised access to a computer, computer network or any digital system.Hacking is the act of unauthorized 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. Hacking, when done with a positive intent, is called ethical hacking. Such ethical hackers are known as white hat hackers. They are specialists in exploring any vulnerability or loophole by during testing of the software. Thus, they help in improving the security of a software.

An ethical hacker may exploit a website in order to discover its security loopholes or vulnerabilities. He then reports his findings to the website owner. Thus, ethical hacking is actually preparing the owner against any cyber-attack. Phishing and Fraud Emails: Phishing is an unlawful activity where fake websites or emails 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.

The most common phishing method is through email spoofing where a fake or forged email address is used and the user presumes it to be from an authentic source. So, you might get an email from an address that looks similar to your bank or educational institution, asking for your information.

Two kinds: Ethical or White Hat and Unethical or Black Hat Phishing/scam calls/fraud emails: Generally, a URL that resembles the name of a famous website. Ex. jio2021.com and with very lucrative offer like free internet for a year. When clicked a fake website opens and steals the data or supplies free gift of the viruses to the user.

This may lead to identity theft. - Identity theft: when someone uses our personal information—such as our name, license, or Unique ID number without our permission to commit a crime or fraud. Common ways how Identity Can Be Stolen: Data Breaches, Internet Hacking, Malware, Credit Card Theft, Mail Theft, Phishing and Spam Attacks, Wi-Fi Hacking, Mobile Phone Theft, ATM Skimmers. How to protect identity online: use up to-date security software, try to spot spam/scams, use strong passwords, monitor credit scores, only use reputable websites when making purchases. –

Cyber bullying:
It is the use of technology to harass, threaten or humiliate a target. Cyber Bullying Any insulting, degrading or intimidating online behaviour like repeated posting of rumors, giving threats online, posting the victim's personal information, sexual harassment or comments aimed to publicly ridicule a victim is termed as cyber bullying. It implies repeatedly targeting someone with intentions to hurt or embarrass. We need to realize that bullying online can have very serious implications on the other person (victim).
Examples of cyberbullying is sending mean texts, posting false information about a person online, or sharing embarrassing photos or videos.

Different Types of Cyber Bullying: Doxing, Harassment, Impersonation, Cyberstalking.

Cyber Law: "law governing cyberspace". It includes freedom of expression, access to and usage of the internet, and online privacy. The issues addressed by cyber law include cybercrime, e-commerce, IPR, Data Protection.

Indian Information Technology Act (IT Act):
With the growth of Internet, many cases of cybercrimes, 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 Government of India's The Information Technology Act, 2000 (also known as IT Act), amended in 2008, provides guidelines to the user on the processing, storage and transmission of sensitive information.

In many Indian states, there are cyber cells in police stations where one can report any cybercrime. The act provides legal framework for electronic governance by giving recognition to electronic records

and digital signatures.

The act outlines cybercrimes and penalties for them. Cyber Appellate Tribunal has been established to resolve disputes arising from cybercrime, such as tampering with computer source documents, hacking the computer system, using password of another person, publishing sensitive personal data of others without their consent, etc. The act is needed so that people can perform transactions over the Internet through credit cards without fear of misuse.

Indian IT Act, 2000 and amendment in 2008 is the cyber law of India.

- Guidelines on the processing, storage and transmission of sensitive information
- Cyber cells in police stations where one can report any cybercrime
- Penalties Compensation and Adjudication via cyber tribunals

Questions

Q1.Describe following –

Cyber bullying

Cyber crime

Cyber stalking

Q2 .Samridh has recently changed his school so he is not aware of the people, but someone is posting negative demeaning comments on his social media profile. He is also getting repeated mails from unknown people. Every time he goes online, he finds someone chasing him online.

Samridh is a victim of _____.

ii. The action that Samridh should take to handle it.

iii. ..... is a set of moral principles that governs the behavior of a group or individual and regulates the use of computers.

Ans :

Cyber stalking

ii. He should bring to the notice of his parents and school authorities.

iii. Computer ethics

Very Short Answer Type Questions

1. In which year the Indian IT Act, 2000 got updated?
2. What is data privacy?
3. Which of the following is not a type of cyber-crime? a) Data theft c) Damage to data and systems b) Forgery d) Installing antivirus for protection Answer: d Explanation: Cyber-crimes is one of the most threatening terms that is an evolving phase. It is said that major percentage of the World War III will be based on cyber-attacks by cyber armies of different countries.
4. Cyber-laws are incorporated for punishing all criminals only.

a) True b) False

Answer: b Explanation: Cyber-laws were incorporated in our law book not only to punish cyber criminals but to reduce cyber-crimes and tie the hands of citizens from doing illicit digital acts that harm or damage other's digital property or identity.

5. Cyber-crime can be categorized into types.

a) 4 c) 2 b) 3 d) 6

Answer:c Explanation: Cyber-crime can be categorized into 2 types. These are peer to-peer attack and computer as weapon. In peer-to-peer attack, attackers target the victim users; and in computer as weapon attack technique, computers are used by attackers for a mass attack such as illegal and banned photo leak, IPR violation, pornography, cyber terrorism etc.

6. In which year the Indian IT Act, 2000 got updated? a)2006 c)2010 b)2008 d)2012 Answer: b Explanation: In the year 2008, the IT Act, 2000 was updated and came up with a much broader and precise law on different computer-related crimes and cyber offenses.

E-waste: hazards and management.

Awareness about health concerns related to technology.The usage of technology

E-waste: Hazards and Management

Summary

E-waste contains a variety of toxic components that pose significant health and environmental risks. Heavy metals such as lead, mercury, cadmium, and chromium can cause severe health issues, including damage to the brain, kidneys, and lungs. Flame retardants used in plastics can release toxic fumes when burned, posing additional health hazards. Batteries and other components often contain hazardous chemicals like lithium, which can cause fires and explosions if not handled properly. The environmental impact of e-waste is considerable. Toxic substances can leach into the soil and groundwater, leading to long-term contamination that affects agriculture and drinking water sources. Burning e-waste releases harmful dioxins and furans into the atmosphere, contributing to air pollution and respiratory diseases. Additionally, contaminants from e-waste can disrupt ecosystems, leading to biodiversity loss and harming wildlife.

Human health risks are pronounced, particularly for workers in informal recycling sectors who often handle e-waste without proper protection, leading to direct exposure to hazardous substances. Communities living near e-waste recycling sites are at risk of chronic exposure to toxic pollutants through air, water, and soil. Effective e-waste management is essential to mitigate these risks. Establishing formal recycling facilities equipped with safe technologies can recover valuable materials like gold, silver, and copper, while safely disposing of hazardous components. Policies such as Extended Producer Responsibility (EPR) hold manufacturers accountable for the end-of-life management of their products, encouraging the design of eco-friendly electronics.

Legislation and policy play a crucial role in e-waste management. Enforcing laws that regulate the disposal and recycling of e-waste ensures proper handling and prevents illegal dumping. International agreements like the Basel Convention control the transboundary movements of hazardous wastes. Public awareness and education are vital in promoting proper e-waste disposal. Educating consumers about the environmental and health hazards of improper handling, along with providing training programs for workers in the recycling sector, enhances safe and efficient e-waste management.

Technological innovations are key to advancing e-waste management. Encouraging the design of electronic products that are easier to recycle, have longer lifespans, and use fewer hazardous materials is essential. Investing in advanced recycling technologies that can safely and efficiently recycle e-waste reduces environmental impact. Establishing e-waste collection centers and take-back programs allows consumers to drop off their old electronics for safe recycling or return them to manufacturers or retailers for proper disposal. These comprehensive strategies are critical to addressing the hazards of e-waste and promoting sustainable management practices.

Quiz: E-Waste Hazards and Management

Multiple Choice Questions:

Which of the following heavy metals is commonly found in e-waste and is known to cause brain damage?
a) Iron
b) Mercury
c) Aluminum
d) Magnesium

What toxic substance in e-waste is often found in batteries and can cause fires and explosions?
a) Sodium
b) Potassium
c) Lithium
d) Calcium

Burning e-waste can release harmful substances into the atmosphere. Which of the following is one such substance?
a) Carbon dioxide
b) Dioxins
c) Nitrogen

d) Oxygen

Which international agreement controls the transboundary movements of hazardous wastes, including e-waste?

a) Kyoto Protocol

b) Paris Agreement

c) Basel Convention

d) Montreal Protocol

What is the term for policies that hold manufacturers accountable for the end-of-life management of their products?

a) Corporate Social Responsibility (CSR)

b) Extended Producer Responsibility (EPR)

c) Consumer Protection Act (CPA)

d) Product Lifecycle Management (PLM)

True/False Questions:

T/F: E-waste only poses environmental risks, not human health risks.

T/F: Informal recycling sectors often handle e-waste with proper protection and safety measures.

T/F: Setting up designated e-waste collection centers can help promote safe recycling practices.

T/F: Advanced recycling technologies can reduce the environmental impact of e-waste.

T/F: The design of electronic products does not affect the ease of recycling them.

Short Answer Questions:

Name two hazardous substances commonly found in e-waste that pose risks to human health and the environment.

Explain one way in which e-waste can contaminate soil and groundwater.

What role does public awareness play in the management of e-waste?

Describe the concept of Extended Producer Responsibility (EPR).

Why is it important to have international agreements like the Basel Convention for managing e-waste?

Answers:

Multiple Choice Questions:

b) Mercury

c) Lithium

b) Dioxins

c) Basel Convention

b) Extended Producer Responsibility (EPR)

True/False Questions:

False

False

True

True

False

Short Answer Questions:

Lead and mercury are two hazardous substances commonly found in e-waste.

E-waste can contaminate soil and groundwater through the leaching of toxic substances like lead and mercury from improperly disposed e-waste, which then infiltrate the soil and water sources.

Public awareness plays a crucial role in e-waste management by educating consumers about the importance of proper disposal and the hazards of improper handling, thus promoting responsible recycling practices.

Extended Producer Responsibility (EPR) is a policy approach that holds manufacturers accountable for the entire lifecycle of their products, especially for take-back, recycling, and final disposal, encouraging the design of eco-friendly and easily recyclable products.

International agreements like the Basel Convention are important for managing e-waste because they control the transboundary movements of hazardous wastes, preventing illegal dumping and ensuring that e-waste is handled and disposed of safely and responsibly.

SOLVED SAMPLE QUESTION PAPER – 1 CLASS XII
INFORMATICS PRACTICES (065)
TIME: 03 HOURS M.M.: 70

General instructions:

This question paper contains five sections, Section A to E.
All questions are compulsory.
Section A has 18 questions carrying 01 mark each.
Section B has 07 Very Short Answer type questions carrying 02 marks each.
Section C has 05 Short Answer type questions carrying 03 marks each.
Section D has 03 Long Answer type questions carrying 05 marks each.
Section E has 02 questions carrying 04 marks each. One internal choice is given in Q35 against part C only.
All programming questions are to be answered using Python Language only.

Section – A		
Q01.	URLs are of two types: (A) Absolute & Relative (B) Static & Dynamic (C) Absolute and Dynamic (D) None of the above	(1)
Q02.	Which of the following is not done by cyber criminals? (A) Unauthorized account access (B) Mass attack using Trojans as botnets (C) Email spoofing and spamming (D) Report vulnerability in any system	(1)
Q03.	An organization purchase new computers every year and dumps the old one into the local dumping yard. Write the name of the most appropriate category of waste that the organization is creating every year, out of the following options: (A) Business waste (B) Commercial waste (C) E-waste (D) Green waste	(1)
Q04.	Which type of values will be returned by SQL while executing the following statement? Select length(“LENGTH”) ; (A) Numeric value (B) Text value (C) Null value (D) Float value	(1)

Q05.	If column "salary" contains the data set (45000, 5000, 55000, 45000, 55000), what will be the output after the execution of the given query? SELECT AVG (DISTINCT salary) FROM employee; (A) 38500 (B) 40000 (C) 41000 (D) 35000	(1)
Q06.	'V' in 'VISA' stands for: (A) Virtual (B) VISA (C) Vital (D) None of these	(1)
Q07.	The correct SQL from below to find the temperature in increasing order of all cities. (A) SELECT city FROM weather order by temperature ; (B) SELECT city, temperature FROM weather ; (C) SELECT city, temperature FROM weather ORDER BY temperature ; (D) SELECT city, temperature FROM weather ORDER BY city ;	(1)
Q08.	Which one of the following is not an aggregate function? (A) Min (B) Sum (C) With (D) Avg	(1)
Q09.	Where and Having clauses can be used interchangeably in SELECT queries? (A) True (B) False (C) Only in views (D) With order by	(1)
Q10.	Given a Pandas series called HEAD, the command which will display the first 3 rows is . (A) print(HEAD.head(3)) (B) print(HEAD.Heads(3)) (C) print(HEAD.heads(3)) (D) print(head.HEAD(3))	(1)
Q11.	In order to draw charts in Python, which of the following statement will be used: (A) import pyplot.matplotlib as pl (B) import matplotlib.pyplot as plt (C) Import matplotlib.pyplot as plt (D) import pyplot from matplotlib as plt	(1)
Q12.	We can create dataframe from: (A) Series (B) Numpy arrays (C) List of Dictionaries (D) All of the above	
Q13.	Which amongst the following is an example of a browser? (A) Mandriva (B) GIMP (C) Epic (D) Azure	(1)

Q14.	In SQL, this function returns the time at which the function executes: (A) SYSDATE (B) NOW (C) CURRENT (D) TIME	(1)
Q15.	are the attempts by individuals to obtain confidential information from you through an original looking site and URL. (A) Pharming attack (B) Plagiarism (C) Spamming (D) Phishing scams	(1)
Q16.	Chaaya sets up her own company to sell her own range of clothes on Instagram. What type of intellectual property can she use to show that the clothes are made by his company. (A) Patents (B) Copyright (C) Trademark (D) Design	(1)
Q17 and 18 are ASSERTION AND REASONING based questions. Mark the correct choice as (A) Both A and R are true and R is the correct explanation for A (B) Both A and R are true and R is not the correct explanation for A (C) A is True but R is False (D) A is false but R is True		
Q17.	Assertion (A): Each website has a unique address called URL. Reasoning (R): It is Unified Resource Locator and a correct example is http://mypage.htm/google.com	(1)
Q18.	Assertion (A): DataFrame has both a row and column index. Reasoning (R): .loc() is a label based data selecting method to select a specific row(s) or column(s) which we want to select.	(1)
Section – B		
Q19.	Explain the terms Web Page and Web Site. OR Compare and contrast – STAR and BUS topologies	(2)
Q20.	Neelam, a database administrator needs to display Class wise total number of students of 'XI' and 'XII' house. She is encountering an error while executing the following query: SELECT CLASS, COUNT (*) FROM STUDENT ORDER BY CLASS HAVING CLASS='XI' OR CLASS= 'XII'; Help her in identifying the reason of the error and write the correct query by suggesting the possible correction (s).	(2)
Q21.	What is the purpose of GROUP BY clause in SQL? Explain with the help of suitable example.	(2)

Q22.	Write a program to create a series object using a dictionary that stores the number of Kendriya Vidyalayas in each city of cities of your state. Note: Assume some cities like AGRA, JHANSI, MATHURA, NOIDA having 4, 3, 5, 4 KVs respectively and pandas library has been imported as mypandas.	(2)
Q23.	Mention any four net etiquettes. OR List any four benefits of e-waste management.	(2)

Q24.	What will be the output of the following code:
	>>> import pandas as pd
	>>> mydata=pd.Series([‘rajesh’, ‘amit’, ‘tarun’, ‘Radhika’])
	>>> print(mydata < ‘rajesh’)
		(2)

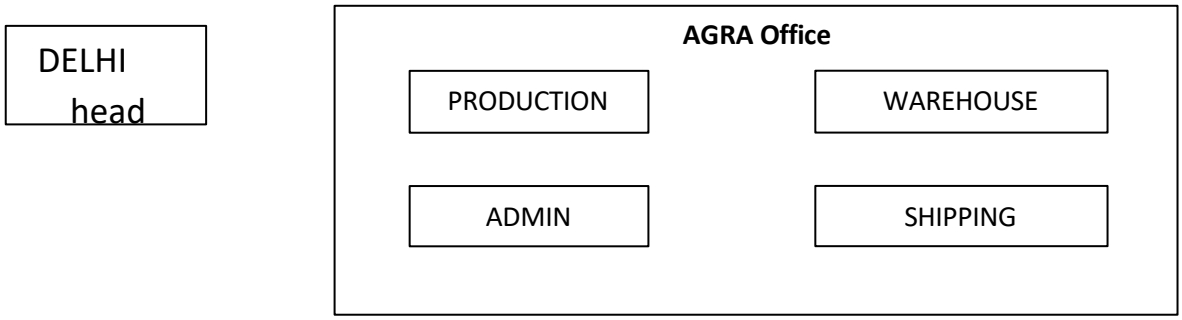
Q25.	Carefully observe the following code:
	>>> import pandas as pd
	>>> xiic = {‘amit’:34, ‘kajal’:27, ‘ramesh’:37}
	>>> xiid = {‘kajal’:34, ‘lalta’:33, ‘prakash’:38}
	>>> result = {‘PT1’:xiic, ‘PT2’:xiid}
	>>> df = pd.DataFrame(result)
	>>> print(df)
	Answer the following:
	List the index of the dataframe df
	Find the output of the following code : print(df.loc[‘kajal’:’ramesh’])
		(2)

Section – C

Q27.	Write a Python code to create a DataFrame with appropriate column headings from the list given below: [[1001,'IND-AUS',’2022-10-17’], [1002,'IND-PAK',’2022-10-23’], [1003,'IND-SA' , ‘2022-10-30], [1004,'IND-NZ',’2022-11-18’]]	(3)

Q28.	Consider the given DataFrame 'Items': Name Price Quantity 0 CPU 7750 15 Watch 475 50 Key Board 225 25 Mouse 150 20 Write suitable Python statements for the following: Add a column called Sale_Price which is 10% decreased value of Price Add a new item named "Printer" having price 8000 and Quantity as 10. Remove the column Quantity	(3)
Q29.	What do you mean by "Digital Footprints"? Explain the different types of digital footprints with example? OR What do you mean by Intellectual Property Right? Give some names of common type of IP with example.	(3)
Q30.	Based on table STOCK given here, write suitable SQL queries for the following: STOCKID NAME COMPANY TYPE DOPURCHASE Quantity Photoshop Adobe SW 5-Oct-2022 1 Windows 10 Microsoft SW 15-Apr-2021 5 Mother Board ASUS HW 8-Sep-2022 5 Office 2007 Microsoft SW 8-Jul-2022 2 Hard Disk Seagate HW 6-Feb-2021 10 Azure Microsoft SW 17-Jul-2022 6 CD ROM Seagate HW 31-Jul-2021 5 Reader Adobe SW 28-Aug-2022 2 Display company wise highest Quantity available Display year wise lowest Quantity available Display total number of Software and Hardware type stock OR Explain the difference between WHERE CLAUSE and HAVING CLAUSE in detail with the help of suitable example.	(3)
	Section – D	
Q31.	Write suitable SQL query for the following: Display 4 characters extracted from 3rd character onwards from string 'IMPOSSIBLE'. Display the position of occurrence of string 'GO' in the string "LET's GO to GOA". Round off the value 257.75 to nearest ten rupees. Display the remainder of 18 divided by 5. Remove all the leading and trailing spaces from a column passwd of the table 'USER'. OR Explain the following SQL functions using suitable examples. MONTHNAME() SUBSTRING() LTRIM() ROUND() RIGHT()	(5)
Q32.	Agra Shoes Pvt. Limited is an international shoe maker organization. It is planning to set up its India Office at Agra with its head office in Delhi. The Agra office campus has four main buildings - ADMIN, PRODUCTION, WAREHOUSE and SHIPPING.	(5)

You as a network expert have to suggest the best network related solutions for their problems raised in (i) to (v), keeping in mind the distances between the buildings and other given parameters.



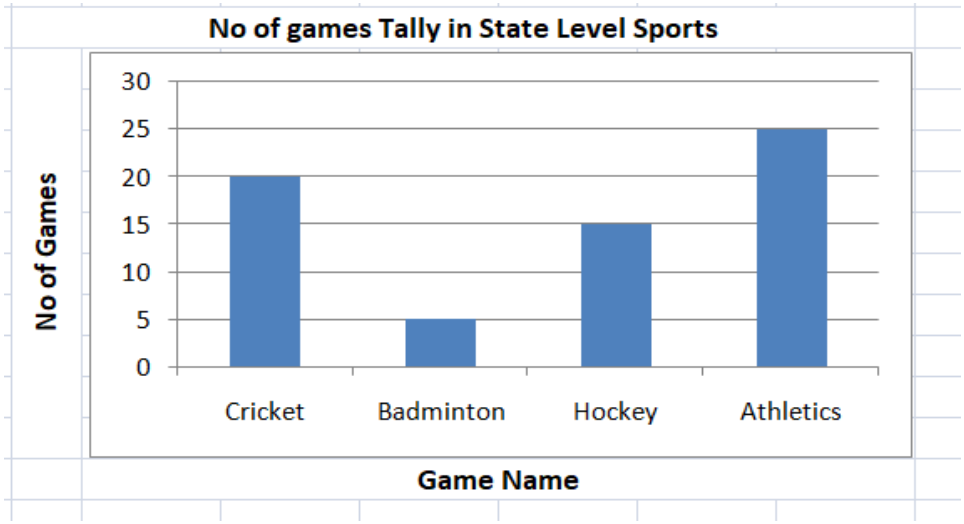
Shortest distances between various buildings:

ADMIN to WAREHOUSE	50 Mtr
ADMIN to PRODUCTION	85 Mtr
ADMIN to SHIPPING	45 Mtr
WAREHOUSE to PRODUCTION	50 Mtr
WAREHOUSE to SHIPPING	45 Mtr
PRODUCTION to SHIPPING	40 Mtr
DELHI head office to AGRA Office	240 Km

Number of computers installed at various buildings are as follows:

ADMIN	120
WAREHOUSE	60
PRODUCTION	35
SHIPPING	18
Delhi Head Office	12

Suggest the most appropriate location of the server inside the AGRA Office (out of the four buildings) to get the best connectivity for maximum number of computers. Justify your answer.
Suggest and draw cable layout to efficiently connect various buildings within the AGRA Office for a wired connectivity. Which networking device will you suggest to be procured by the company to interconnect all the computers of various buildings of AGRA Office?
Company is planning to get its website designed which will allow shopkeepers to see their products, shipping details themselves on its server. Out of the static or dynamic,

	which type of website will you suggest? v) Which of the following will you suggest to establish the online face to face communication between the people in the ADMIN office of AGRA and Delhi head office? A) Cable TV B) Email (C) Video conferencing (D) Text chat	
Q33.	Write Python code to plot a bar chart for No of Games Tally in State Level Sports shown below:  Also give suitable python statement to save this chart. OR Write a python program to plot a line chart based on the given data to depict the changing weekly average temperature in Jhansi for four weeks. Week=[1, 2, 3, 4] Avg_week_temp=[30, 26, 28,24]	(5)

Section -E

Q34.

Write suitable SQL queries for the following:

1. Write an SQL query to calculate 3 raised to the power of 4.
2. To round off the value 1969.5538 without any decimal part
3. Display the current date.
4. Convert the string 'After the test,take some rest' to uppercase:

Q35.	Mr. Summit, a data analyst has designed the DataFrame df that contains data about Computer infrastructure with 'S01', 'S02', 'S03', 'S04', 'S05, 'S06' as indexes shown below. Answer the following questions: S01 S02 S03 S04 S05 S06 Predict the output of the following python statement: df.shape df[2:4] Write Python statement to display the data of working column of indexes S03 to S05. OR (Option for part ii only) Write Python statement to compute and display the difference of data of computers column and working column of the above given DataFrame.	(2+ 2)

school	computers	non-working	working
MPS	80	10	70
SFC	88	12	76
JPS	25	4	21
APS	45	6	39
RLPS	90	15	75
DPS	60	6	54

Solution of Solved Paper-1
CLASS XII
INFORMATICS PRACTICES (065)
TIME: 03 HOURS M.M.: 70

Section – A		
Q01.	(A) Absolute & Relative	(1)
Q02.	(D) Report vulnerability in any system	(1)
Q03.	(C) E-waste	(1)
Q04.	(A) Numeric value	(1)
Q05.	(D) 35000	(1)
Q06.	(B) VIRTUAL	(1)
Q07.	(D) SELECT city, temperature FROM weather ORDER BY city ;	(1)
Q08.	(C) With	(1)
Q09.	(B) False	(1)
Q10.	(A) print(HEAD.head(3))	(1)
Q11.	(B) import matplotlib.pyplot as plt	(1)
Q12.	(D) All of the above	(1)
Q13.	(C) Epic	(1)
Q14.	(A) SYSDATE	(1)
Q15.	(D) Phishing scams	(1)
Q16.	(C) Trademark	(1)
Q17.	(C) A is True but R is False	(1)
Q18.	(A) Both A and R are true and R is the correct explanation for A	(1)
Section – B		
Q19.	A simple individual page is Webpage and an interlinked collection of Webpages make a website. OR One advantage, One Limitation of Bus and Start topology. 1+1 Marks for each correct explanation	(2)
Q20.	The problem with the given SQL query is that ORDER BY is used whereas GROUP BY must be used. To correct the error, GROUP BY clause should be used. Corrected Query:	(2)

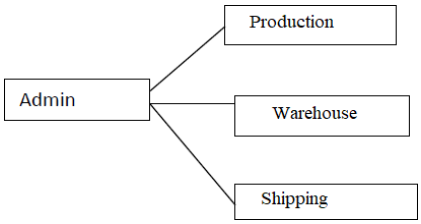
	SELECT CLASS, COUNT (*) FROM STUDENT GROUP BY CLASS HAVING CLASS='XI' OR CLASS= 'XII'; 1 Mark for error identification 1 Mark for writing correct query	
Q21.	1 mark for correct purpose 1 mark for correct example	(2)
Q22.	city={'AGRA':4, 'JHANSI':3, 'MATHURA':5, 'NOIDA':4} kv=mypandas.Series(city) 1 mark for each correct python statement	(2)
Q23.	No copyright violation Share the expertise with others on the internet Avoid cyber bullying Respect other's privacy and diversity ½ mark for each net etiquette OR The e-waste management: Saves the environment and natural resources Allows for recovery of precious metals Protects public health and water quality Saves landfill space ½ mark for each benefit	(2)
Q24.	False True False True ½ mark for each correct output	(2)
Q25.	The index labels of df will include amit, kajal, ramesh, lalta, prakash # 1 mark pt1 pt2 kajal 27 34 # ½ mark ramesh 37 NaN # ½ mark	(2)
	Section – C	
Q26.	name under winner judo 17 RAMESH judo 19 KAMAL lcase(mid(winner,2,3)) ame ama adi mod(under, month(dateofgame)) 7 3 1 mark for each correct output	(3)
Q27.	import pandas as pd data[[1001,'IND-AUS','2022-10-17'], [1002,'IND-PAK','2022-10-23'], [1003,'IND-SA' , '2022- 10-30], [1004,'IND-NZ','2022-11-18']] df=pd.DataFrame (data, columns = ['MatchID', 'TEAMS', 'DATE']) 1 mark for each correct python statement (Student may give column names accordingly)	(3)

Q28.	Items['Sale_Price']=0.90 * Items[‘Price’] Items.loc['4']=[“Printer”, 8000, 10] Items=Items.drop('Quantity', axis=1) 1 mark for each correct statement	(3)
Q29.	Digital Footprints Definition – 1 marks Different types with example – 1 marks each (1+1) OR IPR Definition – 1 marks Different types with example – 1 marks each (1+1)	(3)

Q30.	select COMPANY, MAX(Quantity) from STOCK group by COMPANY;
	select YEAR(DOPURCHASE), MIN(Quantity) from STOCK group by year(DOPURCHASE);
	select TYPE, count(TYPE) from STOCK group by TYPE 1 mark for each correct statement
	
	OR
	WHERE CLAUSE : Definition 1 marks + example ½ marks
	HAVING CLAUSE : Definition 1 marks + example ½ marks
		(3)

Section – D		

Q31.	select mid(‘IMPOSSIBLE’, 3, 4);
	select INSTR(“LET’s GO to GOA”, “GO”);
	select round(257.75, -1);
	select mod(18, 5);
	select trim(passwd) from USER; 1 mark for each correct query
	OR
	5 x ½ mark for each correct explanation 5 x ½ mark for each correct example
		(5)

Q32.	Server should be installed at ADMIN as it has maximum numbers of computers Star Topology  Hub/ Switch Dynamic (C) Video conferencing	(5)
Q33.	import matplotlib.pyplot as plt GAME=[“Cricket”, “Badminton”, “Hockey”, “Athletics”] NOOFGAMES=[20, 5, 15, 25] plt.bar(GAME, NOOFGAMES) plt.xlabel(“Game Name”) plt.ylabel(“No of Games”) plt.title(“No of Games Tally in State Level Sports”) plt.show() ½ mark for each correct statement	(5)

	Python statement to save the chart: plt.savefig("GAME.jpg") 1 mark for the correct statement OR import matplotlib.pyplot as plt Week=[1, 2, 3, 4] Avg_week_temp=[30, 26, 28, 24] plt.plot(Week, Avg_week_temp) plt.show() 1 mark for each correct statement	
Section – E		
Q34.	1. SELECT POW(3, 4); 2. SELECT ROUND(1969.5538, 0); 3. SELECT CURDATE(); 4. SELECT UPPER('After test,take rest');	(4)
Q35.	Output A) (6,4) B) S04 S03 1 mark for each correct output Python statement: print(df.loc[‘S03’:’S05’, ‘working’]) OR print(df.computers – df.working) 2 mark for correct python statement.	(4)

school	computers	non-working	working
JPS	25	4	21
APS	45	6	39

PRACTICE PAPERS-1

CLASS XII
INFORMATICS PRACTICES (065)

TIME: 3 HOURS **M.M.70**

General Instructions:

1. This question paper contains five sections, Section A to E.
2. All questions are compulsory.
3. Section A have 18 questions carrying 01 mark each.
4. Section B has 07 Very Short Answer type questions carrying 02 marks each.
5. Section C has 05 Short Answer type questions carrying 03 marks each.
6. Section D has 03 Long Answer type questions carrying 05 marks each.
7. Section E has 02 questions carrying 04 marks each. One internal choice is given in Q35 against part c only.
8. All programming questions are to be answered using Python Language only.

	PART A	
1.	Television cable network is an example of: i. LAN ii. WAN iii. MAN iv. Internet	1
2.	Which of the following is not a type of cyber crime? i. Data theft ii. Installing antivirus for protection iii. Forgery iv. Cyber bullying	1
3.	What is an example of e-waste? i. A ripened mango ii. Unused old shoes iii. Unused old computers iv. Empty cola cans	1
4.	Which type of values will not be considered by SQL while executing the following statement? **SELECT COUNT(column name) FROM inventory;** i. Numeric value ii. text value iii. Null value iv. Date value	1

5.	If column **"Fees"** contains the data set (5000,8000,7500,5000,8000), what will be the output after the execution of the given query? **SELECT SUM (DISTINCT Fees) FROM student;** i. 20500 ii. 10000 iii. 20000 iv. 33500	1
6.	**'O'** in FOSS stands for: i. Outsource ii. Open iii. Original iv. Outstanding	1
7.	Which SQL statement do we use to find out the total number of records present in the table ORDERS? i. SELECT * FROM ORDERS; ii. SELECT COUNT (*) FROM ORDERS; iii. SELECT FIND (*) FROM ORDERS; iv. SELECT SUM () FROM ORDERS;	1
8.	Which one of the following is not an aggregate function? i. ROUND() ii. SUM() iii. COUNT() iv. AVG()	1
9.	Which one of the following functions is used to find the largest value from the given data in MySQL? i. MAX( ) ii. MAXIMUM( ) iii. BIG( ) iv. LARGE( )	1
10.	To display last five rows of a series object **'S'**, you may write: i. S.Head() ii. S.Tail(5) iii. S.Head(5) iv. S.tail()	1
11.	Which of the following statement will import pandas library? i. Import pandas as pd ii. import Pandas as py iii. import pandas as pd iv. import panda as pd	1

12.	Which of the following can be used to specify the data while creating a DataFrame? i. Series ii. List of Dictionaries iii. Structured ndarray iv. All of these	1
13.	Which amongst the following is not an example of a browser? i. Chrome ii. Firefox iii. Avast iv. Edge	1
14.	In SQL, which function is used to display current date and time? i. Date () ii. Time () iii. Current () iv. Now ()	1
15.	Legal term to describe the rights of a creator of original creative or artistic work is: i. Copyright ii. Copyleft iii. GPL iv. FOSS	1
16.	_____is the trail of data we leave behind when we visit any website (or use any online application or portal) to fill-in data or perform any transaction. i. Offline phishing ii. Offline footprint iii. Digital footprint iv. Digital phishing	1
Q17 and 18 are 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		
17.	**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 & easier, its required to store certain information on the server's computer.	1
18.	**Assertion (A):-** DataFrame has both a row and column index. **Reasoning (R): -** A DataFrame is a two-dimensional labelled data structure like a table of MySQL.	1

	PART B	
19.	Explain the terms Web page and Home Page. **OR** Mention any four networking goals.	2
20.	Rashmi, a database administrator needs to display house wise total number of records of **'Red'** and **'Yellow'** house. She is encountering an error while executing the following query: **SELECT HOUSE, COUNT (*) FROM STUDENT GROUP BY HOUSE WHERE HOUSE='RED' OR HOUSE= 'YELLOW';** Help her in identifying the reason of the error and write the correct query by suggesting the possible correction (s).	2
21.	What is the purpose of Order By clause in SQL? Explain with the help of suitable example.	2
22.	Write a program to create a series object using a dictionary that stores the number of students in each house of class 12D of your school. **Note: Assume four house names are Beas, Chenab, Ravi and Satluj having 18, 2, 20, 18 students respectively and pandas library has been imported as pd.**	2
23.	List any four benefits of e-waste management. **OR** Mention any four net etiquettes.	2
24.	What will be the output of the following code: **>>>import pandas as pd** **>>>A=pd.Series(data=[35,45,55,40])** **>>>print(A>45)**	2
25.	Carefully observe the following code: **import pandas as pd** **Year1={'Q1':5000,'Q2':8000,'Q3':12000,'Q4': 18000}** **Year2={'A' :13000,'B':14000,'C':12000}** **totSales={1:Year1,2:Year2} df=pd.DataFrame(totSales)** **print(df)** **Answer the following:** i. List the index of the DataFrame df ii. List the column names of DataFrame df.	2

SECTION C

26. Write outputs for SQL queries (i) to (iii) which are based on the given table PURCHASE: (3)

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

i. **SELECT LENGTH(CNAME) FROM PURCHASE WHERE QUANTITY>100;**

ii. **SELECT CNAME FROM PURCHASE WHERE MONTH(DOP)=3;**

iii. **SELECT MOD (QUANTITY, DAY(DOP)) FROM PURCHASE WHERE CITY= 'CHANDIGARH';**

27. Write a Python code to create a DataFrame with appropriate column headings from the list given below: (3)

[[101,'Gurman',98],[102,'Rajveer',95],[103,'Samar' ,96],[104,'Yuvraj',88]]

28. Consider the given DataFrame **'Stock':** (3)

	Name	Price
0	**Nancy Drew**	**150**
1	**Hardy boys**	**180**
2	**Diary of a wimpy kid**	**225**
3	**Harry Potter**	**500**

Write suitable Python statements for the following:

i. Add a column called Special_Price with the following data: [135,150,200,440].

ii. Add a new book named 'The Secret' having price 800.

iii. Remove the column Special_Price.

29. Nadar has recently shifted to a new city and school. She does not know many people in her new city and school. But all of a sudden, someone is posting negative, demeaning comments on her social networking profile etc. (3)

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 Nadar?

ii. What immediate action should she take to handle it?

iii. Is there any law in India to handle such issues? Discuss briefly.

OR

What do you understand by plagiarism? Why is it a punishable offence? Mention any two ways to avoid plagiarism.

30. Based on table **STUDENT** given here, write suitable SQL queries for the following: 3

Roll No	Name	Class	Gender	City	Marks
1	Abhishek	XI	M	Agra	430
2	Prateek	XII	M	Mumbai	440
3	Sneha	XI	F	Agra	470
4	Nancy	XII	F	Mumbai	492
5	Himnashu	XII	M	Delhi	360
6	Anchal	XI	F	Dubai	256
7	Mehar	X	F	Moscow	324
8	Nishant	X	M	Moscow	429

i. Display gender wise highest marks. ii. Display city wise lowest marks.
iii. Display total number of male and female students.

OR

Discuss the significance of Group by clause in detail with the help of suitable example.

SECTION D

31. Write suitable SQL query for the following: 5

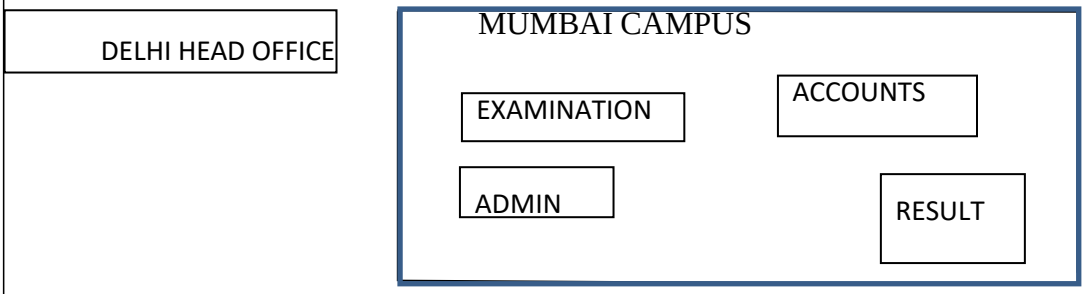
i. Display 7 characters extracted from 7th left character onwards from the string 'INDIA SHINING'.
ii. Display the position of occurrence of string 'COME' in the string 'WELCOME WORLD'.
iii. Round off the value 23.78 to one decimal place. iv. Display the remainder of 100 divided by 9.
v. Remove all the expected leading and trailing spaces from a column userid of the table **'USERS'**.

OR

Explain the following SQL functions using suitable examples.
i. UCASE() ii. TRIM() iii. MID()
iv. DAYNAME()
v. POWER()

32. Prime Computer services Ltd. is an international educational organization. It is planning to set up its India campus at Mumbai with its head office in Delhi. The Mumbai office campus has four main buildings-ADMIN, ACCOUNTS, EXAMINATION and RESULT. 5

You as a network expert have to suggest the best network related solutions for their problems raised in (i) to (v), keeping in mind the distances between the buildings and other given parameters.



Shortest distances between various buildings:

ADMIN TO ACCOUNTS	55 m
ADMIN TO EXAMINATION	90 m
ADMIN TO RESULT	50 m
ACCOUNTS TO EXAMINATION	55 m
ACCOUNTS TO RESULT	50 m
EXAMINATION TO RESULT	45 m
DELHI Head Office to MUMBAI Campus	2150 m

Number of computers installed at various buildings are as follows:

ADMIN	110
ACCOUNTS	75
EXAMINATION	40
RESULT	12
DELHI HEAD OFFICE	20

(i) Suggest the most appropriate location of the server inside the MUMBAI campus (out of the four buildings) to get the best connectivity for maximum number of computers. Justify your answer.

(ii) Suggest and draw cable layout to efficiently connect various buildings within the MUMBAI campus for a wired connectivity.

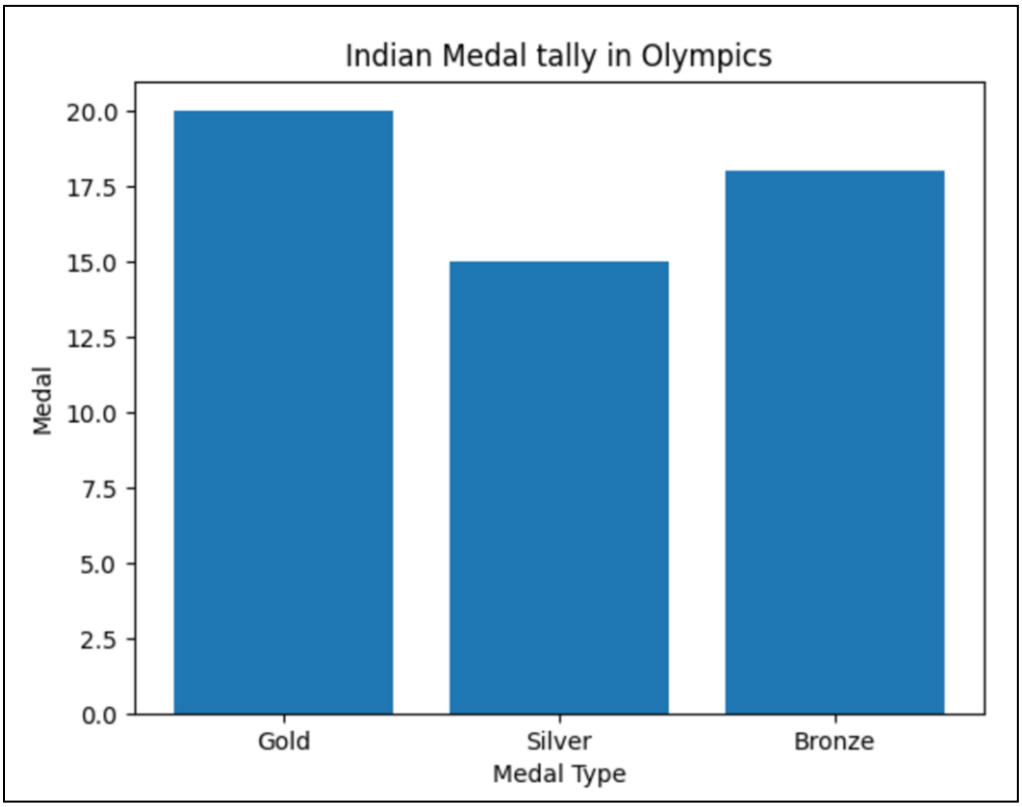
(iii) Which networking device will you suggest to be procured by the company to interconnect all the computers of various buildings of MUMBAI campus?

(iv) Company is planning to get its website designed which will allow students to see their results after registering themselves on its server. Out of the static or dynamic, which type of website will you suggest?

(v) Which of the following will you suggest to establish the online face to face communication between the people in the ADMIN office of Mumbai campus and Delhi head office?

a) Cable TV
b) Email
c) Video conferencing
d) Text chat

33. Write Python code to plot a bar chart for India's medal tally as shown below: 5



Also give suitable python statement to save this chart.

OR

Write a python program to plot a line chart based on the given data to depict the changing weekly average temperature in Delhi for four weeks.

Week=[1,2,3,4]
Avg_week_temp=[40,42,38,44]

SECTION E

34. Shreya, a database administrator has designed a database for a clothing shop. Help her by writing answers of the following questions based on the given table: 1+1+2

TABLE: CLOTH

CCODE	CNAME	SIZE	COLOR	PRICE	DOP
C001	JEANS	XL	BLUE	990	2022-01-21
C002	T SHIRT	M	RED	599	2021-12-12
C003	TROUSER	M	GREY	399	2021-11-10
C004	SAREE	FREE	GREEN	1299	2019-11-12
C005	KURTI	L	WHITE	399	2021-12-07

i. Write a query to display cloth names in lower case.
ii. Write a query to display the lowest price of the cloths.
iii. Write a query to count total number of cloths purchased of medium size.

OR (Option for part iii only)

Write a query to count year wise total number of cloths purchased.

35. 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: 1+1+2

	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 (Option for part iii only)

Write Python statement to compute and display the difference of data of Tot_students column and First_Runnerup column of the above given DataFrame.

PRACTICE PAPERS-2

CLASS XII

INFORMATICS PRACTICES (065)

TIME: 03 HOURS **M.M.: 70**

General Instructions:

1. This question paper contains five sections, Section A to E.
2. All questions are compulsory.
3. Section A has 18 questions carrying 01 mark each.
4. Section B has 07 Very Short Answer type questions carrying 02 marks each.
5. Section C has 05 Short Answer type questions carrying 03 marks each.
6. Section D has 02 questions carrying 04 marks each.
7. Section E has 03 questions carrying 05 marks each.
8. All programming questions are to be answered using Python Language only.

	SECTION A	
1.	A _____is a device that connects the organisation's network with the outside world of the Internet. i. Hub ii. Modem iii. Gateway iv. Repeater	1
2.	When e-waste such as electronic circuit boards are burnt for disposal, the elements contained in them create a harmful chemical called _____which causes skin diseases, allergies and an increased risk of lung cancer. i. Hydrogen ii. Beryllium iii. Chlorine iv. Oxygen	1
3.	Copyright, Patent and Trademark comes under: i. Intellectual Property Right ii. Individual Property Right iii. Industrial Property Right iv. International Property Right	1
4.	Predict the output of the following query: `SELECT MOD (9,0);` i. 0 ii. NULL iii. NaN iv. 9	1

5.	Which of the following SQL functions does not belong to the Math functions category? i. POWER() ii. ROUND() iii. LENGTH() iv. MOD()	1
6.	_____is not a FOSS tool. i. Libre Office ii. Mozilla Firefox iii. Google Chrome iv. Python	1
7.	CSV stands for: i. Column Separated Value ii. Class Separated Value iii. Comma Separated Value iv. Comma Segregated Value	1

8.	Raj, a Database Administrator, needs to display the average pay of workers from those departments which have more than five employees. He is experiencing a problem while running the following query:
	SELECT DEPT, AVG(SAL) FROM EMP WHERE COUNT(*) > 5 GROUP BY DEPT;
	Which of the following is a correct query to perform the given task?
	i. SELECT DEPT, AVG(SAL) FROM EMP WHERE COUNT(*) > 5 GROUP BY DEPT;
	ii. SELECT DEPT, AVG(SAL) FROM EMP HAVING COUNT(*) > 5 GROUP BY DEPT;
	iii. SELECT DEPT, AVG(SAL) FROM EMP GROUP BY DEPT WHERE COUNT(*) > 5;
	iv. SELECT DEPT, AVG(SAL) FROM EMP GROUP BY DEPT HAVING COUNT(*) > 5;
		1

9.	Predict the output of the following query: **SELECT LCASE (MONTHNAME ('2023-03-05'));** i. May ii. March iii. may iv. march	1

10.	Which of the following command will show the last 3 rows from a Pandas Series named NP? i. NP.Tail( ) ii. NP.tail(3) iii. NP.TAIL(3) iv. All of the above	1
11.	With reference to SQL, identify the invalid data type. i. Date ii. Integer iii. Varchar iv. Month	1
12.	In Python Pandas, while performing mathematical operations on series, index matching is implemented and all missing values are filled in with _____by default. i. Null ii. Blank iii. NaN iv. Zero	1
13.	By restricting the server and encrypting the data, a software company's server is unethically accessed in order to obtain sensitive information. The attacker blackmails the company to pay money for getting access to the data, and threatens to publish sensitive information unless price is paid. This kind of attack is known as: i. Phishing ii. Identity Theft iii. Plagiarism iv. Ransomware	1
14.	In SQL, the equivalent of UCASE() is: i. UPPERCASE () ii. CAPITALCASE() iii. UPPER() iv. TITLE ()	1
15.	Collection of hyper linked documents available on the internet is known as_____. i. Website ii. Webpage iii. Web Server iv. Web Hosting	1

16.	_____is a non-profit organization that aims to build a publicly accessible global platform where a range of creative and academic work is shared freely. i. Creative Cost ii. Critical Commons iii. Creative Commons iv. Creative Common	1
17.	**Assertion (A):-** MODEM stands for modulator-demodulator. **Reasoning (R): -** It is a computer hardware device that converts data from a digital format to analog and vice versa. 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	1
18.	**Assertion (A):-** To use the Pandas library in a Python program, one must import it. **Reasoning (R): -** The only alias name that can be used with the Pandas library is pd. 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	1
	SECTION B	
19.	Briefly explain the basic concepts of a web server and web hosting. OR Rati 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.	2

20.	The python code written below has syntactical errors. Rewrite the correct code and underline the corrections made.
	`Import pandas as pd`
	`df ={"Technology":["Programming","Robotics","3D Printing"],"Time(in months)":[4,4,3]}`
	`df= Pd.dataframe(df)`
	`Print(df)`
		2

21.	Consider the given SQL string: "12#All the Best!" Write suitable SQL queries for the following: i. Returns the position of the first occurrence of the substring **"the"** in the given string. ii. To extract last five characters from the string.	2

22.	Predict the output of the given Python code:
	`import pandas as pd list1=[-10,-20,-30]`
	`ser = pd.Series(list1*2)`
	`print(ser)`
		2

23.	Differentiate between the active digital footprint and passive digital footprints.	2

24.	Complete the given Python code to get the required output as: **Rajasthan**
	`import _____ as pd`
	`di = {'Corbett': 'Uttarakhand', 'Sariska': 'Rajasthan', 'Kanha': 'Madhya Pradesh', 'Gir':'Gujarat'}`
	`NP = _____. Series( _____ )`
	`print(NP[ _____ ])`
		2

25.	What are aggregate functions in SQL? Name any two.	2
	SECTION C	

26.	Based on the SQL table CAR_SALES, write suitable queries for the following:
	+--------+------------------+--------+-------+-------+
	| NUMBER | SEGMENT | FUEL | QT1 | QT2 |
	+--------+------------------+--------+-------+-------+
	| 1 | Compact HatchBack | Petrol | 56000 | 70000 |
	| 2 | Compact HatchBack | Diesel | 34000 | 40000 |
	| 3 | MUV | Petrol | 33000 | 35000 |
	| 4 | MUV | Diesel | 14000 | 15000 |
	| 5 | SUV | Petrol | 27000 | 54000 |
	| 6 | SUV | Diesel | 18000 | 30000 |
	| 7 | Sedan | Petrol | 8000 | 10000 |
	| 8 | Sedan | Diesel | 1000 | 5000 |
	+--------+------------------+--------+-------+-------+
	i. Display fuel wise average sales in the first quarter.
	ii. Display segment wise highest sales in the second quarter.
	iii. Display the records in the descending order of sales in the second quarter.
	OR
	Predict the output of the following queries based on the table CAR_SALES given above:
	`i. SELECT LEFT(SEGMENT,2) FROM CAR_SALES WHERE FUEL= "PETROL";`
	`ii.SELECT (QT2-QT1)/2 "AVG SALE" FROM CAR_SALES WHERE SEGMENT= "SUV";`
	`iii. SELECT SUM(QT1) "TOT SALE" FROM CAR_SALES WHERE FUEL= "DIESEL";`
		3

27. Create a DataFrame in Python from the given list: [['Divya','HR',95000],['Mamta','Marketing',97000],['Payal','IT',980000], ['Deepak','Sales',79000]] Also give appropriate column headings as shown below: 3

```
      Name Department  Salary
0    Divya         HR   95000
1    Mamta  Marketing   97000
2    Payal         IT  980000
3   Deepak      Sales   79000
```

28. Write MySQL statements for the following: 3

i. To create a database named FOOD.

ii. To create a table named Nutrients based on the following specification:

Column Name	Data Type	Constraints
Food_Item	Varchar(20)	Primary Key
Calorie	Integer	

29. Richa, recently started using her social media account. Within a few days, she befriends many people she knows and some that she does not know. After some time, she starts getting negative comments on her posts. She also finds that her pictures are being shared online without her permission. 3

Based on the given information, answer the questions given below. i. Identify the type of cybercrime she is a victim of.

ii. Under which act, she can lodge a complaint to the relevant authorities?

iii. Suggest her any two precautionary measures which she should take in future while being online to avoid any such situations.

OR

Mention any three health hazards associated with inappropriate and excessive use of gadgets.

30. Consider the given DataFrame 'Genre': 3

	Type	Code
0	Fiction	F
1	Non Fiction	NF
2	Drama	D
3	Poetry	P

Write suitable Python statements for the following:

i. Add a column called Num_Copies with the following data: [300,290,450,760].

ii. Add a new genre of type 'Folk Tale' having code as "FT" and 600 number of copies.

iii. Rename the column 'Code' to 'Book_Code'.

	SECTION D	
31.	Preeti manages database in a blockchain start-up. For business purposes, she created a table named BLOCKCHAIN. Assist her by writing the following queries: TABLE: BLOCKCHAIN +----+----------+-------+--------+------------------+ | id | user | value | hash | transaction_date | +----+----------+-------+--------+------------------+ | 1 | Steve | 900 | ERTYU | 2020-09-19 | | 2 | Meesha | 145 | @345r | 2021-03-23 | | 3 | Nimisha | 567 | #wert5 | 2020-05-06 | | 4 | Pihu | 678 | %rtyu | 2022-07-13 | | 5 | Kopal | 768 | rrt4% | 2021-05-15 | | 7 | Palakshi | 534 | wer@3 | 2022-11-29 | +----+----------+-------+--------+------------------+ i. Write a query to display the year of oldest transaction. ii. Write a query to display the month of most recent transaction. iii. Write a query to display all the transactions done in the month of May. iv. Write a query to count total number of transactions in the year 2022.	**4**
32.	Ekam, a Data Analyst with a multinational brand has designed the DataFrame df that contains the four quarter's sales data of different stores as shown below: Store Qtr1 Qtr2 Qtr3 Qtr4 0 Store1 300 240 450 230 1 Store2 350 340 403 210 2 Store3 250 180 145 160 Answer the following questions: i. Predict the output of the following python statement: a. print(df.size) b. print(df[1:3]) ii. Delete the last row from the DataFrame. iii. Write Python statement to add a new column Total_Sales which is the addition of all the 4 quarter sales. **OR** **(Option for part iii only)** Write Python statement to export the DataFrame to a CSV file named data.csv stored at D: drive.	4
	SECTION E	
33.	Write suitable SQL queries for the following: i. To calculate the exponent for 3 raised to the power of 4. ii. To display current date and time. iii. To round off the value -34.4567 to 2 decimal place. iv. To remove all the probable leading and trailing spaces from the column userid of the table named user. **v.** To display the length of the string 'FIFA World Cup'.	5

OR

Kabir has created following table named exam:

```
+-------+---------+------------------+-------+
| RegNo | Name    | Subject          | Marks |
+-------+---------+------------------+-------+
|     1 | Sanya   | Computer Science |    98 |
|     2 | Sanchay | IP               |   100 |
|     3 | Vinesh  | CS               |    90 |
|     4 | Sneha   | IP               |    99 |
|     5 | Akshita | IP               |   100 |
+-------+---------+------------------+-------+
```

Help him in writing SQL queries to the perform the following task:

i. Insert a new record in the table having following values:
[6,'Khushi','CS',85]

ii. To change the value **"IP"** to **"Informatics Practices"** in subject column.

iii. To remove the records of those students whose marks are less than 30 .

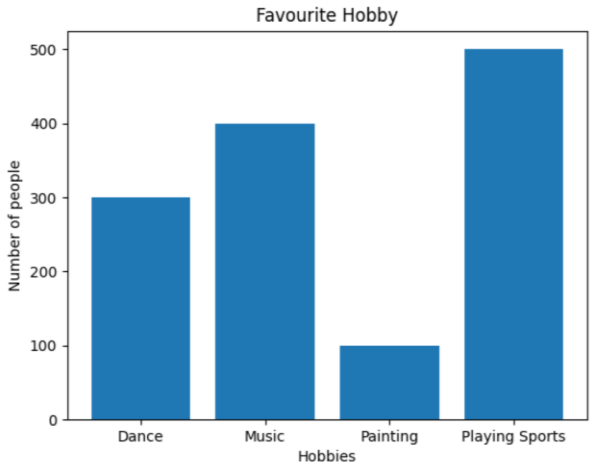
iv. To add a new column **Grade** of suitable datatype.

v. To display records of **"Informatics Practices"** subject.

34. XYZ Media house campus is in Delhi and has 4 blocks named Z1, Z2, Z3 and Z4. The tables given below show the distance between different blocks and the number of computers in each block. 5

Block Z1 to Block Z2	**80 metres**
Block Z1 to Block Z3	**65 metres**
Block Z1 to Block Z4	**90 metres**
Block Z2 to Block Z3	**45 metres**
Block Z2 to Block Z4	**120 metres**
Block Z3 to Block Z4	**60 metres**

Block	Number of computers
Z1	135
Z2	290
Z3	180
Z4	195

	The company is planning to form a network by joining these blocks. i. Out of the four blocks on campus, suggest the location of the server that will provide the best connectivity. Explain your response. ii. For very fast and efficient connections between various blocks within the campus, suggest a suitable topology and draw the same. iii. Suggest the placement of the following devices with justification (a) Repeater (b) Hub/Switch iv. VoIP technology is to be used which allows one to make voice calls using a broadband internet connection. Expand the term VoIP. v. The XYZ Media House intends to link its Mumbai and Delhi centers. Out of LAN, MAN, or WAN, what kind of network will be created? Justify your answer.	
35.	The heights of 10 students of eighth grade are given below: Height_cms=[145,141,142,142,143,144,141,140,143,144] Write suitable Python code to generate a histogram based on the given data, along with an appropriate chart title and both axis labels. Also give suitable python statement to save this chart. **OR** Write suitable Python code to create '**Favourite Hobby**' Bar Chart as shown below:  Also give suitable python statement to save this chart.	5

PRACTICE PAPERS-3

CLASS XII

INFORMATICS PRACTICES (065)

TIME: 3 HOURS **M.M.70**

General Instructions:

1. This question paper contains five sections, Section A to E.
2. All questions are compulsory.
3. Section A has 18 questions carrying 01 mark each.
4. Section B has 07 Very Short Answer type questions carrying 02 marks each.
5. Section C has 05 Short Answer type questions carrying 03 marks each.
6. Section D has 02 questions carrying 04 marks each.
7. Section E has 03 questions carrying 05 marks each.
8. All programming questions are to be answered using Python Language only

SECTION A		
QUES		MARKS
1	Which topology requires a multipoint connection on a single cable? a)Star b) Bus c) Mesh d)Tree	1
2	What is an example of e-waste? a) Empty Soda Cans c) Old Clothes b) A ripened Apple d) an Old Computer	1
3	The information / art / work that exists in digital form is called _____ ? a) e-work b) e-asset c) digital property d) e-property	1
4	Predict the output of the following query: SELECT MOD(39,12); a) NULL b) 0 c) 3 d) 12	1
5	Predict the output of the following query: SELECT ROUND(151.2315,-2); a) 0 b) 200 c) 150 d) 100	1
6	Data which has no restriction of usage and freely available to everyone under Intellectual Property Right is categorised as: a) Open Source b) Open Data c) Open Content d) Open education	1
7	The correct statement to read from a csv file file1 in a dataframe df is: a) df.read_csv(file1) c) df=pandas.read(file1) b) file1.read_csv(df) d) df=pandas.read_csv(file1)	1
8	If columns Fees contains the dataset (5000,8000,7500,5000,8000), what will be the output after executing the following query: SELECT SUM (DISTINCT Fees) From student; a) 20500 b) 10000 c) 20000 d) 33500	1
9	What will be the output of the following SQL query. SELECT LENGTH(CONCAT('KVS RO', 'BBSR')) a) 6 b) 4 c) 10 d) 9	1
10	To display last five rows of a Series object S, you may write: a) S.head() b) S.Tail(5) c) S.Head(5) d) S.tail()	1
11	The Degree of a relation is: a) Columns of a Table c) Rows of a Table b) No. Of Columns of a Table d) No. Of Rows of a Table	1
12	Missing data in Pandas object is represented through: a) Null b) NaN c) None d)Missing	1
13	Reena has recently shifted to a new city and new college. She does not know	1

	many people in her new city and college. But all of a sudden, someone starts posting negative, demeaning comments on her social networking profile, college site's forum, etc. She is also getting repeated mails from unknown people. Every time she goes online, she finds someone chasing her online. What is happening to Reena? a) Phising b) Identity Theft c) Cyber Bullying d) Ransomware	
14	In SQL, the equivalent of LCASE() is: a) LOWERCASE() b) SMALLCASE() c) TITLE() d) LOWER()	1
15	URLs are of two types: a) Absolute and Relative c) Static and Dynamic b) Absolute and Dynamic d) None of the above	1
16	Legal Term to describe the rights of a creator of original creative or artistic work is called _____ a) Copyleft b)GPL c)Copyright d) None of these	1
	Q17 and 18 are 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	
17	Assertion (A): LAN is a Computer Network within a Building. Reason (R): It is called Local area Network as all materials available in Local Market.	1
18	Assertion (A):- Pandas is required to be installed for Pandas related python program to run. Reasoning (R): "import pandas" is required to be imported in every pandas program in the beginning.	1

SECTION B		
QUES		MARKS
19	What is the role of HTTPS? OR Differentiate between Web pages and Websites?	2
20	Give the output for the following code. import pandas as pd data = [{'a': 1, 'b': 2},{'a': 5, 'b': 10, 'c': 20}] df1 = pd.DataFrame(data, index=['first', 'second'],columns=['a', 'b']) df2 = pd.DataFrame(data, index=['first', 'second'], columns=['a', 'b1']) print(df1) print(df2)	2
21	Consider the following string: "I Love My Bharat" Write sql query for the followings: a) Return the position of 'My' b) To extract first 4 characters from the string	2
22	Give the output of the following: import pandas as pd L1=[5,6,7,8] S1=pd.Series(L1, index=[10,20,40,45]) print(S1)	2
23	What measures can you curb online frauds?	2
24	Complete the given python code print the output as 40 import ..... as pd data=[10,20,30,40,50,60] S=.....Series(.....)	2

print(S)
print(.....)

25 Explain the following MySQL function: 2
a) avg() b) min()

SECTION C

QUES		MARKS

26 Consider table GRADUATE and write SQL query: 3

S.NO	NAME	STIPEND	SUBJECT	mark	DIVISION
1	KARAN	400	PHYSICS	68	I
2	DIWAKAR	450	COMP. Sc.	67	I
3	DIVYA	300	CHEMISTRY	62	I
4	REKHA	350	PHYSICS	63	I
5	ARJUN	500	MATHS	70	I
6	SABINA	400	CHEMISTRY	55	II
7	JOHN	250	PHYSICS	64	I
8	ROBERT	450	MATHS	63	I
9	RUBINA	500	COMP. Sc.	62	I
10	VIKAS	400	MATHS	57	II

a) Display average mark subject wise.
b) Display maximum and Minimum Mark division wise.
c) Display Name and descending order of Stipend whose name end with 'A'.
OR
Predict the output of the following queries based on the above table Graduate.
a) SELECT RIGHT(NAME,2) from GRADUATE where mark>65;
b) SELECT mid(SUBJECT,3,2) from GRADUATE where NAME like '_ _B%';
c) Select SUM(mark) as 'Total Mark' from Graduate where STIPEND=400;

27 Create the following dataframe. 3

	ROLLNO	NAME	MARK1	MARK2
S1	1	PRIYA	78	89
S2	2	RIYA	67	98
S3	3	LEENA	87	98
S4	4	KRISH	88	78
S5	5	AKASH	99	67

28 Write mysql statement for the following: 3
(i) Create a database name TRAVELER
(ii) Create table 'TRAVELS' with given details

Column Name	Data Type	Constraint
Travelid	Char(6)	Primary Key
Tname	Varchar(35)	
Sloc	Varchar(20)	
Eloc	Varchar(20)	
Date_journey	Date	
Amount	Decimal(5,2)	

29 Manohar received an e-mail from a company, named ABC Pvt Ltd., claiming that Manohar has won Rs.20 Lakhs in a survey done online. In order to claim the prize money, he was required to answer few questions such as his name, Account Number, PAN card details, Phone numbers and OTP for verification purposes. For this, he had to click on the 3

	link provided in the e-mail. Answer the following questions: a) Should Manohar give the required details to the Company? b) What is the activity depicted above? c) What should he do with this e-mail. OR What is e-waste? How we can manage it (Any two points)?	
30	Consider the following DataFrame df and write Python statement for questions from (i) – (iii) Marks Name 1 38 Tim 2 24 John 3 39 Sony 4 52 Ricky a) Add a new column Age to the dataframe. The values of the Age will be 12, 22, 21, 24. b) Rename the column Name to Std_Name c) Add a new student Hari having mark 45	3

SECTION D

QUES		MARKS
31	Ramya manages database in a finance Office. She create a table TRANSACT as follows. Help her by writing the following query:	4

TRNO	ANO	AMOUNT	TYPE	DOT
T001	101	2500	Withdraw	2016-12-21
T002	103	3000	Deposit	2017-09-01
T003	102	2000	Withdraw	2015-09-12
T004	103	1000	Deposit	2017-10-22
T005	101	12000	Deposit	2016-11-06

a) Write query to display the month of the oldest transaction.
b) Write a query to display year of the most recent transaction.
c) Write a query to count total number of transaction in the year 2016
d) Write a query to display all the transaction done in the month of September.

32 | Asit, a data analyst has designed the DataFrame 'Sales' that contain sales data as follows: | 4

	Employee	Sales	Quarter	State
0	R Sahay	125600	1	Delhi
1	Ryma Sen	456000	1	West Bengal
2	Manila Sahai	172000	2	Haryana
3	Jaya Priya	201400	2	Kerala

Answer the following:
a) Predict the output of the following:
i. print(Sales[1:3])
ii. print(Sales.size)
b) Delete the last row from the Dataframe
c) Write python statement to add a new column Bonus with value of your own.
Or (for part C only)
Write python statement to export the dataframe to a CSV file named myfile.csv

SECTION E

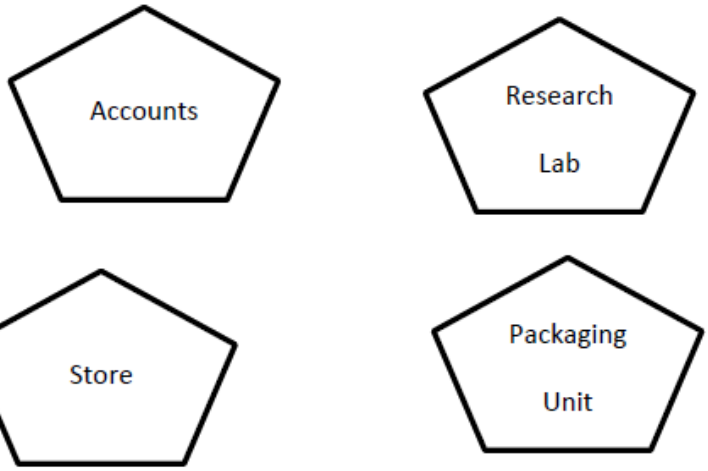
QUES | MARKS

33 | Write SQL queries for the following: | 5
a) To remove all the leading space from the column student_id of student table.
b) To calculate 4 raised to the power of 5
c) To round off the value of 234.2356 to 2 decimal places.
d) To display the first occurrence of 'or' in the string 'Corporate'
e) To display current date and time.
Or
Smruti has created the following table named Hospital

No	Name	Age	Department	Dateofadmin	Charge	Sex
1	Arpit	62	Surgery	21/01/06	300	M
2	Zayana	18	ENT	12/12/05	250	F
3	Kareem	68	Orthopedic	19/02/06	450	M
4	Abhilash	26	Surgery	24/11/06	300	M
5	Dhanya	24	ENT	20/10/06	350	F
6	Siju	23	Cardiology	10/10/06	800	M
7	Ankita	16	ENT	13/04/06	100	F
8	Divya	20	Cardiology	10/11/06	500	F
9	Nidhin	25	Orthopedic	12/05/06	700	M
10	Hari	28	Surgery	19/03/06	450	M

Help her in writing SQL query to perform the following task:
(a)To reduce Rs 200 from the charge of female patients who are in Cardiology department.
(b) To insert a new row in the above table with the following data :
11, 'Rakesh', 45, 'ENT', {08/08/08}, 1200, 'M'
(c) To remove the rows from the above table where age of the patient > 60.
(d) To add a new column Dateofdischarge of suitable data type.
(e) To change the name of the column 'Name' as 'Patient_name'.

34 | Sharma Medicos Center has set up its new center in Dubai. It has four buildings as shown in the diagram given below: | 5



Accounts to research Lab	55m
Accounts to store	150m
Store to packaging unit	160m
Packaging unit to research lab	60m
Accounts to packaging unit	125m
Store to research lab	180m

Number of Computers

Accounts	25
Research Lab	100
Store	15
Packaging Unit	60

As a network expert, provide the best possible answer for the following queries:

a) Suggest a cable layout of connections between the buildings.

b) Suggest the most suitable place (i.e. buildings) to house the server of this organization.

c) Suggest the placement of the following device with justification:

a) Repeater b) Hub/Switch

d) Suggest a system (hardware/software) to prevent unauthorized access to or from the network.

e) The company intends to link its Delhi Centre. Out of LAN,MAN,WAN what kind of network will be created. Justify your answer.

35

The mark of 9 students are given below:

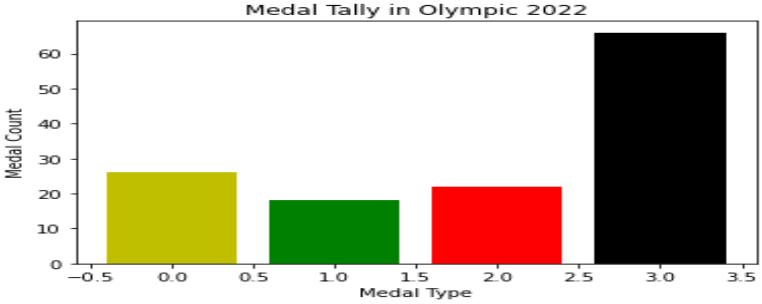
Mark = [289,453,356,300,315,490,378,401,420]

Write a suitable python code to generate a histogram based on the above data, along with an appropriate title and both axis labels.

Also give suitable python statement to save the graph.

OR

Write python code to create the following Bar Graph



Also give suitable python statement to save the graph(ignore colour of the bar).

5

****END***