SOLVED

Sample Question Paper-8

Time Allowed: 3 hours **Maximum Marks: 80**

General Instructions:

(i) Please check this question paper contains 37 questions.

(ii) All questions are compulsory. However, internal choices have been provided in some questions. Attempt only one of the choices in such questions.

(iii) The paper is divided into 5 Sections — A, B, C, D and E.

(iv) Section A consists of 21 questions (1 to 21). Each question carries 1 Mark.

(v) Section B consists of 7 questions (22 to 28). Each question carries 2 Marks.

(vi) Section C consists of 4 questions (29 to 32). Each question carries 3 Marks.

(vii) Section D consists of 2 case study type questions (33 to 34). Each question carries 4 Marks.

(viii) Section E consists of 3 questions (35 to 37). Each question carries 5 Marks.

(ix) All programming questions are to be answered using Python Language only.

(x) In case of MCQ, text of the correct answer should also be written.

SECTION-A

Question 1 to 16 are multiple choice questions. Only one of the choices is correct. Select and write the correct choice as well as the answer to these questions.

1. State whether the following statement is True or False:

The head() method returns the first n rows of a Pandas DataFrame. **[1]**

2. What will be the result of the following SQL query? SELECT MOD(14, 5); **[1]**

(a) 2 **(b)** 4 **(c)** 5 **(d)** 1

3. Ramesh received a message claiming he had won a lottery and was asked to share his bank details. What type of cybercrime is this? **[1]**

(a) Cyber bullying **(b)** Phishing **(c)** Identity theft **(d)** Hacking

4. Which function reads a CSV file into a Pandas DataFrame? **[1]**

(a) `pd.import_csv()` **(b)** `pd.read_csv()` **(c)** `df.from_csv()` **(d)** `pd.csv_read()`

5. Which network device regenerates and forwards electrical signals between two network segments to extend the transmission distance? **[1]**

(a) Bridge **(b)** Repeater **(c)** Router **(d)** Hub

6. What is the purpose of ROUND(num, 2) in SQL, assuming num has a fractional part? **[1]**

(a) Rounds to two decimal places **(b)** Always rounds up
(c) Leaves the number unchanged **(d)** Always rounds down

7. Aarav has invented a new fuel-efficient engine design for cars. Which type of intellectual property right will help him protect his invention? **[1]**

(a) Patent **(b)** Copyright
(c) Trademark **(d)** Both Copyright & Trademark

8. A Pandas Series is a _____. **[1]**

(a) Two-dimensional labelled data **(b)** One-dimensional labelled array
(c) Three-dimensional array **(d)** Unordered collection

9. In the relation Employee(EmpID, SSN, Email, Phone, DeptID), EmpID is defined as the primary key and SSN and

Email each have unique constraints. How many candidate keys exist in this relation? [1]
(a) 1 **(b)** 2 **(c)** 3 **(d)** 4

10. Which of the following mobile services uses VoIP for voice communication? [1]
(a) SMS Messaging **(b)** GPS Navigation **(c)** WhatsApp Voice Call **(d)** Mobile Banking

11. Which function counts only the non-NULL values in column_name? [1]
(a) COUNT(*) **(b)** COUNT(column_name)
(c) COUNT(DISTINCT column_name) **(d)** SUM(column_name)

12. When multiplying two Pandas Series that have different index labels, the outcome is _____. [1]
(a) Raises a KeyError
(b) Drops non-matching indices and multiplies elementwise
(c) Returns a Series with the union of indices and NaN where labels don't match
(d) Ignores indices and multiplies by position

13. The ____ (Amendment) Act, 2008 introduced new cyber-offences such as cyber terrorism and data protection. [1]
(a) Information Technology Act, 2008 **(b)** Digital India (Amendment) Act, 2008
(c) Information Technology (Amendment) Act, 2008 **(d)** Cyber Security Enhancement Act, 2008

14. Which clause is used to group rows that share the same values in one or more columns before applying aggregate functions? [1]
(a) WHERE **(b)** GROUP BY **(c)** HAVING **(d)** ORDER BY

15. Which of the following commands selects the first three rows (labels 0, 1, 2) of a DataFrame df? [1]
(a) df.loc[:3] **(b)** df.loc[:2] **(c)** df.loc[0:3] **(d)** df.iloc[1:3]

16. In which topology does each node connect to a single central device, and all data passes through that device? [1]
(a) Bus **(b)** Star **(c)** Ring **(d)** Mesh

17. What is the purpose of the UPPER() (or UCASE()) function in SQL? [1]
(a) Convert all characters in a string to lowercase **(b)** Convert all characters in a string to uppercase
(c) Remove leading spaces from a string **(d)** Trim spaces from both ends of a string

18. Which of the following statements creates an empty Pandas DataFrame? [1]
(a) pandas.DataFrame([[None]]) **(b)** pandas.DataFrame()
(c) pandas.DataFrame([None]) **(d)** pandas.DataFrame.empty()

19. Which of the following is NOT an aggregate function? [1]
(a) COUNT() **(b)** MAX() **(c)** SUBSTRING() **(d)** AVG()

20. **Assertion (A):** `df.head(0)` returns an empty DataFrame but retains all column names.
Reason (R): `head(0)` returns zero rows and preserves the structure of the DataFrame, including its columns. [1]
(a) Both A and R are True, and R correctly explains A.
(b) Both A and R are True, but R does not correctly explain A.
(c) A is True, but R is False.
(d) A is False, but R is True.

21. **Assertion (A):** The ALTER TABLE command cannot change an existing column's data type.
Reason (R): ALTER TABLE supports modifying column definitions, including changing data types in most SQL dialects. [1]
(a) Both A and R are True, and R correctly explains A.
(b) Both A and R are True, but R does not correctly explain A.
(c) A is True, but R is False.
(d) A is False, but R is True.

SECTION-B

22. **(a)** What is a DataFrame in Pandas? Mention any one property/attribute of a DataFrame. [2]

OR

(b) Write two differences between a Series and a DataFrame in Pandas?

23. What is e-waste? Mention any one impact of e-waste on soil. [2]

24. Mohan wants to create a Pandas Series as shown below:

Apple	3.0
Banana	1.2
Cherry	5.0

Help him complete the code below to achieve the desired output.

Note: `ser_data` is a dictionary.

```
import ___ as pd
ser_data = ___
prices = pd.___(ser_data)
print (prices)
```
[2]

25. **(a)** Explain to Rohan the role of a web server and web hosting in ensuring the availability of his website on the Internet. **[2]**

OR

(b) How would you define Voice over Internet Protocol and state one advantage of using it?

26. Write SQL queries to perform the following:
(i) Display the name of the day (e.g., Monday, Tuesday) for the date '2026-07-04'.
(ii) Return the length (number of characters) of the string "Incredible India". **[2]**

27. What is copyright, and how does it differ from a patent? **[2]**

28. **(a)** Write the output of the following code:

```
import pandas as pd
fruits = pd.Series(['Apple', 'Banana', 'Cherry'])
prices = pd.Series([3.5, 1.2, 5.0])
df = pd.DataFrame({'Fruit': fruits, 'Price': prices})
df.rename(columns={'Fruit': 'Item', 'Price': 'Cost'}, inplace=True)
print(df)
```
[2]

OR

(b) Write the output of the following code:

```
import pandas as pd
countries = pd.Series(['USA', 'Canada', 'Mexico'])
capitals = pd.Series(['Washington', 'Ottawa', 'Mexico City'])
df = pd.DataFrame({'Country': countries, 'Capital': capitals})
df = df.loc[df.index != 1]
print(df)
```

SECTION-C

29. Sunita has recently invented a new type of solar-powered water purification system and is concerned about the possibility of someone illegally copying and selling her invention without her permission.
(i) What is Intellectual Property versus Intellectual Property Rights?
(ii) Which IPR category applies to her purifier?
(iii) Why is enforcing IPR crucial for inventors? **[3]**

30. **(a)** Write a Python program to create a Pandas Series as shown below using a ndarray, where the subject names are the indices and the corresponding marks are the values in the series:

Physics	75
Chemistry	82
Biology	79
Mathematics	88

[3]

OR

(b) Write a Python program to create the Pandas DataFrame displayed below using a list of dictionaries.

	Name	Age
0	Alice	30
1	Bob	25
2	Charlie	28

31. **(i)** Write an SQL statement to create a table named TEACHERS, with the following specifications:

Column Name	Data Type	Key
TeacherID	Integer	Primary Key
Name	Varchar(40)	
Subject	Varchar(30)	
JoinDate	Date	

(ii) Write an SQL query to insert the following data into the TEACHERS table: 1001, 'Sandeep Roy', 'Mathematics', '2018-07-01' **[3]**

32. **(a)** Consider the following tables:

Table 1: STUDENT, which stores **StudentID, Name** and **Class.**

StudentID	Name	Class
S001	Arjun	10
S002	Meera	9
S003	Kavya	10
S004	Rahul	9
S005	Siya	10

Table 2: MARKS, which stores **StudentID, Subject** and Score

StudentID	Subject	Score
S001	English	78
S002	Mathematics	82
S003	Biology	88
S004	Chemistry	74
S005	Physics	91

Write appropriate SQL queries for the following:

(i) List the names of students enrolled in Class 9, sorted in descending order.

(ii) Display the name of all subjects in lowercase where students scored more than 75 marks.

(iii) Display the StudentID of students along with their subject and score. **[3]**

OR

(b) Consider the following table EMPLOYEE, which stores EmployeeID, Name, Department and Salary.

Table: EMPLOYEE

EmployeeID	Name	Department	Salary
E101	Anjali	Marketing	65000
E102	Rohit	IT	72000
E103	Suman	Finance	54000
E104	Neha	Marketing	60000
E105	Rohit	IT	72000

(i) Which attribute in the table can be considered as the Primary Key? Provide justification for your answer

(ii) Write a suitable SQL query to add a new column, Experience, of numeric data type to the table.

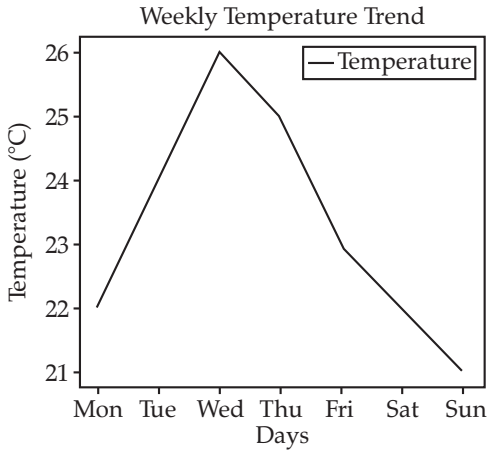
(iii) Write the output of the following SQL query.

SELECT Department, COUNT(*) FROM Employee GROUP BY Department;

SECTION-D

33. Amit wants to visualise temperature trends over a week using a line graph.

Day	Temperature (°C)
Mon	22
Tue	24
Wed	26
Thu	25
Fri	23
Sat	22
Sun	21



Help Amit complete the code.

```
_____________________ as plt #Statement-1
Days = ['Mon', 'Tue', 'Wed', 'Thu', 'Fri', 'Sat', 'Sun']
Temperature = [22, 24, 26, 25, 23, 22, 21]
_____________________ #Statement-2
plt.xlabel('Days')
plt.ylabel('Temperature (°C)')
_____________________ #Statement-3
plt.legend()
_____________________ #Statement-4
plt.show()
```

(i) Write the suitable code for the import statement in the blank space in the line marked as Statement-1.

(ii) Write the suitable code for the blank space in the line marked as Statement-2, which plots the line graph with the appropriate data and includes a label for the legend.

(iii) Fill in the blank in Statement-3 with the correct Python code to set the title of the graph.

(iv) Fill in the blank in Statement-4 with the appropriate Python code to save the graph as an image file named **'weekly_temperature.png'.** **[4]**

34. **(a)** Rajendra, who works as a database designer, has created a table named Employee as shown below:

Table: Employee

EmpID	Name	City	Salary	Join_Date
201	Neha Gupta	Delhi	55000	2021-01-10
202	Arjun Mehta	Mumbai	60000	2020-03-15
203	Riya Sharma	Kolkata	58000	2022-07-01
204	Kunal Joshi	Delhi	62000	2021-11-20
205	Meera Singh	Mumbai	57000	2020-06-05

Write suitable SQL query for the following.

(i) Show the Name and City in uppercase, sorted by Name.

(ii) Display EmpID and the month name of joining.

(iii) Calculate average salary.

(iv) Show cities and number of employees in each city. **[4]**

OR

(b) Consider the following table and write the output of the following SQL queries.

Table: Employee

EmpID	Name	DOB	Salary	City
301	Raj	12-02-1990	60000	Delhi
302	Tanya	NULL	62000	NULL
303	Mohit	NULL	58000	Pune
304	Sneha	25-03-1992	61000	NULL

Write the output of the following SQL queries.

(i) SELECT Name, LENGTH(Name) FROM Employee WHERE EmpID < 303;

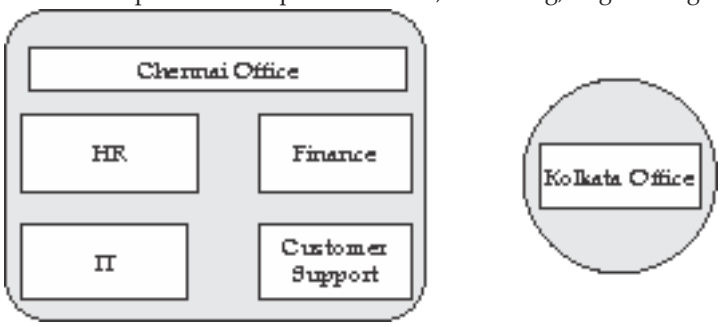
(ii) SELECT lower(Name) FROM Employee WHERE MONTH(DOB)=3;

(iii) SELECT MAX(Salary) FROM Employee;

(iv) SELECT Name, Salary FROM Employee WHERE Salary BETWEEN 60000 AND 65000;

SECTION-E

35. XYZ Solutions Ltd. is a prominent IT services firm with its headquarters in Bengaluru and a regional office in Kochi. The Bengaluru office comprises four departments: HR, Marketing, Engineering and Customer Service.



The distances between these departments, as well as between Bengaluru and Kochi, are as follows:

- HR to Marketing: 55 meters
- HR to Engineering: 85 metres
- HR to Customer Service: 110 metres
- Marketing to Engineering: 45 metres
- Marketing to Customer Service: 65 metres
- Engineering to Customer Service: 40 metres
- Bengaluru Office to Kochi Office: 1200 kilometres

The number of computers in each department/office is as follows:

- HR: 100
- Marketing: 35
- Engineering: 80
- Customer Service: 30
- Kochi Office: 60

As a network engineer, you have to propose solutions for various queries listed from I to V.

(i) Suggest the most suitable department in the Bengaluru Office setup to install the server. Also, give a reason to justify your suggested location.

(ii) Draw a suitable cable layout of wired network connectivity between the departments in the Bengaluru Office.

(iii) Which hardware device will you suggest to connect all the computers within each department?

(iv) Suggest the most appropriate type of network (LAN, MAN, WAN) to connect the Bengaluru Head Office and Kochi Regional Office.

(v) When a signal is transmitted through a wire from HR department to Customer Service department, its strength reduces. Which device would you suggest the company use to solve this problem? **[5]**

36. Consider the DataFrame `df_students` shown below.

Index	Name	Major	GPA
0	Alice	Physics	3.8
1	Bob	Chemistry	3.2
2	Carol	Mathematics	3.9
3	David	Biology	3.5
4	Eve	Computer Science	3.7

Write Python statements for the following tasks:

(i) Print the last three rows of df_students.

(ii) Add a new column named Credits with values [120, 110, 130, 100, 125].

(iii) Delete the column GPA from the DataFrame.

(iv) Rename the column Major to Field.

(v) Display only the Name and Credits columns from the DataFrame. **[5]**

37. **(a)** Write suitable **SQL** query for the following:

(i) Extract the last four characters from the employee_id column in the Employees table.

(ii) Count the number of customers from the Customer_ID column in the Customers table.

(iii) Display the month from the hire_date column in the Employees table.

(iv) Remove all leading and trailing spaces from the City column in the Addresses table

(v) Display the system date. **[5]**

OR

(b) Write suitable **SQL** query for the following:

(i) Find the length of the string 'InformationTechnology':

(ii) Find the position of the first occurrence of 'e' in the column Course_Name from the table Courses:

(iii) Raise the value in the column Score to the power of 3 from the table Results:

(iv) Find the maximum value in the column Marks from the table Students:

(v) Find the minimum value in the column Salary from the table Staff:

❐❐❐☞