

Series : S7PQR

SET~4

प्रश्न-पत्र कोड
Q.P. Code

91/7

रोल नं.

Roll No.

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परीक्षार्थी प्रश्न-पत्र कोड को उत्तर-पुस्तिका के मुख-पृष्ठ पर अवश्य लिखें।
Candidates must write the Q.P. Code on the title page of the answer-book.

नोट	NOTE
(I) कृपया जाँच कर लें कि इस प्रश्न-पत्र में मुद्रित पृष्ठ 47 हैं।	(I) Please check that this question paper contains 47 printed pages.
(II) प्रश्न-पत्र में दाहिने हाथ की ओर दिए गए प्रश्न-पत्र कोड को परीक्षार्थी उत्तर-पुस्तिका के मुख-पृष्ठ पर लिखें।	(II) Q.P. Code given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
(III) कृपया जाँच कर लें कि इस प्रश्न-पत्र में 37 प्रश्न हैं।	(III) Please check that this question paper contains 37 questions.
(IV) कृपया प्रश्न का उत्तर लिखना शुरू करने से पहले, उत्तर-पुस्तिका में यथा स्थान पर प्रश्न का क्रमांक अवश्य लिखें। []	(IV) Please write down the Serial Number of the question in the answer-book at the given place before attempting it.
(V) इस प्रश्न-पत्र को पढ़ने के लिए 15 मिनट का समय दिया गया है। प्रश्न-पत्र का वितरण पूर्वाह्न में 10.15 बजे किया जाएगा। 10.15 बजे से 10.30 बजे तक परीक्षार्थी केवल प्रश्न-पत्र को पढ़ेंगे और इस अवधि के दौरान वे उत्तर-पुस्तिका पर कोई उत्तर नहीं लिखेंगे।	(V) 15 minute time has been allotted to read this question paper. The question paper will be distributed at 10.15 a.m. From 10.15 a.m. to 10.30 a.m., the candidates will read the question paper only and will not write any answer on the answer-book during this period.

कम्प्यूटर साइंस

COMPUTER SCIENCE

निर्धारित समय : 3 घण्टे

Time allowed : 3 hours

अधिकतम अंक : 70

Maximum Marks : 70

General Instructions :

- (i) 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 **3** questions (**29 to 31**). Each question carries **3** marks.
- (vii) **Section D**, consists of **4** questions (**32 to 35**). Each question carries **4** marks.
- (viii) **Section E**, consists of **2** questions (**36 and 37**). Each question carries **5** marks.
- (ix) All programming questions are to be answered using Python Language only.
- (x) In case of MCQs, text of the correct answer should also be written.

SECTION A

21×1= 21

1. Which of the following is a keyword in Python ? 1
- (A) **Break** (B) **None**
(C) **For** (D) **Class**
2. What will be the output of the following statement ? 1
- `print(18/3 == 18//3)`
- (A) **0** (B) **False**
(C) **1** (D) **True**
3. Consider the statements given below and then choose the correct output from the given options : 1
- `D={"A": "MUMBAI", "B": "CHENNAI"}`
`print("C" in D)`
- (A) **False** (B) **0**
(C) **True** (D) **1**

4. What will be the output of the following Python code ? 1

```
try:
    num = 5
    text = "15"
    result = str(num) + text
    print(result)
except:
    print("Error")
```

- | | |
|-----------|---------|
| (A) Error | (B) 515 |
| (C) 20 | (D) 75 |

5. What will be the output of the following statement ? 1

```
print("X"* 2,"Y",end = 2 * "X", sep = "#")
```

- | | |
|-----------|------------|
| (A) Error | (B) YY#XX |
| (C) XXYY# | (D) XX#YXX |

6. If **L** is an empty list, then which of the following expressions are invalid ? 1

- | | |
|-----------------|------------|
| (A) L + 'Hello' | (B) L + [] |
| (C) L + [2] | (D) L * 2 |

7. Which of the following statements will return the substring "**STR**" (i.e. the first 3 characters) from the string "**STRING**" ? 1

- (A) "STRING"[:-3]
(B) "STRING"[-3::-1]
(C) "STRING"[3:]
(D) "STRING".startswith(3)

8. Consider the statements given below and then choose the correct output from the given options : 1

```
K=('A','B')
V='TEST'
D = dict.fromkeys(K, V)
print(D)
```

- (A) {'A': 'TEST', 'B': None}
- (B) {'A': None, 'B': 'TEST'}
- (C) {'A': 'TEST', 'B': 'TEST'}
- (D) Error

9. Which of the following is true about **clear()** in Python ? 1

- (A) It deletes the dictionary itself with all its elements.
- (B) It deletes all items of the dictionary resulting in an empty dictionary.
- (C) If **D** is a dictionary, then **clear (D)** is the correct statement.
- (D) No such function/method exists in Python.

10. Consider the statements given below and then choose the correct output from the given options : 1

```
L = ["A", "B"]
S=['C','D']
L.extend(S)
print(L)
```

- (A) ['A', 'B', 'C', 'D']
- (B) ['A', 'B', 'CD']
- (C) ['A', 'B', ['CD']]
- (D) ['A', 'B', ['C', 'D']]

11. Which of the following options is the correct mode to open a binary pickled file to add more data in a previously existing binary pickled file ? 1
- (A) 'rb' (B) 'ab'
(C) 'w' (D) 'r'
12. State True or False : 1
- In SQL, the **UNIQUE** constraint on an attribute ensures that values in it are not left empty.
13. The degree of the resulting relation after the Cartesian Product of two SQL tables with degrees **A** and **B** will be : 1
- (A) $A \times B$ (B) $A + B$
(C) $A - B$ (D) A / B
14. Which of the following is **not** true about SQL ? 1
- (A) SQL is case sensitive.
(B) An SQL statement will always end with a colon (:).
(C) SQL stands for Structured Query Language.
(D) SQL is used to retrieve data from tables through queries.
15. Which of the following is used to add a primary key to a column in a table created in MySQL ? 1
- (A) **INSERT** (B) **MODIFY**
(C) **UPDATE** (D) **ALTER**

16. In MySQL, which of the following operator is used with **WHERE** clause and returns a **True** if the value belongs to the set of specified values ? 1
- (A) **DISTINCT** (B) **IN**
(C) **LIKE** (D) **NOT**
17. Which of the following networking medium is uni-directional and most appropriate to be used for long distance wireless communication ? 1
- (A) Radio waves
(B) Infrared
(C) Bluetooth
(D) Microwaves
18. Which of the following is the correct protocol used for accessing a Web page ? 1
- (A) HTTP (B) FTP
(C) VoIP (D) SMTP
19. Which of the following options is true about XML ? 1
- (A) It stands for Expert Manipulating Language.
(B) It is a programming language.
(C) It is a dynamic language used to store and transport data through web pages.
(D) It is same as HTML.

Questions **20** and **21** are Assertion (A) and Reason (R) based questions. Mark the correct choice as :

- (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).
- (B) Both Assertion (A) and Reason (R) are true, but Reason (R) is **not** the correct explanation of the Assertion (A).
- (C) Assertion (A) is true, but Reason (R) is false.
- (D) Assertion (A) is false, but Reason (R) is true.

20. *Assertion (A) :* The **upper ()** function/method in Python returns the string with all lowercase letters of the given string converted to uppercase.

Reason (R) : Strings are mutable objects in Python.

1

21. *Assertion (A) :* If we define an attribute of a table as a Foreign key, then **UNIQUE** and **NOT NULL** constraints are automatically applied to it.

Reason (R) : The Foreign key column of a table takes its values from the Primary key of another table.

1

SECTION B

22. Differentiate between `find()` and `index()` with respect to strings in Python. Give supporting examples for both. 2

23. What are default parameters in Python functions ? Explain with the help of an example. 2

24. (I) Consider the following tuple named **PRICE** : 2

PRICE = (100, 55, 72, 65, 85, 90)

(a) Write a single line statement in Python that displays the contents of the tuple **PRICE** in ascending order of the values.

OR

(b) Write a single line statement in Python to find and display the average **PRICE** of all the values in the given tuple.

(II) (a) Write a single line Python statement using built-in functions/methods to display the content of a string **S** such that every occurrence of the alphabet 'i' of the string **S** is replaced with an underscore, i.e ' _ '.

For example, if the string **S** is :

S = "time is precious"

then the statement should display the output as :

t_me _s prec_ous

OR

(b) Write a Python statement using built-in function/method to delete the first occurrence of element **25** from the list named **myList**.

25. What possible output from the given options is expected to be displayed when the following code is executed ? Justify your answer. 2

```
import random

ITEMS={1:"PEN", 2: "ERASER", 3: "PENCIL"}

for i in range(len(ITEMS)):

    print(ITEMS[random.randint(0,i)+1],end="*")
```

- (A) PEN*PENCIL*PENCIL*
- (B) PENCIL*PEN*ERASER*
- (C) PEN*PENCIL*ERASER*
- (D) PEN*ERASER*PEN*

26. The code given below is intended to display all numbers not divisible by 7 from the given list. However, there are syntax and logical errors in the code. Rewrite it after removing all errors. Also, underline all the corrections made. 2

```
def display(L):

    for i in range(0,len(L))

        if i % 7 == 0:

            break

        else:

            print(L[i])

numbers = [11,21,33,42,55]

display(numbers)
```

27. EcoHarvest Solutions Co. is an agricultural technology firm specializing in farm management and crop optimization. The company stores crop planting details in a database table called **PLANTINGS** with attributes such as :

PlantingID, CropType, PlantingDate, FieldLocation.

Details of each harvest, including yield quantity and quality, are stored in another table named **HARVESTS** with attributes like.

HarvestID, PlantingID, YieldQuantity, YieldQuality, HarvestDate.

2

- (I) (a) Identify the attribute which should be considered as the FOREIGN KEY for joining the two tables.

OR

- (b) Which constraint should be applied to the attribute **HarvestID** such that it can be used to uniquely identify every harvest record for all crops ?
- (II) (a) Write the SQL command to change the value of **FieldLocation** of the Planting whose **PlantingID** is 'PL005' to 'North Field 3'.

OR

- (b) Write the SQL command to display the records from the table **HARVESTS** for all records which have excellent **YieldQuality**.

28. (I) (a) Define the term web server.
- (b) Write one difference between Circuit Switching and Packet Switching techniques used in Computer Networks.

2

OR

- (II) Differentiate between FTP and SMTP. Give any two points.

SECTION C

29. (a) Write a user-defined function in Python named **Find_Pattern()** which reads the contents of a text file named **LOGS.TXT** and displays all such lines that begin with the word **"ERROR"** (case-sensitive).

3

For example, if the content of file **LOGS.TXT** is as follows :

INFO: System startup complete.

WARNING: Disk space low on drive C:.

ERROR: Failed to connect to database.

INFO: User 'admin' logged in.

DEBUG: Processing request 'GET /data'.

ERROR: Invalid input received from client.

SUCCESS: Data saved.

Then the function should display the lines :

ERROR: Failed to connect to database.

ERROR: Invalid input received from client.

OR

- (b) Write a user-defined function in Python named **ContainsChar()** which reads the contents of a text file named **DOCUMENT.TXT** and displays all such words that contain the letter 'o' (case-insensitive).

For example, if the content of file **DOCUMENT.TXT** is as follows :

"A brown fox quickly jumped over the dog. It loves to frolic."

Then the function should display the following words:

brown

fox

over

dog.

loves

to

frolic.

30. (a) Consider a globally declared dictionary named **EMPLOYEE_PERFORMANCE** which contains employee IDs and their respective performance scores (out of 100) as key:value pairs. For example, the dictionary **EMPLOYEE_PERFORMANCE** may contain items as follows : $3 \times 1 = 3$

```
EMPLOYEE_PERFORMANCE = {  
    "E101": 85,  
    "E102": 92,  
    "E103": 78,  
    "E104": 95,  
    "E105": 80,  
    "E106": 70  
}
```

Write the following user-defined functions to perform the following given operations on a globally declared list implementing a stack named **TOP_PERFORMERS_LIST** :

- (I) **PushHighPerformers()** : This function should push all employee IDs from the dictionary **EMPLOYEE_PERFORMANCE** whose performance score is greater than or equal to 90 into the stack **TOP_PERFORMERS_LIST**. For example, on execution of the **PushHighPerformers()** function, the stack **TOP_PERFORMERS_LIST** should contain ["E102", "E104"] (assuming the order of insertion is **E102** then **E104**) from the above considered example of the dictionary **EMPLOYEE_PERFORMANCE**.
- (II) **IsPerformanceListEmpty()** : This function should check whether the stack **TOP_PERFORMERS_LIST** is empty or not. If it is empty, the function should return **True**; otherwise, it should return **False**.
- (III) **PopPerformer()** : This function should pop and return the topmost employee ID from the stack **TOP_PERFORMERS_LIST**. If the stack is already empty (check using the **IsPerformanceListEmpty()** function), then the function should display the message "**Stack Underflow: No top performer to pop.**"

OR

- (b) Consider a globally declared list of product prices named **PRODUCT_PRICES** as follows :

```
PRODUCT_PRICES = [ 150.75, 85.00, 299.99, 50.50,  
120.00, 99.95, 450.00 ]
```

Write the following user-defined functions to perform the following given operations on a globally declared list implementing a stack named **DISCOUNT_PRICES** :

- (I) **PushDiscPrices()** : This function should push all those prices from the list **PRODUCT_PRICES** which are less than or equal to **100.00** into the stack **DISCOUNT_PRICES**. For example, on execution of the **PushDiscPrices()** function, the stack **DISCOUNT_PRICES** should contain **[85.00, 50.50, 99.95]** (assuming this order of pushing is based on appearance in the **PRODUCT_PRICES** list) from the above considered example of the list **PRODUCT_PRICES**.
- (II) **PopDiscPrices()** : This function should pop and display the last (topmost) price from the stack **DISCOUNT_PRICES**. If the stack is already empty, then the function should display the message "**No More Discount Prices to Pop**" and return **None**.
- (III) **ShowDiscPrices()** : This function should display all the prices from the stack **DISCOUNT_PRICES** without deleting any price from the stack. The content of **DISCOUNT_PRICES** should be displayed as per stack LIFO rule (i.e., last price to first price). If there are no prices in the stack, then display the message "**Stack is Empty: No discount prices to show**".

31. (a) Predict the output on execution of the following Python code : 3

```
SCORES = [5, 12, 7, 20, 10, 18]
for X in range(len(SCORES)):
    if SCORES[X] % 4 == 0:
        SCORES[X] = SCORES[X] + SCORES[X-1]
    elif SCORES[X] % 3 == 0:
        SCORES[X] = SCORES[len(SCORES) - 1 - X] + 5
    else:
        SCORES[X] = SCORES[X] // 2
for Y in range(0, len(SCORES), 2):
    if Y + 1 < len(SCORES):
        print(SCORES[Y], SCORES[Y+1], sep="$")
    else:
        print(SCORES[Y], sep="$")
```

OR

- (b) Predict the output on execution of the following Python code :

```
def Transform(D_A, D_B):
    D_C = {}
    D_C.update(D_A)
    D_A.update(D_B)
    D_B.update(D_C)
    return D_C

Init_Stock = {"Chocolate": 100, "Cookie": 50}
New_Arriv = {"Cookie": 60, "Chocolate": 120}
T_Data = Transform(Init_Stock, New_Arriv)
print(Init_Stock)
print(New_Arriv)
print(T_Data)
```

SECTION D

32. TechMart Inc. manages its product inventory using an SQL table named **PRODUCTS**. The table consists of the attributes **PID**, **PName**, **Category**, **Price**, **Quantity**, and **LastUpdated**, and contains the following records:

Table : PRODUCTS

PID	PName	Category	Price	Quantity	LastUpdated
101	Laptop Pro	Electronics	1200	50	2024-01-10
102	Gaming Mouse	Peripherals	45.99	200	2023-11-25
103	Ergonomic Keyboard	Peripherals	75	150	2024-02-01
104	Smart Speaker	Electronics	89.99	100	2024-01-15
105	USB-C Hub	Accessories	29.5	300	2023-12-05
106	External SSD 1TB	Storage	99	75	2024-03-01
107	Wireless Earbuds	Audio	129.99	120	2024-02-10
108	Desk Lamp	Home	35	180	2023-10-20
109	Web Camera HD	Peripherals	60	NULL	2024-01-25
110	Portable Charger	Accessories	49.99	250	2023-12-15

(a) Based on the data given above answer the following questions : $4 \times 1 = 4$

- (I) Write the SQL statement to display the **PName** and **Price** of those **PRODUCTS** that belong to the '**Electronics**' category and have a Price greater than 100.00.
- (II) Write the SQL statement to display the **Category** and the total number of products in each category.
- (III) Write the SQL statement to display the entire **PRODUCTS** table content, in ascending order of **Last date of Updation** (showing the earliest updates first).
- (IV) Write the SQL statement to make the **Price** of all **PRODUCTS** whose quantity is not known, to 0.

OR

(b) Considering the above given table **PRODUCTS**, write the output on execution of the following SQL commands:

- (I) **SELECT Avg(Quantity) FROM PRODUCTS**
WHERE Category = 'Peripherals';
- (II) **SELECT DISTINCT Category FROM PRODUCTS;**
- (III) **SELECT COUNT(PID) FROM PRODUCTS**
WHERE Quantity < 100;
- (IV) **SELECT PName, Category FROM PRODUCTS**
WHERE PName LIKE '%Speaker%';

33. A CSV file named "ORDERS.CSV" contains records of customer orders placed on an e-commerce platform. The structure of each record is as follows : 2+2=4

[OrderID, CustomerID, OrderDate, TotalAmount, OrderStatus]

A sample row for the CSV file is given below for reference :

['ORD001', 'C101', '2024-05-20', 150.75, 'Shipped']

Write the following Python function definitions to perform the specified tasks with the CSV file :

- (i) **RecentOrders()** : This function should read the rows from the CSV file and display the **OrderID** and **TotalAmount** for all orders placed in the year '2024'.
- (ii) **AddOrder(newOrder)** : This function should write data at the end of the CSV file. The record is passed as argument to the function.

34. Consider a database **LIBRARY_CATALOG** containing the following two tables – **PUBLISHERS** and **BOOKS** given below :

Table : PUBLISHERS

PublID	Name	Country	Genre
101	Grand Books	USA	Fiction
102	World Lit Press	UK	Non-Fiction
103	Tech Tome	Germany	Sci-Fi
104	Story Weaver	USA	Fiction
105	Global Insights	Canada	Non-Fiction

Table : BOOKS

BookID	Title	PublID	PublYear	Pages
3001	The Last Horizon	101	2018	450
3002	Echoes of Tomorrow	103	2020	320
3003	A Brief History	102	2015	580
3004	Whispers in the Wind	101	2019	280
3005	Starship Odyssey	103	2021	400
3006	The Silent Shore	104	2022	350
3007	Understanding AI	103	2019	290

Note : The attribute **Pages** in the table **BOOKS** represents the total number of pages in a book, **PublID** represents the Publisher's Identification Number, **PublYear** represents the Year of Publication.

Write the SQL queries for the following :

$4 \times 1 = 4$

- (I) (a) To display Title of all **BOOKS** and their corresponding **PublYear** which belong to the '**Fiction**' type of **Genre** (from **PUBLISHERS** table) through Equi Join.

OR

- (b) To display **Title** of all **BOOKS** and their corresponding **PublYear** which belong to the '**Fiction**' type of **Genre** (from **PUBLISHERS** table) through Natural Join.

- (II) To display **Name** of all **PUBLISHERS** and their corresponding **Title** of **BOOKS** in ascending order of **PublYear**.
- (III) To delete all records from the table **BOOKS** whose **PublYear** is older than **2020**.
- (IV) To open the database **LIBRARY_CATALOG** and then display the names of all tables present in the database.

35. A table named **EQUITY** in **INVESTMENT** database has the following structure :

4

Field	Type	Remarks
Code	Char(6)	Code of stock
Name	Varchar(15)	Name of stock
Exchange	Char(3)	Name of exchange
LTP	Float	Last traded Price
Volume	int	Amount of stock

Write a function in Python to display all the records where **Exchange** is **BSE** from the **EQUITY** table. Also display the total number of such records.

Assume the following for Python database connectivity :

- Host – localhost
- User – Finman
- Password – Stk2026

SECTION E

36. A file `CLINICAL_TRIALS.DAT` stores records of the following structure :

[`TRIAL_ID`, `PATIENT_NAME`, `DRUG_TESTED`, `DOSAGE_MG`,
`OUTCOME_SCORE`]

Where :

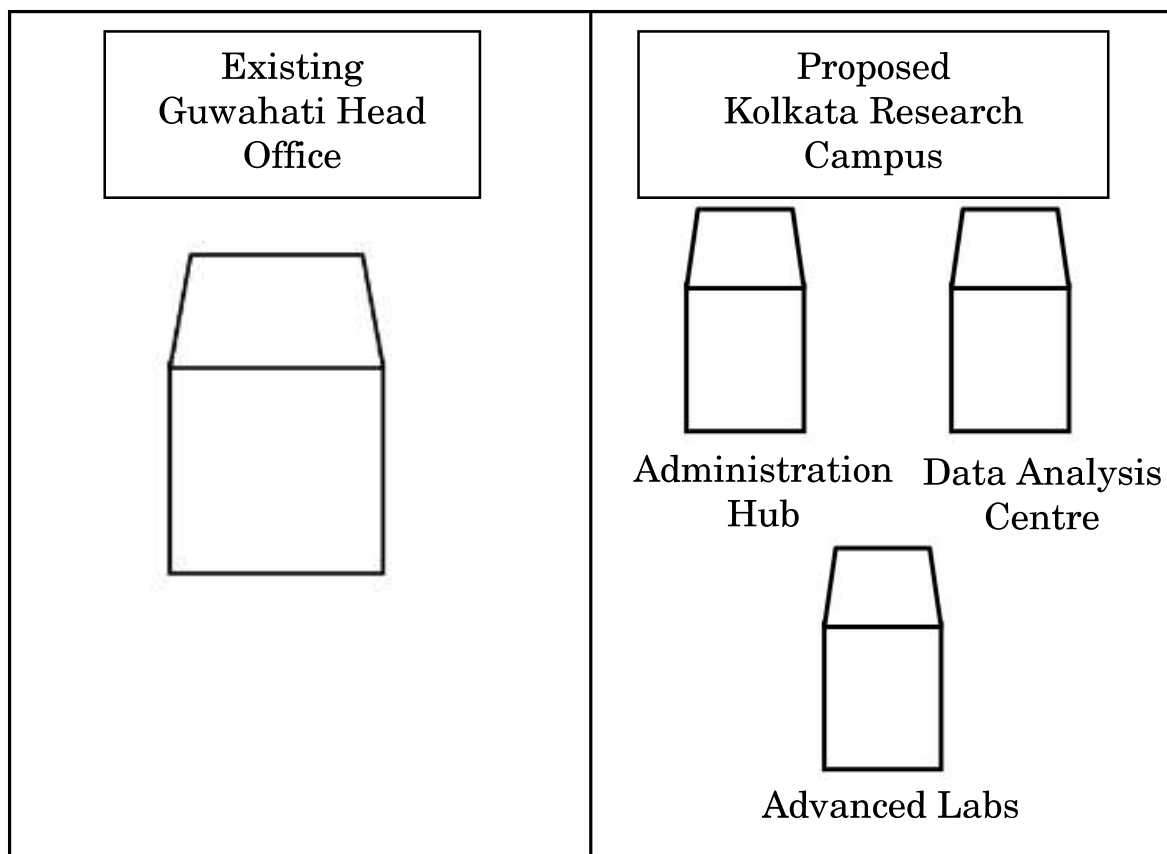
- `TRIAL_ID` - Unique identifier for the clinical trial participant (string type)
- `PATIENT_NAME` - Name of the patient (string type)
- `DRUG_TESTED` - Name of the drug administered (string type, e.g., "DrugX", "DrugY", "Placebo")
- `DOSAGE_MG` - Dosage of the drug in milligrams (integer type)
- `OUTCOME_SCORE` - Numerical score indicating the treatment outcome (float type, higher score means better outcome)

Write user-defined functions in Python for the following tasks : 2+3=5

- (I) `RecordTrialData()` : This function should input data for clinical trial participants and write it to the binary file `CLINICAL_TRIALS.DAT`.
- (II) `AdjustLowDosage()` : This function should increase the `DOSAGE_MG` of all participants whose `OUTCOME_SCORE` is below 0.5 by 20% and rewrite the updated records into the file `CLINICAL_TRIALS.DAT`.

37. You are the lead network architect for “The Green Sprout Institute,” a rapidly expanding agricultural research and development organization with its head office located in Guwahati, Assam. The Green Sprout Institute is undergoing significant expansion, which includes : $5 \times 1 = 5$

- Acquiring a new, larger central research campus in Kolkata, to house advanced laboratory equipment and a large administrative and research staff.
- Integrating four smaller remote field-testing stations across various agricultural regions in Assam : These stations will primarily focus on automated sensor data collection and transfer the data securely to the central research campus in Kolkata.
- The new Kolkata Research Campus will comprise of three distinct sections/blocks : Advanced Labs, Data Analysis Centre, and Administrative Hub, as shown in the conceptual layout below :



Distance between the sections of Proposed Kolkata Research Campus :

Section to Section	Distance
Advanced Labs to Data Analysis Centre	280 metres
Data Analysis Centre to Administrative Hub	320 metres
Administrative Hub to Advanced Labs	250 metres

- Each section in the Kolkata Research Campus will have the following number of computers/devices :

Section	Number of computers/devices
Advanced Labs	100
Data Analysis Centre	60
Administrative Hub	150

As the lead network architect, you need to propose a comprehensive network design and implementation plan that addresses all the key issues of The Green Sprout Institute's expansion goals. Answer the questions given below in this respect :

- (I) Suggest a device to be installed in each of the sections of the Kolkata Research Campus to connect the cables of individual computers/devices within that section.
- (II) Suggest the most appropriate location (Section) to install the SERVER in the Kolkata campus (out of the 3 sections) to get the best and most effective connectivity and security for critical research data. Justify your answer.
- (III) Draw the cable layout to reliably connect various sections within the Kolkata Campus.
- (IV) What type of network out of PAN, LAN, MAN, WAN will be set up when the central Guwahati Head Office is connected with the new Kolkata Research Campus ?
- (V) (a) Which secure and high-bandwidth wired transmission medium should preferably be used to connect the Guwahati Head Office with the Kolkata Research Campus for transferring large datasets and research files ?

OR

- (b) Which specific protocol will be used if researchers at the Guwahati HQ need to have Collaborative Research Sessions using video conferencing with Kolkata Research Centre ?