

DATA ANALYST Assignment -2

Database Thinking for Real-World Systems

Role: Junior Data Analyst / Data Professional

Submission Format: Structured Report (PDF or DOC)

Submission Platform: GITHUB

No AI-generated answers allowed (logic matters more than words)

SECTION 1: DBMS Architecture (40 Minutes)

Q1. Explain 3-Level DBMS Architecture in your own words.

For each level include:

1. Purpose
2. Real-life example
3. What happens if that level is removed?

Q2. Consider a Banking System.

Design views for:

1. Customer
2. Bank Teller
3. Branch Manager

Explain:

1. What data each role should see
2. Why separation is important

SECTION 2: CAP Theorem (35 Minutes)

Q3. Define:

1. Consistency
 2. Availability
 3. Partition Tolerance
- Use real-world examples.

Q4. Classify the following systems:

System	CP / AP / CA	Explain Reason
Bank transaction system	?	?
Instagram likes counter	?	?
Netflix movie streaming	?	?
Airline ticket booking	?	?

CP (Consistency + Partition Tolerance)

CA (Consistency + Availability)

AP (Availability + Partition Tolerance)

Q5. Scenario Question

If Uber loses connection between two data centers:

1. What risks occur?
2. Which CAP property should Uber prioritize?
3. Why?

SECTION 3: ACID Properties (40 Minutes)

Q6. Explain each ACID property using:

1. Definition
2. Banking example
3. What happens if property fails?

Q7. Analyze this scenario:

User transfers ₹5000 from Account A to Account B.

System crashes after debit but before credit.

Answer:

1. Which ACID property failed?
2. What should DBMS do?
3. Business impact if not fixed?

SECTION 4: Transactions & Concurrency (45 Minutes)

Q8. Identify Transaction Boundaries

For Online Shopping:

Steps:

1. Add to cart
2. Make payment
3. Update inventory
4. Generate invoice

Answer:

1. Which steps must be one transaction?
2. Why?

Q9. Concurrency Problem Identification

Two users attempt to book last movie ticket simultaneously.

Explain:

1. Possible data problems
2. Business impact
3. How concurrency control prevents it

SECTION 5: Locking Mechanism (30 Minutes)

Q10. Differentiate:

Lock Type	Purpose	Real Example
Shared Lock	?	?
Exclusive Lock	?	?

Q11. Deadlock Scenario

Design a simple situation where:

- Transaction A holds Resource 1
- Transaction B holds Resource 2
- Both wait for each other

Explain:

- Why deadlock occurs
- One solution to prevent it

SECTION 6: Indexing (30 Minutes)

Q12. Explain Indexing Using:

Library example

Amazon search example

Q13. Decide Index Type

For each case choose suitable index & justify:

Scenario	Index Type	Reason
Searching customer by Customer_ID	?	?
Sorting orders by Order Date	?	?
Searching products by Product Name	?	?

SECTION 7: Analyst Thinking Challenge (20 Minutes)

Q14. Performance Issue Scenario

Company reports slow query performance for sales dashboard.

As data analyst:

1. What questions will you ask DBA?
2. What database elements might cause slowness?
3. How indexing helps solve problem?