CAF 3 - DATA, SYSTEMS AND RISKS

ONE-PAGER REVISION NOTES

Compiled SC E-Learning Revision Pack

Quick Revision • Exam-Focused • Scenario-Based

SC E-LEARNING

Hub of Ultimate Study Solutions

Contact: 0331 4435703

CONTENTS

CAF 3 One-Pager Revision Notes

01 Chapter 1 - Types of Data and Sources

02 Data Governance and Data Quality

03 Chapter 3 - Introduction to Data Analytics

04 Chapter 4 - Big Data

05 Database Management System (DBMS)

06 Three-Level DBMS Architecture

07 ACID Properties of DBMS

08 Normalization and Normal Forms (1NF, 2NF, 3NF)

09 Data Warehousing and Data Marts

10 Data Warehousing and Business Intelligence

11 Cloud Computing

12 Artificial Intelligence (AI) and Automation

13 Blockchain and FinTech

14 Cybersecurity and Information Security

Each topic appears as a full-page revision infographic for quick exam preparation.

SC E-LEARNING
Hub of Ultimate Study Solutions

CAF 3 – DATA, SYSTEMS AND RISKS

REVISION NOTE – QUICK REVISION

CHAPTER 1: TYPES OF DATA AND SOURCES

0331 4435703
www.sce-learning.com/ca
/scelearning
/scelearning

WHAT IS DATA?

Data is a collection of raw facts and figures which, when processed and organized, becomes meaningful information that helps in decision making.



TYPES OF DATA (DETAILS)

Nominal Data
Categorical data with no natural order. Numbers are just labels.
Example: Blood group, Marital status

Ordinal Data
Categorical data with a meaningful order or ranking.
Example: Customer satisfaction (Poor, Average, Good, Excellent)

Discrete Data
Numeric data that can take only whole numbers.
Example: Number of employees, Number of defects

Continuous Data
Numeric data that can take any value within a range (including decimals).
Example: Height, Weight, Temperature

Historical Data
Past data used for analysis and comparison.
Example: Last year sales data

Real-time Data
Data generated and processed immediately.
Example: Live transaction data, IoT sensor data

CLASSIFICATION OF DATA

Basis	Types	Description	Examples
By Nature	Qualitative (Categorical)	Non-numeric data that describes qualities or characteristics.	Gender, Color, Country, Brand
	Quantitative (Numerical)	Numeric data that can be measured or counted.	Age, Salary, Quantity, Sales
By Structure	Structured	Organized in a predefined format (rows & columns).	Excel sheets, Databases
	Unstructured	No predefined format. Text-heavy or multi-media.	Emails, PDFs, Images, Videos
By Time	Cross-sectional (Static)	Data collected at a single point in time.	Census data, Year-end data
	Time-series (Dynamic)	Data collected over different periods of time.	Daily sales, Stock prices

SOURCES OF DATA

INTERNAL SOURCES

Operational Systems
Data from daily business operations.
Example: Sales system, ERP, POS

Internal Reports
Management reports, dashboards, MIS reports.

Transaction Records
Invoices, receipts, payments, journal entries.

Employee Data
HR records, attendance, performance evaluations.

EXTERNAL SOURCES

Government Sources
Census, Economic surveys, Regulatory bodies.

Industry Reports
Market research, Industry associations, Publications.

Public Databases
World Bank, IMF, Stock exchanges, Open data portals.

Social Media & Web
Customer reviews, Trends, News, Online behavior.

KEY POINTS TO REMEMBER

- Data → Raw Facts → Processed → Information → Decision
- Quality data leads to better analysis and decision making.
- Right source + Right type of data = Reliable information
- Data must be accurate, relevant, complete, consistent and timely.
- Always consider confidentiality and ethical use of data.



EXAM TIPS

- Identify data type from the scenario first.
- Understand the source before answering.
- Use clear examples in written answers.
- Diagram/flowcharts can help in data flow or source questions.



EXAM TIP

Scenario mein data ki nature aur source ko pehchanne ki practice karein. Sahi classification se hi sahi analysis aur decision possible hota hai.

IMPORTANT KEYWORDS

Qualitative | Quantitative | Nominal | Ordinal | Discrete | Continuous | Structured | Unstructured | Internal Source | External Source | Real-time | Historical | Data Quality

0331 4435703
FOR ONLINE CLASSES & TEST SERIES

SC E-LEARNING
Hub of Ultimate Study Solutions

CAF 3 – DATA, SYSTEMS AND RISKS

REVISION NOTE – QUICK REVISION

TOPIC: DATABASE MANAGEMENT SYSTEMS (DBMS) & ACID PROPERTIES

0331 4435703
www.sce-learning.com
/scelearning
/scelearning

WHAT IS A DBMS?

A Database Management System (DBMS) is software that allows users to define, create, maintain and control access to a database. It ensures that data is accurate, consistent, secure and can be shared by multiple users efficiently.



TYPES OF DATA IN DATABASE

TYPE	DESCRIPTION
MASTER DATA	Core data that changes infrequently, e.g., Customer, Product, Employee.
TRANSACTION DATA	Daily operational data, e.g., Sales, Purchases, Payments.
REFERENCE DATA	Codes and standards used for consistency, e.g., Country Codes, Tax Codes.
META DATA	Data about data, e.g., Table structure, Data dictionary.

COMPONENTS OF DBMS

DATABASE ENGINE	Manages storage, retrieval, update and deletion of data.
QUERY PROCESSOR	Interprets and executes SQL queries.
TRANSACTION MANAGER	Ensures transactions follow ACID properties.
STORAGE MANAGER	Handles file storage, indexes, partitioning and backup.
SECURITY MANAGER	Controls authentication, authorization and access rights.

KEY BENEFITS OF DBMS

- Data Independence
- Security and Access Control
- Data Integrity and Accuracy
- Efficiency and Performance
- Data Sharing and Consistency

ACID PROPERTIES – ENSURES RELIABLE TRANSACTIONS

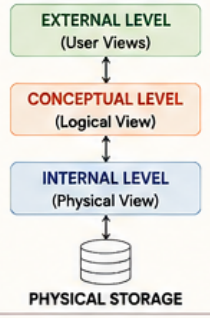
PROPERTY	MEANING	EXAMPLE IN SCENARIO	IF VIOLATED?
A ATOMICITY	All operations in a transaction are completed or none.	Money transfer: Either debit and credit both happen, or none.	Partial update may occur.
C CONSISTENCY	Database moves from one consistent state to another.	Bank balance rules, constraints and data validation are always maintained.	Data becomes inconsistent.
I ISOLATION	Concurrent transactions do not interfere with each other.	While profit is calculated, other transactions cannot change those balances.	Wrong results due to interference.
D DURABILITY	Once committed, changes are permanent.	After payment is saved and system crashes, data is still available.	Committed data may be lost.

SCENARIO EXAMPLE

A payment application posts two entries for a customer transfer. Debit entry is recorded, but before credit entry is posted, the system fails.

PROPERTY APPLIED	RESULT
Atomicity	DBMS rolls back entire transaction so that neither account is changed.

THREE-LEVEL DBMS ARCHITECTURE (QUICK RECAP)



- **EXTERNAL LEVEL:**
  Different users see different views.
  Example: Teller sees only name, balance, due date.
- **CONCEPTUAL LEVEL:**
  Shows complete logical structure of database.
  Example: Customer table with all fields.
- **INTERNAL LEVEL:**
  Shows how data is actually stored.
  Example: Stored in SSD, indexed, partitioned.

Benefit: Changes at one level do not affect the other levels (Data Independence).

DATA INDEPENDENCE (TWO TYPES)

1. LOGICAL DATA INDEPENDENCE

Change in conceptual level (e.g., adding new field or table) does not affect external views and user applications.

Example:
Adding Risk_Category field in Customer table.

2. PHYSICAL DATA INDEPENDENCE

Change in internal level (e.g., adding index, partitioning, changing storage) does not affect conceptual level and user applications.

Example:
Creating index on Customer_ID for faster search.

QUICK POINTS TO REMEMBER

- ✓ DBMS helps store, manage and protect data.
- ✓ ACID properties ensure reliable and correct transactions.
- ✓ Three-level architecture provides data independence.
- ✓ Logical change ≠ Physical change.
- ✓ DBMS manages large data efficiently and securely.
- ✓ Always identify the level or property asked in question first.

EXAM TIP In MCQs, read scenario carefully and identify which property / level / benefit is being applied.

KEY WORDS
DBMS | ACID | Atomicity | Consistency | Isolation | Durability
External Level | Conceptual Level | Internal Level
Logical Independence | Physical Independence

0331 4435703
FOR ONLINE CLASSES & TEST SERIES

SC E-LEARNING
Hub of Ultimate Study Solutions

CAF 3 – DATA, SYSTEMS AND RISKS

REVISION NOTE – QUICK REVISION

CHAPTER 3: INTRODUCTION TO DATA ANALYTICS

0331 4435703
www.sce-learning.com/ca
/scelearning
/scelearning

WHAT IS DATA ANALYTICS?

Data analytics is the process of inspecting, cleaning, transforming and modeling data to discover useful information, draw conclusions and support decision making.



DATA ANALYTICS PROCESS (CRISP-DM FRAMEWORK)

1. **Business Understanding**
   Define the problem, objectives and success criteria.
2. **Data Understanding**
   Collect initial data and understand its quality and characteristics.
3. **Data Preparation**
   Clean, transform, handle missing values and prepare data for analysis.
4. **Modeling**
   Select techniques, build and test models.
5. **Evaluation**
   Evaluate results, check if they meet business objectives.
6. **Deployment**
   Implement insights into business processes and monitor results.

Note: The process is iterative, you may go back to previous steps if needed.

TYPES OF DATA ANALYTICS

Type	Purpose	Key Question	Example
Descriptive	Summarizes historical data to understand what happened.	What happened?	Monthly sales report, dashboards, KPIs.
Diagnostic	Analyzes data to find the reasons behind what happened.	Why did it happen?	Low sales analysis, customer churn reasons.
Predictive	Uses statistical models and ML to predict future outcomes.	What is likely to happen?	Sales forecasting, demand prediction, risk scoring.
Prescriptive	Recommends best actions to achieve desired outcomes.	What should we do?	Pricing optimization, inventory planning, recommendations.

ANALYTICS TECHNIQUES

- **Descriptive Statistics**
  Mean, Median, Mode, %, charts
- **Data Mining**
  Patterns, associations, clustering
- **Regression Analysis**
  Predict numerical outcomes
- **Classification**
  Predict categories (Yes/No, High/Low)
- **Time Series Analysis**
  Trend analysis and forecasting
- **Optimization**
  Find the best possible solution

TOOLS USED IN DATA ANALYTICS

- **Excel**
  Basic analysis, formulas, pivot tables, charts.
- **SQL**
  Data extraction, filtering, aggregation from databases.
- **Python / R**
  Advanced analytics, statistics, machine learning.
- **Power BI / Tableau**
  Data visualization, dashboards, reporting.

DATA ANALYTICS VS DATA ANALYSIS

Data Analysis	Data Analytics
Focuses on historical data.	Uses both historical & current data to predict future.
Answers: What happened?	Answers: Why it happened, What will happen, What should we do?
Uses basic techniques (reports, dashboards, queries).	Uses advanced techniques (statistics, ML, AI, optimization).
Helps in understanding past performance.	Helps in decision making and improving future performance.

KEY BENEFITS OF DATA ANALYTICS

- Better decision making
- Identify trends and patterns
- Improve operational efficiency
- Customer insights and satisfaction
- Cost reduction and risk management
- Competitive advantage

KEY POINTS TO REMEMBER

- Good quality data is the foundation of good analytics.
- Right technique for right problem.
- Data cleaning is very important (Garbage In, Garbage Out).
- Results must be meaningful, accurate and actionable.
- Always consider ethics, privacy and data security in analytics.



EXAM TIP

Question mein "what happened" ho to Descriptive, "why happened" ho to Diagnostic, "what will happen" ho to Predictive aur "what should we do" ho to Prescriptive choose karo.

IMPORTANT KEYWORDS

Data | Information | Analytics | Descriptive | Diagnostic | Predictive | Prescriptive | Model | Pattern | Trend | Forecast | Dashboard | KPI | Decision Support

0331 4435703
FOR ONLINE CLASSES & TEST SERIES

SC E-LEARNING
Hub of Ultimate Study Solutions
SC E-LEARNING

CAF 3 – DATA, SYSTEMS AND RISKS

REVISION NOTE – QUICK REVISION

CHAPTER 4: BIG DATA

0331 4435703
www.sce-learning.com/ca
/scelearning
/scelearning

WHAT IS BIG DATA?

Big Data refers to extremely large and complex datasets that traditional data processing applications cannot handle effectively. It comes from multiple sources in diverse formats and is generated continuously.



THE 5 Vs OF BIG DATA

V	Meaning	Explanation	Example
	Volume	Huge amount of data generated from many sources.	Terabytes of transaction data from all branches.
	Velocity	High speed at which data is generated and needs to be processed.	Real-time clickstream data from mobile app.
	Variety	Data comes in many different types and formats.	Text, images, audio, video, logs, sensor data.
	Veracity	Data quality and reliability can vary and may contain uncertainties.	Duplicate records, missing values, inconsistent data.
	Value	Transforming data into meaningful insights that create business value.	Using data to improve customer experience and increase sales.

COMMON SOURCES OF BIG DATA

- **Social Media** – Posts, likes, comments, shares
- **Mobile Devices** – App usage, location, sensors
- **Internet of Things (IoT)** – Smart devices, meters, vehicles
- **Web & Clickstream Data** – Browsing behavior, page views
- **Enterprise Systems** – ERP, CRM, transaction systems

BIG DATA CHALLENGES

- Handling large volume and high velocity of data
- Integrating data from diverse sources
- Ensuring data quality, accuracy and consistency
- Storage and processing cost
- Data privacy, security and regulatory compliance
- Lack of skilled professionals and tools
- Extracting meaningful insights from raw data

TECHNOLOGIES USED IN BIG DATA

Hadoop	Distributed storage (HDFS) and processing framework (MapReduce)
Apache Spark	Fast in-memory processing for large-scale data.
NoSQL Databases	Store unstructured / semi-structured data (e.g., MongoDB, Cassandra).
Kafka	Real-time data streaming and messaging.
Hive / Pig	Data warehousing and querying big data.

BIG DATA ARCHITECTURE (SIMPLIFIED)

Data Sources	Data Ingestion	Storage	Processing	Analytics & Insights
Social Media, IoT Devices, Web Logs, Enterprise Systems, Mobile Apps	Collect and stream data from multiple sources	Store in distributed file systems or NoSQL databases	Process using distributed computing frameworks	Analyze and visualize for business decisions

IMPORTANCE / BENEFITS OF BIG DATA

- Better and faster decision making
- Improved customer experience and personalization
- Identification of trends and patterns
- Operational efficiency and cost reduction
- New products, services and business models
- Enhanced risk management and fraud detection
- Competitive advantage in the market



COMMON BIG DATA USE CASES

- **Retail:** Customer behavior analysis, demand forecasting
- **Banking:** Fraud detection, credit scoring, customer insights
- **Healthcare:** Patient monitoring, disease prediction
- **Manufacturing:** Predictive maintenance, quality control
- **Telecom:** Churn prediction, network optimization

KEY POINTS TO REMEMBER

- Big Data ≠ only large data, it includes speed, variety, quality & value.
- Right data + right tools + right analysis = valuable insights.
- Big Data needs special technologies: Hadoop, Spark, NoSQL, etc.
- Data quality and security are critical in Big Data projects.
- Business objective should drive data collection and analysis.



EXAM TIP

V's yaad rakhne ke liye: "Volume bahut zyada, Velocity bahut tez, Variety alag alag, Veracity par dhyaan, tabhi milti hai Value."

IMPORTANT KEYWORDS

Volume | Velocity | Variety | Veracity | Value | Hadoop | Spark | NoSQL | IoT | Social Media | Clickstream | Distributed Processing | Real-time | Data Quality

0331 4435703
FOR ONLINE CLASSES & TEST SERIES

SC E-LEARNING
Hub of Ultimate Study Solutions

CAF 3 – DATA, SYSTEMS AND RISKS

REVISION NOTE – QUICK REVISION

TOPIC: DATABASE MANAGEMENT SYSTEM (DBMS)

0331 4435703
www.sce-learning.com
/scelearning
/scelearning

WHAT IS DBMS?

A Database Management System (DBMS) is software that allows users to define, create, maintain and control access to a database. It acts as an interface between users/applications and the data.



FUNCTIONS OF DBMS

Data Definition	Defines structure of database, tables, fields, relationships.
Data Manipulation	Insert, update, delete and retrieve data.
Data Security	Controls access to data and protects from unauthorized use.
Data Sharing	Allows multiple users to access and share data safely.
Backup & Recovery	Ensures data is backed up and can be restored in case of failure.
Data Integrity	Ensures accuracy, consistency and validity of data.

TYPES OF DBMS

- **Hierarchical DBMS** – Organizes data in a tree-like structure.
- **Network DBMS** – Uses graph structure with many-to-many relationships.
- **Relational DBMS (RDBMS)** – Stores data in tables (relations). Most widely used.
- **Object-Oriented DBMS** – Stores data as objects, similar to OOP.

DBMS ARCHITECTURE (THREE LEVELS)

LEVEL	DESCRIPTION	EXAMPLE
External Level	User views. Each user sees only the part of data relevant to them.	HR view sees only employee data.
Conceptual Level	Overall logical structure of the entire database.	All data entities and relationships.
Internal Level	Physical storage structure and how data is stored.	Files, indexes, data pages on disk.

DBMS SCHEMAS

SCHEMA	DESCRIPTION	EXAMPLE
External Schema	Describes user views or sub-views of the database.	A view for accounts department.
Conceptual Schema	Describes entire database logically, including entities & relationships.	All tables, relationships, constraints.
Internal Schema	Describes how data is physically stored.	Storage structures, indexes, file organization.

ACID PROPERTIES OF DBMS

PROPERTY	MEANING
Atomicity	All operations in a transaction are completed fully, or none at all.
Consistency	Transaction brings database from one valid state to another valid state.
Isolation	Concurrent transactions do not interfere with each other.
Durability	Once committed, changes are permanent even in case of failure.

DBMS vs FILE SYSTEM

DBMS	File System
Minimal data redundancy	High data redundancy
Data consistency and integrity	Data inconsistency may occur
Multi-user data sharing	No or limited data sharing
Security and access control	Weak security
Backup and recovery	Limited recovery options
Data independence	No data independence

EXAMPLE IN REAL LIFE

A university uses DBMS to store student, course, and result data. Different departments (Admissions, Exams, Accounts) access only their required data through their own views securely, while the central database remains consistent and protected.



DBMS ADVANTAGES

- Reduces data redundancy and inconsistency.
- Improves data security and access control.
- Data sharing and multi-user access.
- Enforces data integrity and accuracy.
- Provides backup and recovery facilities.
- Data independence (logical & physical).
- Improves productivity and decision making.

DBMS DISADVANTAGES

- High cost of software and hardware.
- Complex to design and maintain.
- Requires skilled database administrator.
- Performance may slow down with very large data.
- Single point of failure if DBMS fails.

DBMS SECURITY MEASURES

- **Authentication** – Verify user identity.
- **Authorization** – Grant access based on role or privilege.
- **Access Control** – Restrict data access.
- **Audit Trail** – Record activities for monitoring.
- **Encryption** – Protect data from unauthorized access.

KEY POINTS TO REMEMBER

- ✓ DBMS manages data efficiently and securely.
- ✓ Three level architecture provides data independence.
- ✓ ACID ensures reliable and consistent transactions.
- ✓ Proper security protects data from unauthorized access.
- ✓ DBMS is better than file system for large organizations.

★ EXAM TIP

In exams, identify the DBMS concept in the scenario, explain it properly and relate with real-life examples.

KEY WORDS

DBMS | Schema | Table | Relation | ACID | Integrity | Redundancy | Normalization | Transaction | Security | Backup

0331 4435703
FOR ONLINE CLASSES & TEST SERIES

SC E-LEARNING
Hub of Ultimate Study Solutions

CAF 3 – DATA, SYSTEMS AND RISKS

REVISION NOTE – QUICK REVISION

TOPIC: THREE-LEVEL DBMS ARCHITECTURE

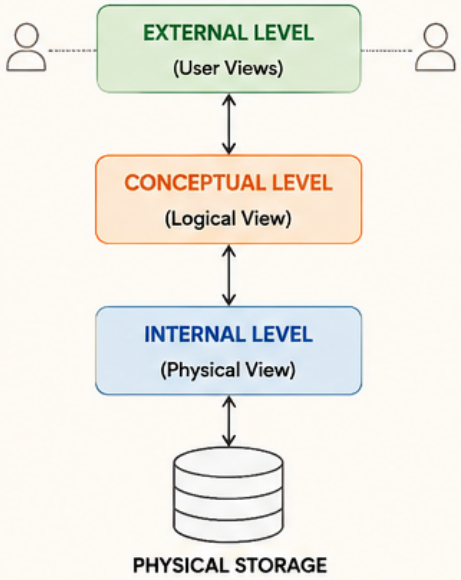
0331 4435703
www.sce-learning.com
/scelearning
/scelearning

WHAT IS DBMS ARCHITECTURE?

DBMS Architecture is the structure of Database Management System which shows how data is stored, managed and accessed by different users in an organization.

THREE-LEVEL ARCHITECTURE

DBMS uses a three-level architecture to separate users from the physical storage of data. It provides data independence, security and flexibility.



LEVELS EXPLAINED

LEVEL	PURPOSE	EXAMPLE
1. EXTERNAL LEVEL (User Views)	• Shows data as per user's requirement. • Different users see different views. • Hides unnecessary data from users.	Teller sees only Name, Balance and Due Date.
2. CONCEPTUAL LEVEL (Logical View)	• Shows complete logical structure of the database. • Defines tables, fields, relationships and constraints. • Independent of physical storage.	Customer table has fields: ID, Name, Balance, Risk_Category, etc.
3. INTERNAL LEVEL (Physical View)	• Shows how data is actually stored. • Includes files, indexes, partitions, compression, storage devices. • Independent of logical structure.	Data stored in SSD, partitioned table, with index on Customer_ID.

KEY BENEFITS

DATA INDEPENDENCE
Changes at one level do not affect other levels.

SECURITY
Users see only the data they are authorized to see.

FLEXIBILITY
Different users/ departments have customized views.

EASY MAINTENANCE
Physical changes can be made without affecting users.

DATA INDEPENDENCE – TWO TYPES

1. LOGICAL DATA INDEPENDENCE

- Change in conceptual level (e.g. adding new field) does not affect external views / user applications.
- Example: Adding Risk_Category in Customer table.

2. PHYSICAL DATA INDEPENDENCE

- Change in internal level (e.g. adding index, partitioning, changing storage) does not affect conceptual level and user applications.
- Example: Creating index on Customer_ID.

IMPORTANCE IN SCENARIO

- Organization can give different views to different departments.
- Sensitive data can be hidden from unauthorized users.
- Database can be changed or improved at physical level without affecting users.
- Improves performance and reduces maintenance cost.

SCENARIO EXAMPLE

In FinLedger, Teller sees only Customer Name, Loan Balance and Due Date (External View). Risk Department also sees Risk_Category (Another External View).

DBA adds Risk_Category in Customer table (Conceptual Level Change) – existing teller application is not disturbed (Logical Independence). DBA also creates index on Customer_ID and moves Repayment table to faster storage (Internal Level Change) – applications remain unchanged (Physical Independence).

QUICK POINTS TO REMEMBER

- ✓ External = User View (Partial Data)
- ✓ Conceptual = Logical Structure (Whole Database)
- ✓ Internal = Physical Storage (Files, Indexes)
- ✓ Logical Independence = Logical changes don't affect users
- ✓ Physical Independence = Physical changes don't affect logical structure

★ EXAM TIP In exam, always draw the 3 levels diagram and explain with scenario application. It carries high marks.

KEY WORDS External Level | Conceptual Level | Internal Level | Logical Independence | Physical Independence

0331 4435703
FOR ONLINE CLASSES & TEST SERIES

SC E-LEARNING
Hub of Ultimate Study Solutions

CAF 3 – DATA, SYSTEMS AND RISKS

REVISION NOTE – QUICK REVISION

TOPIC: ACID PROPERTIES OF DBMS

0331 4435703
www.sce-learning.com
/scelearning
/scelearning

WHAT ARE ACID PROPERTIES?

ACID properties are a set of rules used by DBMS to ensure that database transactions are processed reliably and data remains accurate even in case of errors, failures or system crashes.



WHAT IS A TRANSACTION?

A transaction is a sequence of one or more operations performed as a single logical unit of work. Either all operations are completed successfully or none of them are applied.

BEGIN TRANSACTION → OPERATIONS (INSERT, UPDATE, DELETE) → COMMIT (END)

WHY ACID IS IMPORTANT?

- Guarantees data accuracy and integrity
- Prevents partial updates
- Ensures consistent results in multi-user environment
- Protects data from crashes and failures
- Builds trust in systems and reports

THE FOUR ACID PROPERTIES

PROPERTY	MEANING	EXAMPLE IN REAL LIFE	IF VIOLATED?
A ATOMICITY	All operations in a transaction are completed entirely or not at all.	If Rs. 10,000 is transferred from A to B, then both debit from A and credit to B must happen. If one fails, none should happen.	Partial data saved (e.g., money deducted but not credited).
C CONSISTENCY	Transaction brings database from one valid state to another valid state by following all rules and constraints.	After a loan disbursement, Total Loan Amount must be updated and remain within approved limits.	Rules broken (e.g., balance becomes negative, invalid data entered).
I ISOLATION	Multiple transactions happen concurrently but each transaction behaves as if it is the only one executing.	Two users updating different accounts at the same time should not see each other's partial updates.	Interference occurs (e.g., incorrect reading or dirty data).
D DURABILITY	Once a transaction is committed, the changes are permanently saved even if system fails later.	After saving a journal entry, it must remain saved even if power goes off or system crashes.	Committed data lost after crash (serious data loss).

HOW ACID WORKS TOGETHER? (EXAMPLE)

1. Customer places an order.
2. Payment is processed from customer.
3. Inventory is updated and order is saved.
4. If all steps complete – COMMIT.
5. If any step fails – ROLLBACK (no change).

ACID ensures that system remains correct, reliable and safe even in errors or failures.

QUICK COMPARISON

A Atomicity	All or nothing
C Consistency	Follows all rules
I Isolation	No interference between concurrent transactions
D Durability	Once saved, always saved

SCENARIO EXAMPLE

A bank system is transferring Rs. 5,000 from Customer X to Customer Y.

Atomicity: Either both accounts updated or none.

Consistency: Total money in system remains same.

Isolation: Other users cannot see half transfer.

Durability: After transfer, data remains saved even if system crashes.

EXAM TIPS

- ✓ Always remember the full form: ACID.
- ✓ Learn meaning + example for each.
- ✓ Focus on the "If violated" column – very important for scenarios.
- ✓ Practice MCQs – these are high weightage.
- ✓ Use keywords in answers for theory questions.

EXAM TIP In theory answers, explain property + example + why it is important in DBMS. In scenarios, identify which property is involved and give reason.

KEY WORDS Atomicity | Consistency | Isolation | Durability | Transaction | Commit | Rollback | Database Integrity

0331 4435703
FOR ONLINE CLASSES & TEST SERIES

SC E-LEARNING
Hub of Ultimate Study Solutions

CAF 3 – DATA, SYSTEMS AND RISKS

REVISION NOTE – QUICK REVISION

TOPIC: NORMALIZATION & NORMAL FORMS (1NF, 2NF, 3NF)

0331 4435703
www.sce-learning.com
/scelearning
/scelearning

WHAT IS NORMALIZATION?

Normalization is the process of organizing data in tables to:

- ✓ Reduce data redundancy
- ✓ Improve data integrity
- ✓ Eliminate insert, update and delete anomalies
- ✓ Make data more consistent and reliable

WHY NORMALIZATION IS IMPORTANT?

- Reduces duplicate data (Saves storage)
- Improves data integrity (Accurate and consistent data)
- Reduces anomalies (Insert, Update, Delete anomalies)
- Easy maintenance (Changes in one place only)

NORMALIZATION SHORTCUT

1NF = ONE VALUE
2NF = WHOLE KEY
3NF = ONLY KEY

Yaad rakhne ka simple rule –
1NF: One Value, 2NF: Whole Key, 3NF: Only Key

NORMAL FORMS EXPLAINED

Normal Form	Key Rule	Example Problem	How to Fix	Result
1NF (First Normal Form)	• Each column must have atomic (single) values. • No repeating groups or multiple values in one cell.	PromotionCodes column has 'P20;EID' in one cell.	Make a separate table for Promotion Codes or store each code in a separate row.	All values are atomic (single).
2NF (Second Normal Form)	• Must be in 1NF first. • No partial dependency. • Every non-key column must depend on the whole of the primary key.	Composite key = (OrderID + ProductID) ProductName depends only on ProductID, not on whole key.	Move Product-related columns to Product table. Keep only order line details in Order table.	No partial dependency remains.
3NF (Third Normal Form)	• Must be in 2NF first. • No transitive dependency. • Non-key column should not depend on another non-key column.	SupplierName depends on SupplierID, and SupplierID depends on ProductID.	Move SupplierName to Supplier table. Keep only SupplierID in Product table.	No transitive dependency remains.

NORMALIZATION FLOW

UNNORMALIZED TABLE (Has redundancy & anomalies) → **1NF** (Atomic values only) → **2NF** (Remove partial dependency) → **3NF** (Rmnove transitive dependency) → OPTIMIZED TABLE (No redundancy, No anomalies)

BENEFITS vs DRAWBACKS

BENEFITS

- ✓ Reduces duplicate data and saves space.
- ✓ Improves data accuracy and integrity.
- ✓ Less update / insert / delete anomalies.
- ✓ Easy data maintenance and consistency.

DRAWBACKS

- ✗ More tables are created.
- ✗ More joins are required in queries.
- ✗ Some queries may become slower.
- ✗ Complex for simple reporting sometimes.

ANOMALIES ELIMINATED

Insert Anomaly
Cannot insert some data without other related data.

Update Anomaly
Same data in many rows. Change in one place only causes inconsistency.

Delete Anomaly
Deleting a row may cause loss of other important data.

SCENARIO EXAMPLE (QuickPharma)

QuickPharma records online orders in one table (Order_History). It has duplicate data and anomalies.

- ✓ **1NF Issue:** PromotionCodes has multiple values (P20;EID).
- ✓ **2NF Issue:** ProductName depends only on ProductID, not on whole key (OrderID + ProductID).
- ✓ **3NF Issue:** SupplierName depends on SupplierID, not directly on the key.

KEY POINTS TO REMEMBER

- ✓ 1NF makes values atomic (no multiple values).
- ✓ 2NF removes partial dependency.
- ✓ 3NF removes transitive dependency.
- ✓ Higher normal forms = better integrity but more tables and joins.
- ✓ Always start normalization after identifying primary key and dependencies.

EXAM TIP In exam, first identify the key, then find the dependencies and decide the normal form.

KEY WORDS Atomic Value | Redundancy | Anomaly | Dependency | Partial Dependency | Transitive Dependency | 1NF | 2NF | 3NF

0331 4435703
FOR ONLINE CLASSES & TEST SERIES

SC E-LEARNING
Hub of Ultimate Study Solutions

CAF 3 – DATA, SYSTEMS AND RISKS

REVISION NOTE – QUICK REVISION

TOPIC: DATA WAREHOUSING & DATA MARTS

0331 4435703
www.sce-learning.com
/scelearning
/scelearning

WHAT IS DATA WAREHOUSE?

A Data Warehouse (DW) is a central repository of integrated, historical, subject-oriented, non-volatile data used for **management reporting** and **decision making.**

KEY CHARACTERISTICS OF DW

Subject-Oriented
Organized around major subjects (e.g., Sales, Customer, Product).

Integrated
Data comes from multiple sources but is consistent.

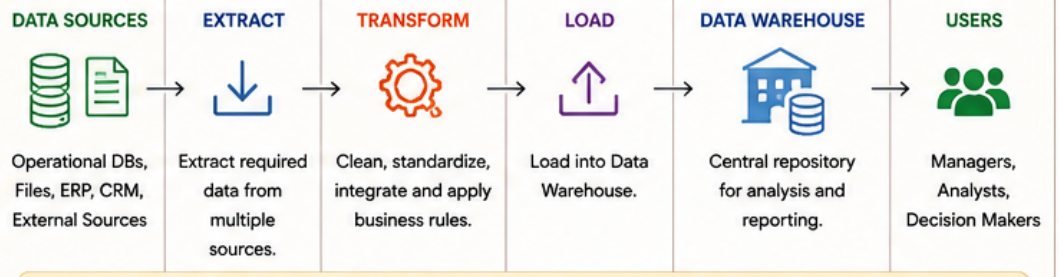
Time-Variant
Stores historical data with a time dimension.

Non-Volatile
Data is read-only; once loaded it is not changed, only new data added.

OLTP vs DATA WAREHOUSE

	OLTP (Operational DB)	Data Warehouse
Purpose	Day-to-day operations	Reporting & analysis
Data	Current, detailed	Historical, summarized
Updates	Frequent (Insert/Update/Delete)	Infrequent (Append only)
Users	Clerks, Staff	Managers, Analysts
Design	Normalized	Denormalized (Star/Snowflake)
Queries	Short, simple	Complex, analytical

DATA WAREHOUSE ARCHITECTURE (ETL PROCESS)



ETL = Extract → Transform → Load (Most important process in Data Warehousing)

DATA MART

A Data Mart is a smaller subset of the Data Warehouse focused on a specific department or business unit.

TYPES OF DATA MARTS

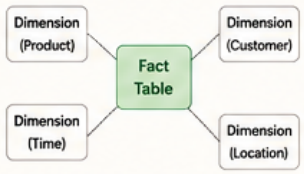
- **Dependent Data Mart**: Derived from the central Data Warehouse.
- **Independent Data Mart**: Created directly from operational sources.

BENEFITS OF DATA MARTS

- ✓ Faster reporting for a specific department.
- ✓ Lower cost than building a full Data Warehouse.
- ✓ Focused data = easier to manage.

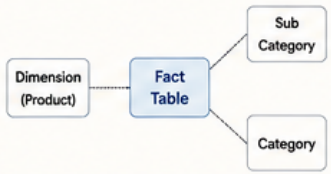
DATA WAREHOUSE SCHEMAS

STAR SCHEMA



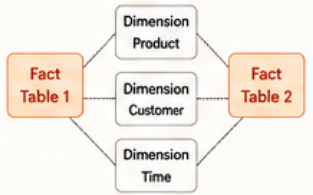
- Central fact table linked to denormalized dimensions.
- Simple & easy to understand.
- Faster query performance.

SNOWFLAKE SCHEMA



- Dimensions are normalized into multiple tables.
- Saves storage space.
- More joins, slightly slower queries.

FACT CONSTELLATION (GALAXY SCHEMA)



- Multiple fact tables share common dimensions.
- Used for complex business analysis.
- More flexible but more complex.

SCENARIO EXAMPLE

A company records daily sales in its operational system (OLTP).
Management wants monthly sales by Product, Customer and City for the last 5 years.

Solution: Build a Data Warehouse with a Sales_Fact table and dimensions of Product, Customer and Time.

The Sales Department also needs quick reports only for their region, so a Data Mart is created for Sales Dept.

KEY POINTS TO REMEMBER

- ✓ Data Warehouse supports decision making, not day-to-day transactions.
- ✓ ETL process is the heart of Data Warehouse.
- ✓ Data Mart = small, focused part of DW.
- ✓ Star schema = simple & fast.
- ✓ Snowflake schema = saves storage, more joins.
- ✓ OLTP and DW are different in purpose and design.

COMMON EXAM POINTS

- Characteristics of Data Warehouse (4 points)
- ETL process steps
- Difference between OLTP and DW
- Data Mart: types and benefits
- Star vs Snowflake schema differences
- Scenario-based application (must link with case)

EXAM TIP
In scenario questions, first identify the requirement (Reporting / Analysis / Departmental). Then decide whether DW, Data Mart or OLTP is suitable.

KEY WORDS
Subject-Oriented | Integrated | Time-Variant | Non-Volatile
ETL | Data Mart | Star Schema | Snowflake Schema | OLTP | Reporting

0331 4435703
FOR ONLINE CLASSES & TEST SERIES

SC E-LEARNING
Hub of Ultimate Study Solutions

CAF 3 – DATA, SYSTEMS AND RISKS

REVISION NOTE – QUICK REVISION

TOPIC: DATA WAREHOUSING & BUSINESS INTELLIGENCE

0331 4435703
www.sce-learning.com
/scelearning
/scelearning

WHAT IS A DATA WAREHOUSE?

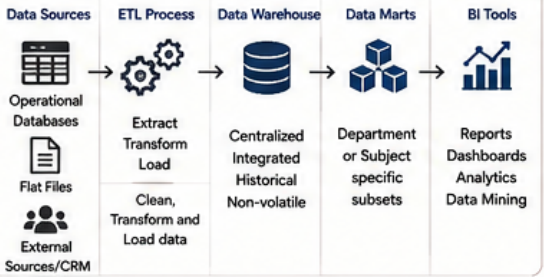
A Data Warehouse (DW) is a central repository that stores integrated, subject-oriented, time-variant and non-volatile data to support management decision making.



KEY CHARACTERISTICS (INMON)

- **Subject-Oriented** – Organized around major subjects like Sales, Finance, etc.
- **Integrated** – Data from multiple sources is cleaned and consistent.
- **Time-Variant** – Keeps historical data with time reference.
- **Non-Volatile** – Data is stable and not updated or deleted, only added.

DATA WAREHOUSE ARCHITECTURE



ETL (Extract, Transform, Load) is the process of extracting data from various sources, transforming it into a consistent format and loading it into the data warehouse.

DATA MARTS

- Data marts are smaller, subject or department specific subsets of data warehouse.
- They improve performance, simplify access and meet specific business needs.
- Types: Dependent Data Mart (from DW) and Independent Data Mart (direct from sources).

OLTP vs OLAP vs DATA WAREHOUSE

OLTP (Online Transaction Processing)	OLAP (Online Analytical Processing)	DATA WAREHOUSE
Handles day-to-day transactions	Handles analysis and complex queries	Stores historical integrated data
Many short simple transactions	Complex, long running queries	Time-variant data (historical)
Many users (Clerks, Operators)	Fewer users (Analysts, Managers)	Non-volatile (Write once, read many)
Current data (Up-to-date)	Summarized and aggregated data	Integrated from multiple sources
High performance for inserts/updates	High performance for read/analysis	Supports BI, Reporting, Data Mining

BUSINESS INTELLIGENCE (BI)

BI refers to technologies, applications and processes used to collect, analyze and present business information to support better decision making.



BI TOOLS & TECHNIQUES

- Reporting (Standard, Ad-hoc, Drill-down)
- Dashboards & Scorecards
- OLAP (Slice & Dice, Pivot)
- Data Mining (Pattern, Prediction)
- KPI Monitoring
- Trend Analysis
- What-if Analysis
- Predictive Analytics

BENEFITS OF DATA WAREHOUSING & BI

- **Better Decision Making** – Timely and accurate insights.
- **Improved Performance** – Offloads reporting from operational systems.
- **Historical Analysis** – Track trends and patterns over time.
- **Data Consistency** – Single version of truth.
- **Operational Efficiency** – Saves time and reduces cost.
- **Competitive Advantage** – Better planning and forecasting.

CHALLENGES / RISKS

- High initial cost of implementation.
- Data quality issues (Garbage In, Garbage Out).
- Complex ETL process.
- Data latency (Not real-time).
- Need for skilled resources.
- Security and privacy of sensitive data.

EXAM FOCUS – KEY POINTS

- Understand characteristics of Data Warehouse (Inmon model).
- Know difference between OLTP, OLAP and Data Warehouse.
- Explain ETL process with its steps.
- Data Marts: types and advantages.
- List and explain BI tools and their uses.
- Benefits and challenges of Data Warehousing and BI.
- Apply concepts in scenario based questions.

EXAM TIP

In exam, identify whether the question is asking about Data Warehouse, Data Mart, ETL, OLAP/OLTP or BI tools. Link your answer with scenario and give practical examples.

KEY WORDS

Data Warehouse | ETL | Data Mart | OLTP | OLAP | BI | Inmon Model
Subject-Oriented | Integrated | Time-Variant | Non-Volatile | Reporting
Dashboards | Data Mining | KPI | Trend Analysis | Decision Support

0331 4435703
FOR ONLINE CLASSES & TEST SERIES

SC E-LEARNING
Hub of Ultimate Study Solutions

CAF 3 – DATA, SYSTEMS AND RISKS

REVISION NOTE – QUICK REVISION

TOPIC: CLOUD COMPUTING

0331 4435703
www.sce-learning.com
/scelearning
/scelearning

WHAT IS CLOUD COMPUTING?

Cloud Computing is the delivery of computing services (servers, storage, databases, networking, software, analytics, etc.) over the internet ("the cloud") to offer faster innovation, flexible resources and economies of scale.



CLOUD SERVICE MODELS

IaaS (Infrastructure as a Service)	Provides virtualized computing resources over the internet. User manages OS, applications and data. Example: AWS EC2, Azure VM
PaaS (Platform as a Service)	Provides platform for developing, testing and deploying applications. User manages applications and data only. Example: Google App Engine, Azure App Service
SaaS (Software as a Service)	Provides complete software applications over the internet. User manages data and settings. Example: Microsoft 365, Google Workspace

KEY CHARACTERISTICS (NIST)

- **On-Demand Self-Service** – Users can provision resources automatically without human interaction with provider.
- **Broad Network Access** – Services are available over the network and accessed via standard mechanisms.
- **Resource Pooling** – Provider's resources are pooled to serve multiple users (multi-tenant model).
- **Rapid Elasticity** – Resources can be scaled up or down quickly and appear unlimited to the user.
- **Measured Service** – Usage is measured, monitored and billed (pay-as-you-go model).

BENEFITS OF CLOUD COMPUTING

- Lower upfront cost (Pay-as-you-go)
- Scalability and flexibility
- High availability and reliability
- Accessibility from anywhere
- Reduced maintenance and updates
- Focus on core business

RISKS / CHALLENGES

- Data security and privacy
- Vendor lock-in
- Downtime and service disruption
- Compliance and legal issues
- Limited control over infrastructure
- Dependence on internet connectivity

CLOUD DEPLOYMENT MODELS

Public Cloud	Services are provided over the public internet and shared by multiple organizations. Example: AWS, Microsoft Azure
Private Cloud	Cloud infrastructure is used exclusively by one organization. Greater control and security. Example: On-premise private cloud
Hybrid Cloud	Combination of public and private clouds with data and applications shared between them. Example: Using Azure with on-premise data center
Community Cloud	Shared by several organizations with similar requirements (e.g., healthcare, government). Example: GovCloud

IaaS vs PaaS vs SaaS (WHO MANAGES WHAT?)

Component	IaaS	PaaS	SaaS
Physical Infrastructure	Provider	Provider	Provider
Virtualization	Provider	Provider	Provider
Operating System	Customer	Provider	Provider
Middleware	Customer	Provider	Provider
Applications	Customer	Customer	Provider
Data	Customer	Customer	Customer
Who Manages?	More Control	Moderate Control	Less Control

Customer Manages Provider Manages

KEY SECURITY CONCERNS AND CONTROLS IN CLOUD

CONCERN	DESCRIPTION	KEY CONTROLS
Data Confidentiality	Unauthorized access to sensitive data.	• Encryption (in transit & at rest) • Access Control & MFA • Data classification
Data Integrity	Unauthorized or accidental modification of data.	• Hashing, digital signatures • Versioning & audit trails • Input validation
Availability	Service downtime or unavailability.	• Redundancy, backup & failover • DDoS protection • SLA monitoring
Compliance	Failing to meet legal and regulatory requirements.	• Compliance frameworks (ISO 27001, etc.) • Data residency & retention policies • Regular audits

CLOUD COMPUTING BEST PRACTICES

- Choose the right service and deployment model for your needs.
- Understand the shared responsibility model.
- Encrypt data and manage keys securely.
- Implement strong identity and access management.
- Monitor usage, performance and costs continuously.
- Keep regular backups and test disaster recovery.
- Ensure compliance with applicable laws and standards.
- Review vendor SLAs carefully.
- Conduct regular security assessments.
- Provide user training and awareness.



EXAM TIP

In exam questions, first identify the type of cloud service or deployment model, then match the scenario with correct characteristics, benefits, risks and controls.

KEY WORDS

On-Demand | Resource Pooling | Elasticity | Measured Service | IaaS | PaaS | SaaS | Public Cloud | Private Cloud | Hybrid Cloud | Confidentiality | Integrity | Availability | Compliance | SLA

0331 4435703
FOR ONLINE CLASSES & TEST SERIES

SC E-LEARNING
Hub of Ultimate Study Solutions

CAF 3 – DATA, SYSTEMS AND RISKS

REVISION NOTE – QUICK REVISION

TOPIC: ARTIFICIAL INTELLIGENCE (AI) & AUTOMATION

0331 4435703
www.sce-learning.com
/scelearning
/scelearning

WHAT IS AI?

Artificial Intelligence (AI) refers to machines or software that can perform tasks that normally require human intelligence, such as learning, reasoning, problem solving, perception and decision making.



TYPES OF AI (BY CAPABILITY)

Narrow / Weak AI	Designed to perform a specific task (e.g., voice assistants, recommendation systems).
General / Strong AI	Machines with human-level intelligence across a wide range of tasks. (Not yet achieved)
Super AI	Intelligence beyond human level in every aspect. (Hypothetical)

TYPES OF AI (BY FUNCTION)

Analytical AI	Analyzes past data to find patterns and insights.
Predictive AI	Uses historical data to predict future outcomes.
Generative AI	Creates new content like text, images, audio, code, etc.
Agenting AI	Acts autonomously to achieve goals, make decisions and take actions.

RISKS AND CHALLENGES

- Job displacement due to automation
- Bias in AI models due to biased data
- Data privacy and security concerns
- Lack of transparency (black box problem)
- Lack of transparency (black box
- High implementation and maintenance
- Over-reliance on AI decisions

EXAMPLES OF AI APPLICATIONS

AREA	APPLICATION	EXAMPLE
Customer Service	Chatbots and virtual assistants	Chatbots on websites, voice assistants (e.g., Siri)
Finance	Fraud detection and risk scoring	AI detects unusual transactions in banking
Manufacturing	Predictive maintenance	AI predicts machine failure before it happens
Retail	Recommendation systems	Suggesting products on Daraz, Amazon
Healthcare	Disease diagnosis	AI analyzes medical images to detect diseases
Transport	Self-driving vehicles	Autonomous cars using AI for navigation

AI TECHNIQUES (KEY ONES)

TECHNIQUE	DESCRIPTION
Machine Learning (ML)	Systems learn from data and improve without explicit programming.
Deep Learning (DL)	Uses neural networks with many layers for complex pattern recognition.
Natural Language Processing (NLP)	Allows machines to understand, interpret and generate human language.
Computer Vision	Enables machines to interpret and make decisions from visual data.

AI vs TRADITIONAL AUTOMATION

	TRADITIONAL AUTOMATION (Rule-Based)	AI (Intelligent Automation)
	Follows predefined rules and instructions.	Learns from data and improves over time.
	Best for repetitive and structured tasks.	Handles complex, unstructured and dynamic tasks.
	Cannot adapt to changes without reprogramming.	Can adapt to new data and situations.
	Requires human intervention for exceptions.	Can make decisions with minimal human help.
	Example: Macro in Excel, Data entry bots.	Example: Fraud detection, Chatbots, Predictive models.

BENEFITS OF AI AND AUTOMATION

- Increases efficiency and productivity
- Reduces human errors
- Saves time and cost
- Works 24/7 without fatigue
- Enhances decision making with data insights
- Handles large volumes of data quickly
- Improves customer experience
- Supports innovation and business growth

EXAM TIP

In scenario based questions, first identify the type of AI or automation technique being used, then explain its role, benefits and possible risks in that situation.

HOW TO APPROACH SCENARIO QUESTIONS

1. Identify the main issue in the scenario.
2. Identify the correct AI/Automation concept or tool.
3. Explain how it works in that scenario.
4. Give benefits, limitations or risks.
5. Conclude with a suitable recommendation.

QUICK POINTS TO REMEMBER

- AI learns and improves; Traditional automation just follows rules.
- AI types by function: Analytical, Predictive, Generative, Agenting.
- AI applications exist in almost every industry.
- Benefits are high but risks must be carefully managed.
- Always relate the concept directly to the scenario in the exam.

EXAM TIP

Learn concepts with examples and practice MCQs and scenarios daily for better understanding.

KEY WORDS

AI | Machine Learning | Deep Learning | NLP | Computer Vision | Automation | Analytical AI | Predictive AI | Generative AI | Agenting AI | Bias | Privacy | Efficiency

0331 4435703
FOR ONLINE CLASSES & TEST SERIES

SC E-LEARNING
Hub of Ultimate Study Solutions

CAF 3 – DATA, SYSTEMS AND RISKS

REVISION NOTE – QUICK REVISION

TOPIC: BLOCKCHAIN AND FINTECH

0331 4435703
www.sce-learning.com
/scelearning
/scelearning

WHAT IS BLOCKCHAIN?

Blockchain is a distributed digital ledger that records transactions across many computers in a secure, transparent and tamper-resistant way.



KEY CHARACTERISTICS

Decentralized	No central authority controls the network.
Transparency	All transactions are visible to authorized participants.
Immutability	Once recorded, data cannot be changed or deleted.
Security	Uses cryptography to secure data and transactions.
Distributed Ledger	All participants have a copy of the ledger.

TYPES OF BLOCKCHAIN

Public Blockchain
Open to anyone.
Bitcoin, Ethereum

Private Blockchain
Controlled by one organization.
Example: Hyperledger Fabric

Permissioned / Consortium
Controlled by a group of organizations.
Example: R3 Corda

HOW BLOCKCHAIN WORKS (SIMPLE FLOW)



1. **Transaction Initiated** – A transaction is requested.
2. **Broadcast to Network** – The transaction is sent to all nodes.
3. **Validation** – Nodes validate the transaction using consensus mechanism.
4. **Block Creation** – Transaction is grouped with others into a block.
5. **Block Added to Chain** – Block is added to the blockchain.
6. **Transaction Complete** – The transaction is permanent and visible.

CONSENSUS MECHANISMS

Mechanism	How it Works	Example	Key Point
Proof of Work (PoW)	Miners solve complex mathematical puzzles.	Bitcoin	High security but high energy use.
Proof of Stake (PoS)	Validators are chosen based on the coins they hold.	Ethereum (PoS)	More energy efficient.
Delegated Proof of Stake (DPoS)	Token holders vote for delegates to validate transactions.	EOS, TRON	Faster and more scalable.

BLOCKCHAIN vs TRADITIONAL DATABASE

BLOCKCHAIN	FEATURE	TRADITIONAL DATABASE
Decentralized	Control	Centralized
Immutable	Data Change	Can be modified
Transparent (visible to network)	Visibility	Access controlled
High (uses cryptography)	Security	Depends on administrator
Slower (consensus needed)	Speed	Faster
High (multiple copies)	Cost	Lower

WHAT IS FINTECH?

FinTech (Financial Technology) refers to the use of technology to deliver financial services in a better, faster and more efficient way.



EXAMPLES OF FINTECH APPLICATIONS

- **Digital Payments** – Mobile wallets, online payments (e.g., Easypaisa, JazzCash)
- **Online Banking** – Internet banking, account management
- **Robo-Advisors** – Automated investment advice and portfolio management
- **P2P Lending** – People lend money to others through online platforms
- **InsurTech** – Technology-driven insurance products and services
- **RegTech** – Technology used to ensure regulatory compliance

BENEFITS AND RISKS OF BLOCKCHAIN & FINTECH

BENEFITS

- Increases transparency and trust
- Reduces fraud and errors
- Lower transaction costs
- Faster settlements
- Financial inclusion for more people
- Automation improves efficiency

RISKS / CHALLENGES

- Regulatory uncertainty
- Cybersecurity threats
- Scalability issues
- High energy consumption (PoW)
- Lack of standardization
- Privacy concerns

EXAM TIP

In MCQs and scenarios, identify the technology or concept first, then apply it with correct reason and example from the scenario.

KEY WORDS

Blockchain | Distributed Ledger | Consensus | Hash | Block | Chain | Smart Contract | FinTech | Digital Payment | RegTech | InsurTech | Decentralization | Immutability | Transparency | Cryptography

0331 4435703
FOR ONLINE CLASSES & TEST SERIES

SC E-LEARNING
Hub of Ultimate Study Solutions

CAF 3 – DATA, SYSTEMS AND RISKS

REVISION NOTE – QUICK REVISION

TOPIC: CYBERSECURITY & INFORMATION SECURITY

0331 4435703
www.sce-learning.com
/scelearning
/scelearning

WHAT IS CYBERSECURITY?

Cybersecurity is the practice of protecting systems, networks, programs and data from digital attacks, damage, unauthorized access or theft. It ensures confidentiality, integrity and availability of information.



COMMON CYBER THREATS

Malware	Malicious software like virus, worm, Trojan Horse, ransomware that damages or steals data.
Phishing	Fraudulent emails or websites trick users to reveal sensitive information.
Ransomware	Malware that encrypts data and demands payment to restore access.
DDoS Attack	Overwhelms a server or network with huge traffic making services unavailable.
Insider Threat	Current or former employee misuses access to harm the organization.

CIA TRIAD – CORE SECURITY PRINCIPLE

Confidentiality	Ensure data is accessible only to authorized users.
Integrity	Ensure data is accurate, complete and not altered unauthorizedly.
Availability	Ensure data and systems are available to authorized users when needed.

TYPES OF CYBER ATTACKS

ATTACK	HOW IT WORKS	EXAMPLE
Phishing Attack	Attacker tricks user to click malicious link or share credentials.	Fake email from bank asking to verify account.
Malware Attack	Malicious software installed on system to damage or steal data.	Ransomware locking files and demanding payment.
Pansword Attack	Attacker guesses or cracks weak passwords.	Brute force attack on login page.
Man-in-the-Middle (MITM)	Attacker secretly intercepts communication between two parties.	Eavesdropping on public Wi-Fi network.
SQL Injection	Attacker inserts malicious SQL code through input field to access database.	Bypassing login form using SQL commands.

KEY SECURITY CONTROLS

Access Control	Restrict access to data and systems to authorized users only. (e.g., RBAC, MFA)
Encryption	Convert data into unreadable format to protect from unauthorized access.
Firewalls	Monitors and filters incoming and outgoing network traffic.
IDS/IPS	Detects (IDS) and prevents (IPS) suspicious activities or intrusions.
Antivirus / Anti-malware	Detects and removes malicious software.
Backup & Recovery	Regular backup ensures business continuity in case of attack or failure.

CYBERSECURITY BEST PRACTICES

- Use strong passwords and change regularly.
- Enable Multi-Factor Authentication (MFA).
- Keep systems and software updated.
- Do not click on suspicious links or emails.
- Regularly backup important data.
- Use firewalls, antivirus and encryption.
- Provide security awareness training to employees.
- Monitor systems and logs for unusual activities.
- Implement least privilege access principle.
- Have incident response and recovery plan.

WAYS TO PROTECT INFORMATION SYSTEMS

TECHNOLOGY CONTROLS	ADMINISTRATIVE CONTROLS
• Firewalls, IDS/IPS, Antivirus	• Security Policies and Procedures
• Encryption (Data at rest & in transit)	• User Awareness and Training
• Access Control (Passwords, Biometrics, MFA)	• Access Management Policy
• Patch Management	• Incident Response Plan
• Data Loss Prevention (DLP)	• Risk Assessment and Monitoring
• Secure Network Design (VPN, Segmentation)	• Vendor Management
• Regular Backups & Disaster Recovery	• Compliance with Laws & Standards

RISKS OF CYBER ATTACKS

- Data Breach and Theft
- Downtime and Business Disruption
- Financial Loss and Penalties
- Legal and Compliance Issues
- Loss of Reputation and Customer Trust

SCENARIO EXAMPLE

A company employee receives an email claiming to be from the IT department asking for login credentials to update system. The employee clicks the link and enters credentials. Later, the company's system shows unusual activity and some data is encrypted.

QUESTIONS THAT MAY BE ASKED:

- Identify the type of attack.
- What are the risks to CIA?
- Suggest controls to prevent such attacks.
- What immediate steps should the company take?

HOW TO ANSWER:

Identify attack → Explain how it violates CIA → Suggest specific controls → Recommend steps like isolate system, change passwords, inform IT, restore from backup.

EXAM TIP

In scenario questions, first identify the threat or attack, then explain its impact on CIA and suggest specific controls with scenario application.

KEY WORDS

Cybersecurity | Threat | Malware | Phishing | Ransomware | DDoS | Insider Threat | Confidentiality | Integrity | Availability | Access Control | Encryption | Firewall | IDS/IPS | Antivirus | Backup | Incident Response | Risk | Awareness

0331 4435703
FOR ONLINE CLASSES & TEST SERIES