

<b>1</b>	<b>Introduction Database Concepts</b>	<b>3</b>
	1.1 Introduction, Characteristics of database, File system v/s Database system, Data abstraction and data Independence, DBMS system architecture, Database Administrator	

1. Discuss advantages of DBMS over traditional file management system.
2. Explain different types of database users.
3. Short note on Data Independence. Define Data Base Administrator. Discuss role of DBA.
4. Explain building blocks of DATA Model.
5. Explain data abstraction in brief.
6. Explain evaluation of data model.
7. Explain data definition language and data manipulation language.
8. What do you mean by data modelling? Discuss different types of models.
9. Describe the overall architecture of DBMS with example
10. Data independence
11. Differentiate between file processing and dbms

<b>2</b>	<b>Entity-Relationship Data Model</b>	<b>6</b>
	2.1 The Entity-Relationship (ER) Model: Entity types, Weak and strong entity sets, Entity sets, Types of Attributes, Keys, Relationship attributes, Cardinality and Participation, Extended Entity-Relationship (EER) Model: Generalization, Specialization and Aggregation	

1. Explain the importance of UML diagram.
2. Explain different types of attributes with example
3. Explain components of ER model.
4. Define following terms i) super key ii) candidate key iii) primary key iv) foreign key
5. Explain specialization and generalization in detail with suitable example
6. Explain weak entity with example.
7. Explain what is attribute? Explain different types of attributes with example
8. Explain following types of attributes with an example. i) Single Valued ii) Multi Valued iii) Composite iv) Derived
9. What do you understand by joins? Explain following terms with example. i) Natural join ii) left outer join iii) right outer join iv) full outer join
10. Draw ER diagram for Hospital management system. Convert ER diagrams into tables.
11. Construct an ER diagram for school with the sets of students and a set of teachers associated with each student with a log of various examinations conducted write a relational schema for the ER design
12. Explain aggregate functions in sql
13. Explain referential integrity and Authorization and security in SQL.
14. Draw er diagram and covert it into relational model for Airline reservation system.
15. Draw er diagram and covert it into relational model for Hotel management system.

16. Draw er diagram and covert it into relational model for Hospital management system.
17. Following terms explanation: i) Weak entity set ii) data independence iii) extended ER features iv) total and partial participation

3	<b>Relational Model and relational Algebra</b>	8
4.1	Introduction to the Relational Model, relational calculus and concept of keys Mapping the ER and EER Model to the Relational Model, Relational Algebra-operators, Relational Algebra Queries	

1. Explain Domain relational calculus.
2. Explain Tuple relational calculus database recovery management in brief.
3. Construct ER diagram and convert it into relational model for company which has several Employees working on different types of projects. Several Employees are working on one department. Department associated with many projects. Every Employee has a manager. Several employees are supervised by one employee. Consider the necessary attributes of each entity.
4. 3 We require to develop an information management system that supports some of the services
5. involved in an Online Bookstore (e.g., Amazon.com). The Book store has registered customers in order to sell books. It also contains publishers' information and a customer can place the book he desires to buy on a shopping basket.
  - A customer has an email, name, phone and address.
  - A book has an ISBN, year, title and price.
  - Publisher has a name, address, phone and url and publishes several books, but one book can be published by one publisher.
  - An author has a name and address and can write several books.
  - Books can be written by only one author and they are stored on many warehouses and one warehouse has many books.
  - A customer can have several shopping baskets

Each shopping basket belongs to one customer, where each shopping basket can contain several books.
6. Explain following relational algebra operations with suitable example
  - i) Project
  - ii) Select
  - iii) Union
  - iv) Cartesian Product
  - v) rename
  - vi) natural join
  - vii) project
  - viii) generalized projection
  - ix) set intersection
  - x) aggregation operator
7. Explain relational algebra queries and calculus with example

4	Structured Query Language (SQL)	4
4.1	Overview of SQL, Data Definition Commands, Integrity constraints, key constraints, Domain Constraints, Referential integrity, check constraints, Data Manipulation commands, Data Control commands, Set and string operations, aggregate function group by, having, Views in SQL, joins, Nested and complex queries, Triggers	

1. Explain constraints in SQL.
2. Describe trigger with example.
3. Discuss data definition and manipulation commands in sql
4. Consider the following relations  
Sailors (sid, sname, rating, age)  
Boats (bid, bname, color)  
Reserves (sid, bid, day)  
Write the following queries in SQL  
i) Find the name and ages of all the sailors  
ii) Find all sailors with rating above 7  
iii) Find the names of sailors who have reserved at least one boat  
iv) Find the name and age of the oldest sailor (nested query)  
v) Find the sid of sailors who have reserved a red boat

4.15 Consider the following database:

Product (maker, model, type)

PC (model, speed, ram, hd, price)

Laptop (model, speed, ram, hd, screen, price)

Printer (model, color, type, price)

The Product relation gives the manufacturer, model number and type (PC, laptop, or printer) of various products. We assume for convenience that model numbers are unique over all manufacturers. The PC relation gives for each model number that is a PC the speed (of the processor, in gigahertz), the amount of RAM (in megabytes), the size of the hard disk (in gigabytes), and the price.

Write SQL queries for the following (any FIVE)

Find the model number, speed and hard drive capacity for all the PCs with prices below \$500

Find the makers of PCs with a processor speed of 450 MHz or more

Find out the average speed of the PCs produced by maker A

Find the makers producing at least three distinct models of PCs. Result set: maker, number of PC models

Get the laptop models that have a speed smaller than the speed of any PC. Result set: type, model, speed.

Find the model number and maker of the lowest priced PC that has 64MB or more memory

5. Explain cost based query optimization
6. Explain aggregate function and set operations in sql with examples
7. Explain data control commands in sql with example
8. Explain sort merge join algorithm in query processing
9. Describe triggers with example
10. Explain integrity constraints
11. Steps in query processing
12. Explain authorization in sql

5	Relational Database Design	6
5.1	Problems in Relational Database design, Concept of Normalization, Functional Dependence, First Normal Form, 2NF, 3NF, 4NF	

1. Define Normalization. Explain 1NF, 2NF, 3NF and BCNF with example.
2. Explain three level schema architecture of DBMS. State different level of dependencies in this architecture.
3. Explain implementation of atomicity and durability
4. Armstrong axioms
5. Thomas write rules

6	Transactions Management and Concurrency and Recovery	10
6.1	Transaction concept, Transaction states, ACID properties, Transaction Control Commands, Concurrent Executions, Serializability-Conflict and View, Concurrency Control: Lock-based, Timestamp-based protocols, Recovery System: Log based recovery, Deadlock handling	

1. What do you understand by the concurrent execution of the transactions? Mention any two advantages of concurrency.
2. Explain ACID properties of transaction with example and draw state transition diagram of transaction.
3. Explain database recovery management in brief.
4. What do you understand by schedule? Give an example of serializable schedule.
5. Draw the state diagram of transaction. Discuss every step in brief with an example.
6. Explain conflict serializability and view serializability with example
7. Define deadlock. Explain deadlock detection, prevention and recovery. Deadlock handling.
8. Explain lock based, timestamp base, validation based protocols
9. Explain the following with suitable example.
  - 1) Time stamp-based concurrency protocol and
  - 2) 2PL based concurrency protocol.

9. Write short note on Log based recovery and shadow paging

10. What do you mean by conflict serializable schedule? Use the given schedule and determine whether it is conflict serializable?

T1	T2
Read(A)	
Write(A)	
	Read(A)
	Write(A)
Read(A)	
Write(A)	
	Read(B)
	Write(B)

18. Consider the following schedule S

T1	T2	T3
	R(X)	
	W(X)	
		R(X)
	R(Y)	
	W(Y)	
	COMMIT	
R(X)		
		W(X)
		COMMIT
W(X)		
COMMIT		

R(X) denotes read operation on data X and W(X) denotes write operation on data X. Determine whether the schedule is recoverable or cascadeless.