

DAYANANDA SAGAR COLLEGE OF ENGINEERING
DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

Question Bank

Course: Database Management System

Course code: 18IS5DCDBM

Unit-1: Introduction, ER Model

- 1) Define the following terms:
(i) Database (ii) DBMS (iii) Database Catalog (iv) meta data (v) Program-data independence
(vi) canned transaction (vii) database system (viii) database system (ix) data (x) user view
(10*1=10m)
- 2) With a neat diagram explain the database system. (10m)
- 3) Define and explain the importance of database and database catalog. Explain the internal storage format of a catalog with an example. (10m)
- 4) Discuss the main characteristics of the database approach over the file processing approach. (10m)
- 5) What are the advantages and disadvantages of using a DBMS? Explain. (10m)
- 6) Define the following terms:
(i) data model (ii) database schema (iii) database state (iv) catalog (v) data independence
(vi) query language (vii) database utility (10*1=10m)
- 7) Describe the three-schema architecture. Why do we need the mappings between different schema levels? How do different schema definition languages support this architecture? (10m)
- 8) Explain the typical components modules of a DBMS, with a neat diagram. (10m)
- 9) Define the following terms:
(i) Entity (ii) attribute (iii) key attribute (iv) derived attribute (v) Multi valued attribute
(vi) Composite attribute (vii) attribute value (viii) value set (ix) relationship instance
(x) Cardinality Ratio (10*1=10m)
- 10) Explain different types of attributes in an ER model with an example. (10m)
- 11) Explain the concept of E-R model with an example. (10m)

- 12) (a) What is an entity type? What is an entity set? Explain the differences among an entity, an entity type, and an entity set. (5m)
(b) What is relationship type? Explain the differences among a relationship instance, a relationship type, and a relationship set. (5m)
- 13) (a) What is the degree of a relationship type? Explain the types with an example. (5m)
(b) What is a participation role? When is it necessary to use role names in the description of relationship types? (5m)
- 14) What are Structural constraints on a relation type? Define and explain with examples. (10m)
- 15) When is the concept of a weak entity used in data modeling? Define the terms owner entity type, weak entity type, identifying relationship type, and partial key with an example. (10m)
- 16) List out the notations for E-R diagram & their meaning. (10m)
- 17) Draw an E-R diagram for Musicians who perform for album. Assume any 4 entities; indicate all key and cardinality constraints and any assumptions made. (10m)
- 18) Design an ER diagram for the mail order Database considering the following requirements. Here Employees takes order for parts from customers.
(i) The mail order company has employees each identified by a unique employee ID, first name and last name Address, Gender, Zip code.
(ii) Each customer of the company is identified by a unique customer ID, first name and last name Address, Location & Zip code.
(iii) Each part sold by the company is identified by a unique part number, part name, price and quantity in stock.
(iv) Each order placed by a customer is taken by an employee and is given a unique order number. Each order contains specified quantities of one or more parts. Each order has a date of receipt as well as an expected ship date. The actual ship date is also recorded.
(v) Each customer can place number of orders & each order placed by one customer only.
(vi) Each employee can take any number of orders but each order belongs to only one employee.
(vii) Each part placed by number of customers and each customer can place order for number of parts.
(viii) Write assumptions made. (10m)
- 19) Draw an ER Diagram for the hospital management system. Assume your own entities (Minimum of 4 entities), attributes and relations. Explain the assumptions made. (10m)
- 20) Design an ER diagram for maintaining a movie database taking into account at least four entities. Explain the assumptions made. (10m)

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Unit - 2: Relational model and Relational Algebra

- 1) Define the following terms with an example:
(i) Domain (ii) attribute (iii) intension (iv) relation state (v) degree of a relation (vi) relational database schema (vii) relational database state (viii) tuple (ix) super key (x) integrity constraint
(10*1=10m)
- 2) What is a relation? Discuss the characteristics of relations with appropriate examples. (10m)
- 3) What is a constraint? Give the detailed explanation of key constraints. (10m)
- 4) Discuss the various update operations on relations and the types of integrity constraints that must be checked for each update operation. (10m)
- 5) (a) Explain Basic Unary operations in Relational Algebra with examples. (7m)
(b) Write a “complete set” of relational algebra operations with examples. (3m)
- 6) Explain the relational algebra operations from set theory, with examples. (10m)
- 7) Discuss the various types of JOIN operations. Why is theta join required? (10m)
- 8) (a) Explain the division operator with an example. How can a division operator be implemented using other relational algebraic operations? (4m)
(b) How are the OUTER JOIN operations different from the (inner) JOIN operations? How is the OUTER UNION different from UNION? Explain with examples. (6m)
- 9) Explain the aggregate functions used in relational algebra. (10m)
- 10) Consider the following schema and write the relational algebra expressions for the queries given below: (10m)
SAILORS(Sid, Sname, rating, age)
BOATS(bid, bname, color)
RESERVES(sid, bid, day)
 - (i) Find names of sailors who reserved green boat
 - (ii) Find the colors of boats reserved by “Ramesh”
 - (iii) Find names of sailors who have reserved a red or a green boat.
 - (iv) Find the “sids” of sailors with age over 20 who have not registered a red boat.

11) Given the schema: (10m)

Student(USN,NAME,BRANCH,PERCENTAGE)

Faculty(FID,FNAME,DEPT,DESIGNATION,SALARY)

Course(CID,CNAME,FID)

Enroll(CID,USN,GRADE)

Give the relation algebra expression for the following:

- i) Retrieve the name and percentage of all students for the vourse 10CS54.
- ii) List the Departments having a average salary of the faculties above Rs.30,000.
- iii) List name of the course having student grade 'A' maximum.

12) Consider the following schema and write the relational algebra expressions for the queries given below: (10m)

Suppliers (sid : integer, sname : string, address : string)

Parts(pid : integer, pname : string, color:string)

Catalog(sid : integer, pid : integer, cost : real)

- i) Find the names of suppliers who supply some red parts.
- ii) Find the sids of suppliers who supply some red parts or at 221 packer street.
- iii) Find the sids of suppliers who supply some red part and some green part.

13) Give the ER to relational mapping algorithm. Discuss each step, with an example. (10m)

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Unit - 2: SQL

- 1) Explain the different constraints that can be applied during table creation in SQL, with an example. (10m)
- 2) (a) List the data types that are allowed for SQL attributes. (4m)
(b) Explain the use of unspecified where-clause and use of asterisk with an example in SQL. (6m)
- 3) With respect to SQL, explain with example :
(a) The drop command (4m)
(b) The alter command (6m)
- 4) Describe the Six clauses in the syntax of an SQL query and explain how an SQL query is executed conceptually. Which of the six clauses are required and which are optional. (10m)
- 5) Explain all possible options that can be specified when a referential integrity constraint is violated using suitable example for all options. (10m)
- 6) Write SQL commands to perform the following. (10m)
 - i) To create a table STUDENT with fields Register number, St-name, Address, course section, total Marks.
 - ii) To insert values to that table interactively
 - iii) To create a view with fields register name and st-name.
 - iv) To change the total marks to 35 if the marks lies in between 25 and 34.
 - v) To delete tuples from the relation if the total marks is less than 35
- 7) Use the schema and answer the queries in SQL. (10m)

SAILORS(Sid, Sname, rating, age)
BOATS(bid, bname, color)
RESERVES(sid, bid, day)

 - (i) Find names of sailors who reserved green boat 10*
 - (ii) Find the colors of boats reserved by “Ramesh”
 - (iii) Find names of sailors who have reserved a red or a green boat.
 - (iv) Find the names of the sailors who have reserved a red boat
 - (v) Find the names of sailors who have reserved all boats called ‘Interlake’

- 8) Consider the following schema for a company database (10m)

Employee (Name, SSN, Address, Sex, Salary, Dno)
Department (Dname, Dnumber, MGRSSN, MGRSTART Date)
Dept-Locations (Dnumber, Dlocations)
Project (Pname, Pnumber, Plocations, Dnum)
Works-On (ESSN, PNo, Hours)
Dependent (ESSN, Dependent-name, Sex, Bdate, Relationship)

Give the queries in SQL:

- i). Retrieve the names and address of employees who work for “Research” Department.
- ii). List all the project names on which employee “Smith” is working.
- iii). Retrieve all employees in Dept. 5 whose salary is between 30,000 and 40,000.
- iv). Retrieve the name of each employee who works on all the projects controlled by department number 5.
- v). Retrieve the names of employees who have no dependents.

- 9) Consider the following relational database schema (10m)

Student (Student-id,Sname,major,GPA)
Faculty (Faculty-id,fname,dept,designation,salary)
Course (Course-id,Cname,Faculty-id)
Enrol (Course-id,Student-id,grade)

Write the following queries in SQL:

- i) List the names of all students enrolled for the course “IS6T1”.
- ii) List all the departments having an average salary of above Rs. 10,000.
- iii) Give a 20% raise to salary of all faculties.
- iv) List the names of all faculty members beginning with “P” and ending with letter “A”.

- 10) Explain with syntax in SQL : EXISTS & ORDER BY clauses. (10m)

- 11) Explain all possible options that can be specified when a referential integrity constraint is violated using suitable example for all options. (10m)

- 12) Consider the following relations: (10m)

Student (*snum*: integer, *sname*: string, *major*: string, *level*: string, *age*: integer)
Class (*name*: string, *meets at*: string, *room*: string, *d*: integer)
Enrolled (*snum*: integer, *cname*: string)
Faculty (*fid*: integer, *fname*: string, *deptid*: integer)

Write the following queries in SQL. No duplicates should be printed in any of the answers.

- i. Find the names of all Juniors (level = JR) who are enrolled in a class taught by Prof. Harshith
- ii. Find the names of all classes that either meet in room R128 or have five or more Students enrolled.
- iii. Find the names of faculty members who teach in every room in which some class is taught.
- iv. Find the names of faculty members for whom the combined enrollment of the courses that they teach is less than five.

- 13) Consider the following database of student enrollment in courses & books adopted for each course. (10m)

STUDENT (regno: string, name: string, major: string, bdate:date)
COURSE (course #:int, cname:string, dept:string)
ENROLL (regno:string, course#:int, sem:int, marks:int)
BOOK _ ADOPTION (course# :int, sem:int, book-ISBN:int)
TEXT (book-ISBN:int, book-title:string, publisher:string, author:string)

- i. Demonstrate how you add a new text book to the database and make this book be adopted by some department.
- ii. Produce a list of text books (include Course #, Book-ISBN, Book-title) in the alphabetical order for courses offered by the 'CS' department that use more than two books.
- iii. List any department that has *all* its adopted books published by a specific publisher.

- 14) Consider the following database for a banking enterprise (10m)

BRANCH(branch-name:string, branch-city:string, assets:real)
ACCOUNT(accno:int, branch-name:string, balance:real)
DEPOSITOR(customer-name:string, accno:int)
CUSTOMER(customer-name:string, customer-street:string, customer-city:string)
LOAN(loan-number:int, branch-name:string, amount:real)
BORROWER(customer-name:string, loan-number:int)

- i. Find all the customers who have an account at *all* the branches located in a specific city.
- ii. Demonstrate how you delete all account tuples at every branch located in a specific city.

- 15) Explain the commands used to modify the database with examples. (10m)

- 16) Explain with example how the group by clause works. What is the difference between the where and having clause? (10m)

- 17) List and explain the differences between Independent nested and co-related nested query. (10m)

- 18) Explain IN and EXISTS operators of SQL with suitable examples. (10m)

- 19) Explain with an example aggregate functions and grouping used with SQL. (10m)

- 20) Explain with an example in SQL

- i) Unspecified where-clause and use of asterisk. (4m)
- ii) Exist and not exists (6m)

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Unit - 4: SQL, Database Design

- 1) Explain the commands used to modify the database with examples. (10m)
- 2) How is a “view” created and dropped? What are the problems associated with updation of views? (10m)
- 3) Explain with example how the group by clause works. What is the difference between the **Where** and **Having** clause? (10m)
- 4) List and explain the differences between Independent nested and co-related nested query. (10m)
- 5) Explain the following : (i) Embedded SQL (ii) Database stored procedure (10m)
- 6) Discuss the significance of an assertion. Write an assertion to specify a constraint such that the salary of an employee must not be greater than the salary of the manager of the department that the employee works for in SQL. (10m)
- 7) Discuss main approaches to database programming. (10m)
- 8) What do you mean by Impedance mismatch? Explain. (10m)
- 9) Explain IN and EXISTS operators of SQL with suitable examples. (10m)
- 10) Explain with an example aggregate functions and grouping used with SQL. (10m)
- 11) Explain the following: (a) Triggers (b) Dynamic SQL (10m)
- 12) Explain in detail the working, syntax and importance of cursors with a code segment. (10m)
- 13) Discuss the informal guidelines for relational databases. Illustrate how violations are harmful. (10m)
- 14) Discuss insertion, deletion, and modification anomalies. Why are they considered bad? Illustrate with examples. (10m)
- 15) Discuss the problem of spurious tuples and how we may prevent it. (10m)
- 16) (a) Why are Armstrong's inference rules – IR1 to IR3 important? (5m)
(b) What is meant by the completeness and soundness of Armstrong's inference rules? (5m)

17) Define with example: (10m)

- a) Functional dependency
- b) 1NF
- c) 2NF
- d) 3NF

18) List the inference rules for FDs. (10m)

19) What is normalization? Explain third normal form with example. (10m)

20) Consider the universal relation $R = \{A, B, C, D, E, F, G, H, I, J\}$ and the set of functional dependencies : $F = \{ \{A, B\} \rightarrow \{C\}, A \rightarrow \{D, E\}, \{B\} \rightarrow \{F\}, \{F\} \rightarrow \{G, H\}, \{D\} \rightarrow \{I, J\} \}$.

What is the key for R? Decompose R into 2NF, then 3NF relations. (10m)

21) Normalize the given relation to 3NF: (10m)

Name	Assignment 1	Assignment 2
Jeff Smith	Article Summary	Poetry Analysis
Nancy Jones	Article Summary	Reaction Paper
Jane Scott	Article Summary	Poetry Analysis

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Unit - 5: Database Design, Transaction Management

- 1) Give the general definitions of Normal forms with examples. (10m)
- 2) Consider $R = (A, B, C, D, E)$ decomposed into

$$R_1 = (A, B, C)$$

$$R_2 = (A, D, E)$$

The set of functional dependencies are: $A \rightarrow BC$, $CD \rightarrow E$, $B \rightarrow D$, $E \rightarrow A$

Show that this decomposition is a lossless-join decomposition. (5m)

- 3) For a relation $R(A, B, C, D, F)$ with following function dependencies for the relation R :

$$A \rightarrow BCDF, BF \rightarrow ACD, D \rightarrow F$$

Decompose the relation to BCNF. (10m)

- 4) When is a table in BCNF? Differentiate between 3NF and BCNF. (6m)
- 5) What is a transaction? Explain the desirable properties of a transaction. (10m)
- 6) What are the anomalies that occur due to interleaving of execution? Explain with example. (10m)
- 7) Discuss the different concurrency control techniques. (10m)
- 8) Write a short note on:
 - (i) Strict Two phase locking protocol. (ii) Transaction support in SQL. (10m)
- 9) What is a schedule? Explain with examples serial, nonserial and conflict serializable schedule. (10m)
- 10) Explain the following with suitable examples:
 - i) The lost update problem ii) the temporary update (or dirty read) problem (10m)