



Siddaganga Institute of Technology, Tumakuru-572 103

(An Autonomous Institution affiliated to VTU, Belagavi, Approved by AICTE, New Delhi)

Fifth Semester B.E. Computer Science Examinations Feb. - March 2023

Database Management System

Time: 3 Hours

Max. Marks: 100

- Note :** 1. Revealing of Identity in any form in the answer book will be treated as malpractice.
2. Answer any five questions choosing one full question from each unit.

Unit - I

- | | M | BL | CO | PO | PSO |
|--|---|----|----|---------|-----|
| 1 a) Describe a simplified database system environment with a diagram. | 6 | 2 | 1 | 1, 2, 3 | 1 |
| b) Illustrate workers behind the scene for database design. | 6 | 2 | 1 | 1, 2, 3 | 1 |
| c) List and explain advantages of using the DBMS approach. | 8 | 2 | 1 | 1, 2, 3 | 1 |

OR

- | | | | | | |
|---|---|---|---|---------|---|
| 2 a) Explain physical two-tier client-server architecture for DBMS. | 6 | 2 | 1 | 1, 2, 3 | 1 |
| b) Illustrate relationship types, sets and instances with example. | 6 | 2 | 1 | 1, 2, 3 | 1 |
| c) Draw the E-R diagram for BANK database with the following scenario. i) Each bank can have multiple branches and each branch can have multiple accounts and loans. ii) Show non-weak entity type along with key attributes. iii) Specify cardinality ratio and relationship types. | 8 | 3 | 1 | 1, 2, 3 | 1 |

Unit - II

- | | | | | | |
|--|---|---|---|------|---|
| 3 a) With an example, explain the role of the following operations using relational algebra. i) UNION ii) EQUIJOIN iii) NATURAL JOIN | 6 | 2 | 2 | 1, 2 | 1 |
| b) Discuss the various types of INNER JOIN operations. Why is natural join required. | 6 | 2 | 2 | 1, 2 | 1 |
| c) Consider the following relations and write the relational algebra queries for the following. Employee (Fname, Lname, <u>SSN</u> , Bdate, Address, Dno) Department (Dname, <u>Dnumber</u> , Mgr-SSN) Dept_Loc (<u>Dnumber</u> , <u>Dlocation</u>) Project (Pname, <u>Pnumber</u> Plocation, Dnum) Works_on(<u>ESSN</u> , <u>Pno</u> , Hours) Dependent(<u>ESSN</u> , <u>Dname</u> , Relationship) i) Find the names and address of all employees who work for the 'production' department. ii) Find names of the employees who work on all the projects controlled by department number 5. iii) Retrieve the average salary of all male employees. iv) Find the names of managers who have at least one dependent. | 8 | 3 | 2 | 1, 2 | 1 |

OR

- | | | | | | |
|--|---|---|---|------|---|
| 4 a) Discuss the DIVISION operation in relational algebra with an example. | 6 | 2 | 2 | 1, 2 | 1 |
|--|---|---|---|------|---|

- b) Consider the following relations and write relational algebraic expressions for the following.

Book (Book_id, Title Publisher_name)

Book_authors(Book_id, Author_name)

Publisher(Name, address, phone)

Book_Copies (Book_id, Branch_id, no_of_copies)

Book_leans(Book_id, Branch_id, Card_no, Date_out, Due_date)

Library_Branch(Branch_id, Branch_name, address)

Borrower(Card_no, Name, Address, Phone)

- i) How many copies of the book titled “The lest tribe” are owned by each library branch.

- ii) Retrieve the names of all borrowers who do not have any books checked out.

- iii) Retrieve the branch name and the total number of books loaned out from that branch.

8 3 2 1,2 1

- c) Illustrate aggregate functions and grouping with example.

6 2 2 1,2 2

Unit - III

- 5 a) How does SQL implement the entity integrity and referential integrity constraints of the relational data model? Explain with an example.

6 2 3 1,3 1

- b) Explain how the GROUP BY clause works. Differentiate between the WHERE and HAVING clause.

6 2 3 1,3 1

- c) Consider the following relational schema and write the SQL queries for the following:

WORKS(Pname, Cname, Salary)

LIVES (Pname, Street, City)

LOCATED_IN(Cname, City)

Manager(Pname, Mgrname)

Where Pname=person name, CName=Company name,
Mgrname = Manager name.

- i) List the names of the people who work for the company “Wipro” along with cities they live in.

- ii) Find the names of the persons who live and work in the same city.

- iii) Find the names of the persons who do not work for “Infosys”.

- iv) Find the persons whose salaries are more than that of all of the “Oracle” employees.

8 3 3 1,3 1

OR

- 6 a) Describe the six clauses in the syntax of an SQL retrieval query.

6 2 3 1,3 1

- b) Consider the database

Car (reg_no, model, colour, dop, SSN)

Owner (SSN, name, address)

- i) Write a procedure to list all cars and owner information purchased during the specific year.

- ii) Write a insertion trigger to check date of purchase must be less than the current date.

6 3 3 1,3 1

- c) Consider the following schema and write the queries using SQL.

Student(Name, Student_number, Class, Major)

Course(Cname, Cnumber, credit_hours, Dept)

Section(Section_identifier, Cnumber, Sem, year, instructor)

Grade_Report (Student_number, Section_Identifier, Grade)

- Retrieve the names of all courses taught by Professor "Kiran"
- For each section taught by professor Kiran, retrieve the Cnumber, Sem, year, and number of students who took the section.
- Retrieve the names and major departments of all students who do not have a grade of A in any of their courses.

8 3 3 1,3 1

Unit - IV

- Discuss the informal design guidelines for the good database design.
 - A set of FDs for the relation $R=\{A,B,C,D,E,F\}$ is $AB \rightarrow C$, $C \rightarrow A$, $BC \rightarrow D$, $ACD \rightarrow B$, $BE \rightarrow C$, $EC \rightarrow FA$, $CF \rightarrow BD$, $D \rightarrow E$. Find a minimum cover for this set of FDs.
 - Explain BCNF with an example.

8 2 4 1,2 1

6 3 4 1,2 1

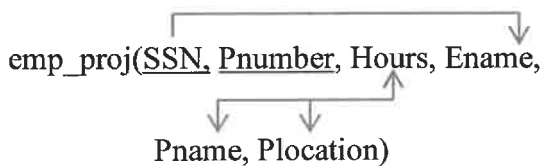
6 3 4 1,2 1

OR

- Write an algorithm for testing Non-additive join property.
 - Write the algorithm for finding a minimal cover F for a set of functional dependencies. Consider the relation $R=\{A,B,C,D,E,H\}$ and functional dependency $F=\{A \rightarrow BC$, $CD \rightarrow E$, $E \rightarrow C$, $D \rightarrow AEH$, $ABH \rightarrow BD$, $DH \rightarrow BC\}$. Find the key for R.
 - Simplify the following relational schema into 2NF.

6 2 4 1,2 1

8 3 4 1,2 1



6 3 4 1,2 1

Unit - V

- Discuss the actions taken by the read_item and write_item operations on a database.
 - Explain the desirable properties of transactions.
 - Illustrate the different approaches to dealing with deadlock prevention.

6 2 5 1,3 1

8 2 5 1,3 1

6 2 5 1,3 1

OR

- Discuss two multiversion techniques for concurrency control.
 - Examine the requirement of cascading rollback with example.
 - Explain ARIES recovery algorithm.

6 2 5 1,3 1

6 3 5 1,3 1

8 2 5 1,3 1