2025/EVEN/18/24/CS-DSC-251/MCSC-403/004

UG/Integrated Even Semester Examination, 2025

COMPUTER SCIENCE

(4th Semester)

Course No.: CS-DSC-251/MCSC-403

(Database Management System)

Full Marks: 70

Pass Marks: 28

Time: 3 hours

The figures in the right margin indicate full marks for the question. Answer any five questions selecting one from each unit.

UNIT-I

1. (a) Define DBMS. Write the responsibilities of DBA and the Database designer. 5

   (b) Discuss the main characteristics of the Database approach and how it differs from traditional file system. 5

   (c) Differentiate between physical schema and logical schema. 4

2. (a) What do you understand by data abstraction. Explain briefly the three level of data abstraction with suitable example. 6

   (b) Define : (i) Entity (ii) Attribute (iii) Relationship with examples. 6

   (c) Write the functions of data-manipulation language (DML). 2

UNIT-II

3. (a) Define with example : (i) Foreign key (ii) Candidate Key (iii) Primary Key 6

(b) Explain briefly the Relational Model? Write the function of SELECT command. 4

(c) Differentiate between Mapping Cadinalities and Participation Constraints. 4

4. (a) What do you understand by Entity-Relationship Model. Write its major components while designing an E-R Model. 7

(b) Explain briefly with suitable example (i) Strong entity set and (ii) Weak entity set 4

(c) Construct an E-R diagram for a hospital with a set of patient and a set of medical doctors. Associate with each patient a log of the various tests and examinations conducted. 4

UNIT-III

5. (a) State the formal definition of relational algebra. 2

(b) Explain the conditions under which the relational algebraic operations UNION and SET DIFFERENCE can be implemented. 3

(c) Consider the following relational schema for a bank :

branch (branch-name, branch-city, assets)

(iv) Find the set of all courses taught in both the semesters Fall 2009 and Spring 2010 by retaining all duplicates. 2

(v) For all instructors in the University who have taught some course(s), find their names and the course ID of all courses they taught. 1

(b) Explain the steps involved in processing a database query with examples. 7

8. Explain the First Normal form, Functional Dependency, Second Normal Form and the Third Normal Form of Relational Database schemas with the help of examples. 14

UNIT-V

9. (a) What is transaction? Explain the properties of transactions with examples. 6

(b) Explain the states of transaction with a state diagram. 6

(c) What do you mean by concurrent execution transactions? Explain with examples. 2

10. (a) What are schedules? Explain with an example. 4

(b) What do you mean by concurrency control? Explain by giving examples of concurrent schedules. 5

(c) Explain the differences between social schedule and serializable schedules with examples. 5

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6. (a) Explain the natural join operation with relevant examples both in relationship algebra and in SQL. 3½x2=7

(b) Consider the following database schema for part of a University database :

department (dept-name, building, budget)

course (course-id, title, dept-name, credits)

instructor (ID, name, dept-name, salary)

section (course-ID, section-ID, semester, year, building, room-number, time-slot-ID)

teacher (ID, course-ID, section-ID, semester, year)

Implement the above schema in SQL data definition language by specifying the primary keys and the foreign key references wherever necessary. 7

UNIT-IV

7. (a) Consider the relational database schema given in Q6(a) and write appropriate queries for the following SQL DML.

(i) List the names of all instructors along with their department names and department building name. 1

(ii) List the names of instructor along with the titles of courses that they teach. 1

(iii) Find the set of all courses taught either in Fall 2009 or in Spring 2010, or both by retaining all the duplicates. 2

account (account-number, branch-name, balance)

depositor (customer-name, account-number)

customer (customer-name, customer-street, customer-city)

loan (loan-number, branch-name, amount)

borrower (customer-name, loan-number)

Write relational algebraic expression for the following querie :

(i) Find the names of all customers who have a loan at the 'Mohan Gram' branch. 2

(ii) Find the names of all bank customers who have an account or a loan or both. 2

(iii) Find all the types of a branch 'Mohan Gram' in which the loan amount is more than ₹1,20,000.00. 1

(iv) Find the names of all customers of the bank who have an account but not a loan. 1½

(v) Find the names of those customers who live in 'College Street'. 1½

(vi) List all the loan numbers and amount of loan. 1

(vii) Write the relation schema for a relation r such that

r= borrower x loan 1