Registration No.: | | | | | | | | | | |

Total Number of Pages: 02 **Course: M.Sc.I**

Sub_Code: FBEF411

4th Semester Back Examination: 2024-25

SUBJECT: Relational Database Management System

BRANCH(S): M.Sc.I(MC)

Time: 3 Hours

Max Marks: 70

Q.Code: S234

Answer Question No.1 (Part-I) which is compulsory, any five from rest (Part-II)

The figures in the right-hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) State the primary goal of mapping an ER model to a relational model.

b) In a relational table 'Orders' with a foreign key 'CustomerID' referencing the 'Customers' table, what type of integrity constraint is applied?

c) What DML operation is used to modify existing data in a relational table?

d) In a relational database, what data manipulation operation would you use to retrieve all records from a table named 'Students'?

e) Define the process of dependency preservation during decomposition.

f) State the purpose of the PROJECT operation in Relational Algebra.

g) What is the function of the GROUP BY clause in SQL?

h) What happens if a transaction tries to write a data item with a timestamp older than the data item's write timestamp in basic timestamp ordering?

i) What is the growing phase in the two-phase locking protocol?

j) Define a serializable schedule in transaction processing.

Part-II

Long Answer Type Questions (Answer Any five)

Q2 **a)** Discuss the concept of data abstraction in database systems. Describe the three levels of abstraction (physical, logical, and view levels) and their significance in providing data independence with schematic diagram. **(5 + 5)**

b) Describe the functions of Data Definition Language (DDL) and Data Manipulation Language (DML) in a database system. Provide examples of common DDL and DML commands and their purposes.

Q3 **a)** Explain the key concepts of the Entity-Relationship (ER) model, including entities, attributes, and relationships. Illustrate with an example of a simple ER diagram for a library management system. **(5 + 5)**

b) Compare and contrast the relational data model with the network data model. Discuss their underlying structures, how relationships are represented, and their respective advantages and disadvantages.

Q4 **a)** State the different types of integrity constraints that can be enforced in a relational database, including primary key constraints, foreign key constraints, unique constraints, not null constraints, and check constraints. Provide examples of how each constraint helps maintain data quality. **(5 + 5)**

b) Describe the basic data manipulation operations in relational algebra: SELECT, PROJECT, UNION, INTERSECTION, and JOIN. Provide a brief explanation and the symbolic notation for each operation.

Q5 **a)** Explain the fundamental differences between Relational Algebra and Relational Calculus. Discuss whether they are procedural or non-procedural and illustrate their distinct approaches to querying data with simple examples. **(5 + 5)**

b) Discuss how to define and use constraints in SQL (e.g., PRIMARY KEY, FOREIGN KEY, UNIQUE, NOT NULL, CHECK). Explain their role in maintaining data integrity.

Q6 **a)** Explain the purpose of different clauses in a SELECT statement in SQL. Provide an example SQL query that uses several of these clauses and explain what it retrieves. **(5 + 5)**

b) Discuss how to define and use constraints in SQL. Explain their role in maintaining data integrity.

Q7 **a)** Explain the ACID properties of a transaction and their importance in ensuring the reliability of database systems. Illustrate each property with a brief example. **(5 + 5)**

b) Discuss the concept of schedules in transaction processing. Explain the differences between serial, serializable, and non-serializable schedules. Why is serializability a desirable property?

Q8 **a)** Discuss the different types of database failures that can occur. Explain the characteristics of each type of failure and their potential impact on data integrity. **(5 + 5)**

b) Explain the ARIES (Algorithm for Recovery and Isolation Exploiting Semantics) recovery technique. Discuss its key phases and how it ensures database consistency after a failure.