MITE
Invent Solutions

MANGALORE INSTITUTE OF TECHNOLOGY & ENGINEERING

(A Unit of Rajalaxmi Education Trust®, Mangalore)
Autonomous Institute affiliated to VTU, Belagavi, Approved by AICTE, New Delhi
Accredited by NAAC with A+ Grade & ISO 9001:2015 Certified Institution

Model Question Paper

Second Semester MCA Degree Examination, 2025-26

Database Management Systems

Time: 3 Hours **Max. Marks: 100**

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M: Marks, L: RBT (Revised Bloom's Taxonomy) level, C: Course outcomes.

		Module -1	M	L	C
Q1	a.	A college currently stores student data in separate Excel files for each department, leading to data duplication and inconsistency. Based on this scenario, identify the problems associated with the file system approach, apply appropriate DBMS concepts to address these issues, and explain how the use of a DBMS improves data integrity.	10	L3	CO1
	b.	An online learning platform stores student course details. Taking this scenario, design a suitable database schema to store student, course, and enrollment information, show two different instances of the database at different points in time, and illustrate how the schema remains constant while the instances change.	10	L3	CO1
		OR			
Q2	a.	A hospital database includes entities such as Patient and Doctor. Assuming this scenario, identify appropriate relationships, assign suitable cardinality and participation constraints, and justify their use in database design.	10	L3	CO1
	b.	A retail store wants to manage product and sales data using a database system. Apply different types of database languages by writing suitable DDL, DML, DCL, and TCL commands for managing data and controlling transactions using this scenario.	10	L3	CO1
		Module 2			
Q3	a.	A company database contains Employee and Department details. Apply relational algebra operations to find employees working in a specific department, list employees with salary above a given value, and identify departments with more than a specified number of employees.	10	L3	CO2
	b.	A university database contains Student, Course, and Enrollment tables. Based on this scenario, write SQL queries to retrieve students enrolled in a specific course, update marks of a student, and remove records of students who have discontinued.	10	L3	CO2
		OR			
Q4	a.	A training institute maintains records of instructors, courses, and participants. Design an ER diagram showing relationships among entities and convert it into relational schemas with appropriate primary and foreign keys.	10	L3	CO2
	b.	An online store database maintains information about customers, products, and orders. Apply relational algebra operations to identify customers who purchased	10	L3	CO2

		high-value products, list products that were never ordered, and determine total quantity of products ordered by each customer.			
Module – 3					
Q5	a.	A hospital management system stores details of patients, doctors, and appointments. Create SQL tables with appropriate data types, define primary and foreign keys, and apply necessary constraints such as NOT NULL. Further, write SQL statements to insert sample records into each table and retrieve the details of patients along with their corresponding doctor names using suitable JOIN operations.	10	L3	CO3
	b.	A retail system maintains product information and stock details. Create a view to display selected attributes, retrieve products with low stock using the view, and describe the advantages and limitations of using views. Further, write an SQL query to update the stock quantity of a specific product through the view using appropriate conditions.	10	L3	CO3
OR					
Q6	a.	A university database contains Student, Course, and Enrollment tables. Write SQL queries to identify students enrolled in multiple courses, calculate total enrollments per course, and find students not enrolled in any course. Further, write SQL queries to update the grade of a student for a specific course, delete enrollment records of students who have withdrawn, and retrieve course details along with the number of enrolled students using appropriate JOIN and GROUP BY operations.	10	L3	CO3
	b.	An employee database maintains details such as department and salary. Write SQL queries to update salaries of employees in a specific department, delete records based on joining date conditions, and insert new employee records. Further, write SQL queries to retrieve employees with salary greater than a specified amount, display the total salary of employees in each department using appropriate GROUP BY operations, and find departments having more than a specified number of employees using suitable conditions.	10	L3	CO3
Module – 4					
Q7	a.	A table stores information about employees, projects, and assignments in a single relation. Identify functional dependencies, determine the candidate keys, normalize the table into 3NF step-by-step, and present the resulting relations with appropriate primary and foreign keys. Further, check whether the final relations satisfy BCNF conditions and perform decomposition if any violations are found.	10	L3	CO4
	b.	An order management system stores order details in a single table. Identify candidate keys, determine functional dependencies, and decompose the table into BCNF with proper justification. Further, normalize the relation step-by-step from 1NF to BCNF, present the resulting relations with appropriate primary and foreign keys, and verify whether the final decomposition is lossless and preserves dependencies.	10	L3	CO4
OR					
Q8	a.	A database table stores student-course-instructor details where one course may have multiple instructors. Identify functional and multivalued dependencies, determine the candidate keys, and decompose the table into 4NF. Further, normalize the relation step-by-step from 1NF to 4NF, present the resulting relations with appropriate primary and foreign keys, and verify whether the decomposition is lossless and free from redundancy.	10	L3	CO4
	b.	A project management system stores project–task–employee relationships in a single table. Identify join dependencies, determine the candidate keys, and check whether the relation violates Fifth Normal Form (5NF). Decompose the table into 5NF with proper justification. Further, present the resulting relations with	10	L3	CO4

		appropriate primary and foreign keys and verify whether the decomposition is lossless and preserves the original information without redundancy.			
Module – 5					
Q9	a.	A banking system supports fund transfer between accounts. Design a transaction with required operations, apply ACID properties, and describe the issues that arise if any property fails. Further, construct a possible concurrent execution of two such transactions, identify potential problems such as lost updates or dirty reads, and apply appropriate locking mechanisms to ensure correct execution.	10	L3	CO5
	b.	Two transactions operate on shared data items in a database system. Construct serial and non-serial schedules, identify possible deadlock situations, and apply suitable deadlock prevention techniques. Further, analyze whether the given schedules are conflict-serializable using a precedence graph and apply appropriate techniques to ensure serializability.	10	L3	CO5
OR					
Q10	a.	A movie ticket booking system allows multiple users to reserve seats simultaneously. Identify concurrency problems such as lost updates and dirty reads, and apply suitable locking mechanisms to prevent them. Further, construct a schedule involving multiple transactions, analyze whether it is serializable, and apply appropriate isolation levels to ensure correct and consistent execution.	10	L3	CO5
	b.	A payroll system updates employee salary records periodically. Use this scenario, define transactions for bonus calculation and salary update, apply validation-based concurrency control, and describe the system behaviour when validation fails. Further, construct a possible schedule involving these transactions, analyse whether it maintains serializability, and suggest appropriate recovery mechanisms to handle transaction failures.	10	L3	CO5