



First Semester MCA Degree Examination, Dec.2025/Jan.2026 Database Management System (DBMS)

MMC103

Max. Marks: 100

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

Module – 1			M	L	C
Q.1	a.	Explain the three-schema architecture of a DBMS with a neat diagram. Discuss the importance of each schema layer in managing database systems with suitable examples.	11	L2	CO1
	b.	Define the concept of keys in a relational database. Explain the differences between candidate keys, primary keys, and foreign keys with examples.	09	L2	CO1
OR					
Q.2		Consider a University database with the following entities: Students, Courses, Professors, Parents and Departments			
	a.	Draw an ER diagram representing the relationships between these entities. Clearly specify entity types, attributes, relationships, keys and cardinalities.	10	L3	CO3
	b.	Convert the ER diagram into relational tables, specifying primary keys and foreign keys.	10	L3	CO3
Module – 2					
Q.3		Consider the following relational schema for a library database: Books(BookID, Title, Author, Genre, PublisherID) Publishers(PublisherID, PublisherName, Location) BorrowedBooks(MemberID, BookID, BorrowDate) Using Relational Algebra, write expressions for:	20	L4	CO2
	a.	Retrieve all books written by "J.K. Rowling".			
	b.	Find the names of publishers located in "New York".			
	c.	List all BookIDs that have been borrowed at least once.			
	d.	Retrieve the titles of books that have not been borrowed.			
	e.	Display the names of publishers along with the titles of books they published.			
OR					
Q.4		Consider the following database schema for an employee management system: Employee (EmpID, Name, Department, Salary, ManagerID) Department (DeptID, DeptName, Location) Write SQL queries for the following:	20	L3	CO3
	a.	Create the Employee and Department tables with appropriate data types and constraints.			
	b.	Insert a new employee record into the Employee table.			
	c.	Increase the salary of employees in the "IT" department by 10%.			
	d.	Delete employees earning less than 30,000.			
	e.	Retrieve the names of employees and their department names using a JOIN.			

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Module – 3																																	
Q.5	a.	Explain the concept of Normalization and its importance in database design.	05	L2	CO2																												
	b.	Define Functional Dependency with an example.	05	L2	CO2																												
	c.	Discuss Non-Loss Decomposition with an example.	05	L4	CO2																												
	d.	What are the advantages of Dependency Preservation in database normalization?	05	L4	CO2																												
OR																																	
Q.6		Consider the following table:																															
		<table border="1" style="width: 100%; border-collapse: collapse; margin-left: 20px;"> <thead> <tr> <th>Order ID</th> <th>Customer Name</th> <th>Product</th> <th>Quantity</th> <th>Price</th> <th>Total Amount</th> <th>Customer Address</th> </tr> </thead> <tbody> <tr> <td>101</td> <td>Alice</td> <td>Laptop</td> <td>1</td> <td>800</td> <td>800</td> <td>NY, USA</td> </tr> <tr> <td>102</td> <td>Bob</td> <td>Phone</td> <td>2</td> <td>500</td> <td>1000</td> <td>CA, USA</td> </tr> <tr> <td>103</td> <td>Alice</td> <td>Mouse</td> <td>1</td> <td>50</td> <td>50</td> <td>NY, USA</td> </tr> </tbody> </table>	Order ID	Customer Name	Product	Quantity	Price	Total Amount	Customer Address	101	Alice	Laptop	1	800	800	NY, USA	102	Bob	Phone	2	500	1000	CA, USA	103	Alice	Mouse	1	50	50	NY, USA			
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	a.	Identify the functional dependencies in the table.	05	L4	CO2																												
	b.	Convert the 1NF table to Second Normal Form (2NF) and justify your changes.	05	L3	CO2																												
	c.	Convert the 2NF table to Third Normal Form (3NF) and explain its advantages.	05	L3	CO2																												
	d.	Differentiate BCNF from 3NF.	05	L3	CO2																												
Module – 4																																	
Q.7	a.	Define a transaction in DBMS and explain different states of a transaction with a neat diagram.	07	L2	CO1																												
	b.	How are atomicity and durability implemented in a DBMS?	08	L2	CO1																												
	c.	Provide an example where atomicity is violated. How can this issue be resolved?	05	L3	CO1																												
OR																																	
Q.8	a.	What are the two types of lock? Explain lock compatibility matrix.	07	L2	CO1																												
	b.	Explain how Timestamp-Based Protocols work. How do these locks prevent conflicts?	07	L2	CO1																												
	c.	Explain two phase locking protocol with a diagram. How is it different from pre-claiming lock protocol?	06	L4	CO1																												
Module – 5																																	
Q.9	a.	Explain the Log-Based Recovery mechanism in database systems.	10	L2	CO1																												
	b.	Discuss how different log records help ensure atomicity and durability in case of system failures.	10	L4	CO1																												
OR																																	
Q.10	a.	List the different types of checkpoints and explain the need for checkpoints in recovery mechanisms.	08	L2	CO1																												
	b.	Describe how check pointing helps in reducing recovery time and explain the steps involved in implementing checkpoints.	12	L4	CO1																												