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MANGALORE INSTITUTE OF TECHNOLOGY & ENGINEERING

(A Unit of Rajalaxmi Education Trust®, Mangalore)
Autonomous Institute affiliated to VTU, Belagavi, Approved by AICTE, New Delhi
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Model Question Paper

Fifth Semester B.E Degree Examination

DATABASE MANAGEMENT SYSTEM

Time: 3 Hours (180 Minutes) **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.	**Compare the traditional file system approach with a Database Management System (DBMS). Highlight the key limitations of early file systems and explain the major advantages of adopting the database approach.**	6	L2	CO1
	b.	**Explain the three-schema architecture of a DBMS with the help of a neat diagram. Discuss the significance of each level in providing abstraction.**	8	L2	CO1
	c.	**Describe the different types of user-friendly DBMS interfaces. Also, explain the categories of database users and the types of interfaces they typically use.**	6	L2	CO1
		OR			
Q2	a.	**Explain the component modules of a DBMS. With the help of a neat diagram, describe how these modules interact with each other in database management.**	8	L2	CO1
	b.	**Explain the three-tier architecture and the n-tier architecture of web applications that include a database.**	6	L2	CO1
	c.	**Describe the client-server architecture of a database system. Explain the roles of client and server with an illustrative diagram.**	6	L2	CO1
		Module- 2			
Q3	a.	**i) Define entity sets and weak entity sets.** **ii) Draw an ER diagram for a hospital management system with entities: Patient, Doctor, Appointment, and Treatment. Specify the keys and relationships clearly.**	10	L3	CO2
	b.	**i) Explain the types of attributes in ER modeling with suitable examples.** **ii) For the following schema:** **STUDENT (USN, Name, Dept, Semester)** **COURSE (CourseID, CourseName, Credits)** **ENROLLS (USN, CourseID, Grade)** **Express the following queries in Relational Algebra:** • **List all students enrolled in the course "DBMS".** • **Find students who have enrolled in more than one course.** • **Retrieve names of students who have not enrolled in any course.**	10	L3	CO2
		OR			
Q4	a.	**i) Explain *unary* and *binary* operations in relational algebra with examples.** **ii) For the relations EMPLOYEE (EmpID, Name, Dept, Salary) and DEPARTMENT (Dept, Location), write relational algebra expressions to:** • **Find employees working in the "HR" department.** • **Find employees earning more than 50,000.**	10	L3	CO2

		• **List departments that have no employees.**			
	b.	**What is *ER-to-Relational Mapping*? Briefly explain the mapping steps.** **ii) Convert the following ER diagram into relational schemas with appropriate primary and foreign keys:** **Entities: *Book (BookID, Title, Publisher), Author (AuthorID, Name)*** **Relationship: *Writes (BookID, AuthorID, Year)*.**	10	L3	CO2
Module – 3					
Q5	a.	**Given the relation R(StudentID, StudentName, Dept, CourseID, CourseName, Instructor) with the following functional dependencies:** • **StudentID → StudentName, Dept** • **CourseID → CourseName, Instructor** • **StudentID, CourseID → (marks of enrollment assumed)** **Normalize the relation step by step up to 3NF.**	8	L3	CO3
	b.	**Consider the following unnormalized relation:** **StudentCourse(StudentID, StudentName, Dept, CourseID, CourseName, Instructor)** **i) Illustrate with examples how update, insertion, and deletion anomalies can occur in this schema.** **ii) Normalize the schema up to 3NF to eliminate these anomalies, and show the new relations.**	6	L3	CO3
	c.	**Consider a relation R(EmpID, EmpName, DeptID, DeptName, Location) with FDs:** • **EmpID → EmpName, DeptID** • **DeptID → DeptName, Location** **Decompose R into BCNF and show that the decomposition is lossless and dependency-preserving.**	6	L3	CO3
OR					
Q6	a.	**A database relation R(A, B, C, D, E) has the following dependencies:** • **A → B** • **B → C** • **A → D, E** **Identify the candidate keys of R and decompose it into 2NF and then 3NF.**	8	L3	CO3
	b.	**Differentiate between 3NF and BCNF with a suitable example. Show a case where a relation is in 3NF but not in BCNF, and then decompose it into BCNF.**	6	L3	CO3
	c.	**Define Multivalued Dependency (MVD) with an example. Given the relation R(Student, Course, Hobby), show why this violates 4NF, and normalize it into 4NF relations.**	6	L3	CO3
Module – 4					
Q7	a.	**What are DML, DDL, DCL?** **Create a table Product(ProductID, Name, Price, Stock, CategoryID) with the following constraints:** • **ProductID as Primary Key** • **Price must be greater than 0** • **Stock should be non-negative** **Write the SQL DDL statement with constraints.**	8	L3	CO4
	b.	**Given the relation Book(BookID, Title, Author, Price, PublisherID), write**			

		an SQL query to display the publisher IDs that have published more than 5 books priced above 500.	6	L3	CO4
	c.	**Consider Customer(CustID, Name, City) and Order(OrderID, CustID, Amount).** **Write an SQL query to find the names of customers who placed orders with an amount greater than the average order amount of all customers.**	6	L3	CO4
		OR			
Q8	a.	**Describe the various types of join operations available in SQL with suitable examples.** **Given Teacher(TID, TName, DeptID) and Course(CID, Title, DeptID), write a query to display the names of teachers who do not teach any course (use LEFT OUTER JOIN).**	8	L3	CO4
	b.	**What is a trigger in SQL? Explain its purpose and working with an example.** **For the table Account(AccNo, Balance), write a trigger that prevents the balance from going below 1000 during an UPDATE or INSERT. If violated, the transaction should be cancelled.**	6	L3	CO4
	c.	**What is a view in SQL? Explain its use.** **Create a view named HighSalary that displays employee names and salaries from Employee(EmpID, Name, Salary) for those earning above 75,000. Then write a DCL command to grant SELECT access on this view to a role HR_Manager.**	6	L3	CO4
		Module - 5			
Q9	a.	**Explain ACID properties of transactions with suitable examples. Why are they important for transaction management?**	10	L2	CO1
	b.	**Describe the Two-Phase Locking (2PL) protocol. How does it ensure serializability? Discuss its limitations.**	10	L2	CO1
		OR			
Q10	a.	**Explain recovery techniques in DBMS with emphasis on Shadow Paging and the ARIES Recovery Algorithm.**	10	L2	CO1
	b.	**Differentiate between conflict serializability and view serializability. Illustrate with an example schedule.**	10	L2	CO1

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