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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

June 2025 Semester End Main Examinations

Programme: B.E. **Semester: IV**

Branch: Computer Science and Business Systems **Duration: 3 hrs.**

Course Code: 23BS4PCDBM **Max Marks: 100**

Course: Database Management Systems

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

			UNIT - I	*CO*	*PO*	Marks
1	a)		Highlight the key benefits and drawbacks of a Database Management System (DBMS) compared to a traditional file system.	*CO1*	*PO1*	**6**
	b)		Explain the concepts of entity, entity set, and attribute in the context of the Entity-Relationship (ER) model. Additionally, categorize and describe the different types of attributes along with their respective symbols.	*CO1*	*PO1*	**8**
	c)		Describe the three-schema architecture of a database system and explain the types of languages used at each level	*CO1*	*PO1*	**6**
			OR			
2	a)		Illustrate the DBMS architecture using a well-structured block diagram and elaborate on the three levels of abstraction that define database organization and access.	*CO1*	*PO1*	**10**
	b)		Create an Entity-Relationship (ER) Diagram for a Bank Database, ensuring the inclusion of at least five essential entities to represent the system effectively.	*CO2*	*PO2*	**10**
			UNIT - II			
3	a)		Consider the following schema for a company database. Employee (Name, SSN, Address, Sex, Salary, Dno) Department (Dname, Dnumber, MGR SSN, MGRSTART DATE) Dept_Location (Dnumber, Dlocations) Project (Pname, Pnumber, Plocation, Dnum) Works_on (ESSN, Pno, Hours) Dependent (ESSN, Dependent_name, Sex, Ddate, Relationship) Write the queries in relational algebra to	*CO3*	*PO3*	**10**

			1. Retrieve the name and address of all employees who work for the research department 2. Find the name of employees who work on all projects controlled by department number 5. 3. List all projects on which employee Smith is working. Retrieve the names of employees who have no dependents.			
		b)	Explain the following database terms and illustrate each with an example: 1. Domain 2. Relation Schema 3. Relation State 4. Relational Database Schema	*CO1*	*PO1*	**10**
			OR			
	4	a)	With respect to the Relational data model, explain the concept of primary keys and Foreign keys. Illustrate your answer with examples.	*CO1*	*PO1*	**10**
		b)	Discuss the following relational algebra operations. Illustrate each of them with an example. 1. SELECT 2. PROJECT 3. DIFFERENCE 4. UNION	*CO2*	*PO2*	**10**
			UNIT - III			
	5	a)	Explain how data can be added, removed, or modified in a relational database using the INSERT, DELETE, and UPDATE operations. Support your explanation with suitable examples.	*CO1*	*PO1*	**10**
		b)	Describe JOIN operation in SQL and explain any four types of JOIN operations using appropriate examples.	*CO3*	*PO1*	**10**
			OR			
	6	a)	Consider the following relation schema Project(P_No, P_Name, P_Incharge) Employee(E_No, E_Name) Assigned_to(P_No, E_No) Write the SQL Quires for the following: (i) List details of employees who are working on all the projects. (ii) List E_No of employees who are not working on project number 2K. (iii) List the names of employees who are working in the same project as employee named 'Tom'. (iv) List the names of employees who are not working in any project.	*CO3*	*PO3*	**10**
		b)	Interpret following with syntax and example i. Subquery ii. Correlated subquery iii. EXITS, IN, ALL and ANY operators	*CO3*	*PO1*	**10**

			UNIT - IV			
	7	a)	State the informal guidelines for relational schema design. Illustrate how violation of these guidelines may be harmful.	*CO1*	*PO1*	**10**
		b)	Consider the universal relation R={A,B,C,D,E,F,G,H,I,J} and the set of functional dependencies F={{A,B}→{C}, {A}→{D,E}, {B}→{F}, {F}→{G,H}, {D}→{I.J}}. What is the key for R? Decompose R into 2 NF and then 3 NF relations.	*CO2*	*PO3*	**10**
			OR			
	8	a)	Briefly explain the ACID properties. With the example of a fund transfer between two accounts, show how these properties maintain transaction reliability. Identify the possible property violations in case of an unexpected system failure.	*CO2*	*PO2*	**10**
		b)	Which of the following schedules is (conflict) serializable? For each serializable schedule, determine the equivalent serial schedules. 1. r1(x); r3(x); w1(x); r2(x); w3(x); 2. r1(x); r3(x); w3(x); w1(x); r2(x); 3. r3(x); r2(x); w3(x); r1(x); w1(x); 4. r3(x); r2(x); r1(x); w3(x); w1(x);	*CO2*	*PO3*	**10**
			UNIT - V			
	9	a)	Describe the two-phase locking protocol, including examples and its advantages.	*CO2*	*PO2*	**10**
		b)	Consider system crashed after the following log, system crash occurs after step 8. 1. START T1 2. WRITE T1, A, 10 → 20 3. START T2 4. WRITE T2, B, 30 → 40 5. COMMIT T1 6. START T3 7. WRITE T3, A, 20 → 25 8. COMMIT T2 Apply the NO-UNDO/REDO recovery technique based on deferred updates to a transaction log. Show step-by-step how the database state is recovered after a system crash	*CO2*	*PO3*	**10**
			OR			
	10	a)	Analyze the need of NoSQL and detail out main categories of NoSQL databases with examples.	*CO1*	*PO2*	**10**
		b)	Detail out data modeling concepts used in MongoDB. Describe the primary CRUD operations and how they are performed in MongoDB	*CO1*	*PO2*	**10**

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