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

Autonomous Institute Affiliated to VTU

January / February 2025 Semester End Main Examinations

Programme: B.E. **Semester: III**

Branch: CSE (IoT)/AI&DS/CSE(DS) **Duration: 3 hrs.**

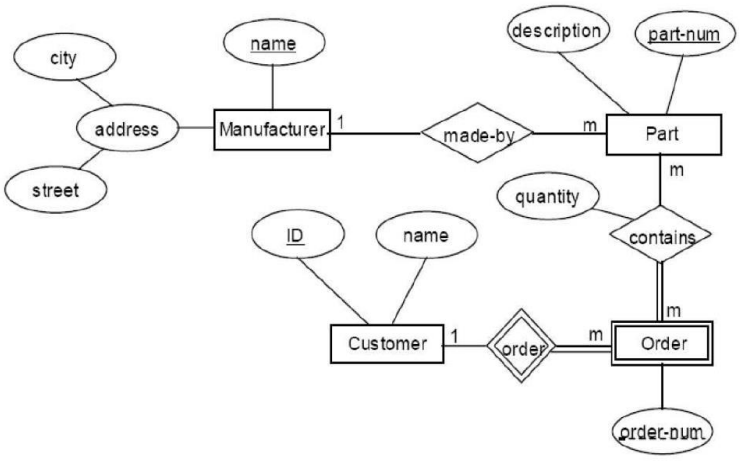
Course Code: 23DC3PCDBM **Max Marks: 100**

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)	With the help of a neat block diagram explain simplified database system environment.	CO1	PO1	**10**
	b)	Consider the following database schema for a university database: Student (SID, Name, Address, Sex, Major, GPA, DeptID) Department (DeptID, DeptName, HODID, EstablishmentYear) Course(CID, CName, Credits, DeptID) Enrolled (SID, CID, Semester, Year, Grade) Instructor (InstructorID, Name, DeptID, Salary, HireDate) Dependent (SID, DependentName, Sex, BDate, Relationship) Write the SQL Query for the following: i. Retrieve student name, course name for students enrolled in "Computer Science" department. ii. List the names of all instructors in the "Computer Science" department. iii. Increase the GPA by 0.5 for all students majoring in "Physics". iv. Find instructors with the highest salary in their department. v. Retrieve the names of all students who do not have any dependents using a correlated query	CO2	PO2	**10**
		OR			
2	a)	Explain with example, the basic constraints that can be specified when a database table is created in SQL.	CO1	PO1	**05**
	b)	Consider the following tables: Branch (Bname, Bcity, Assets) Account (Accno, Bname , Accbal) Loan (Loanno , Bname , LoanAmt) Customer (Cname, Cstreet, City)	CO2	PO2	**08**

			Depositor (Cname, Accnum) Borrow (Cname, Loannum) Write the following queries in SQL: i. Find all loan numbers for loans made at cantonment branch with loan amounts greater than 20000. ii. Find the names of all customers whose street address includes 'Main'. iii. Find the average balance for each branch, if average balance is greater than 12000. iv. Find all Customers who do not have loan at the bank, but do have an account.			
		c)	Create an assertion SQL to specify the constraint that the salary of an employee must not be greater than the salary of the manager of the department that the employee works for.	CO1	PO1	**07**
			UNIT – II			
	3	a)	Explain the different types of attributes in ER model with suitable example.	CO1	PO1	**05**
		b)	With examples, explain the following: (i) Strong and Weak Entity sets (ii) Recursive relationships (iii)Ternary relationships	CO1	PO1	**05**
		c)	 For the above ER diagram shown, apply the ER to relational mapping rules and write all the relations:	CO2	PO2	**10**
			OR			
	4	a)	Assume that you wish to start a small mobile operator company called "AirPhone". Design an Entity-Relationship diagram to depict the following requirements for your company: AirPhone has several registered customers with legitimate SIM cards supplied to them categorized into postpaid or prepaid. The company provides service to its customers in the form of plans depending upon the state and city they are located. A bill has to be	CO3	PO3	**10**

			generated for each customer depending upon the billing cycle and usage/plan. Customers are offered extra services for their family members as a group with special/discounted tariff. The company has third party outlets in each city to provide customer service. Customers are charged depending upon their usage of voice calls and mobile data or both (combo plan.) These calls and mobile data consumed by the customers are stored in the database. Also the complaints received from the customers must be registered and resolved within some specified time limit.			
		b)	Briefly discuss different types of update operations on relational database. Show an example of violation of the referential and entity integrity constraints in each of the update operation.	CO2	PO2	**10**
			UNIT – III			
	5	a)	Consider the following two relations: T1 T2 A B C P Q R 10 a 5 10 b 6 15 b 8 25 c 3 25 a 6 10 b 5 Show the result of the following a) T1 ⋉ T1.B = T2.Q T2 b) T1 ⋊ T1.A = T2.P T2 c) T1 ⋈ T1.A = T2.P and T1.C = T2.R T2 d) T1-T2	CO2	PO2	**10**
		b)	Consider the following relations: Works(PName, CName, Salary) Lives(PName, Street, City) LocatedIn(CName, City) Write relational algebra queries for: i) Find the names of the persons who work for company Wipro along with the cities they live in. ii) Find the names of all employees in this database who do not work for Infosys. iii) Find the persons whose salaries are more than the salary of everybody who work for company Oracle. iv) Find the names of the persons who live and work in the same city. v) Find the names of the companies that is located in every city where company Infosys is located in.	CO3	PO3	**10**
			OR			
	6	a)	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},	CO3	PO3	**10**

			B→F, F→{G,H}, D→{I,J} i) What is key of R? ii) Decompose R into 2NF and then 3NF relation			
		b)	Which normal forms are based on multivalued dependency and Join dependency? Explain the same with example.	CO2	PO2	**10**
			UNIT – IV			
	7	a)	Define transaction .Explain ACID properties.	CO1	PO1	**05**
		b)	With a neat diagram Explain different state of transaction	CO1	PO	**05**
		c)	Illustrate with precedence graph, which of the following schedules is conflict serializable? (i) R1(X); R3(X); W1(X); R2(X); W3(X); (ii) (R3(X); R2(X); W3(X); R1(X); WI(X);	CO3	PO3	**10**
			OR			
	8	a)	Discuss the problems that can occur i) Transaction rollback and Cascading rollback. ii) Deadlock prevention protocol.	CO2	PO2	**10**
		b)	Consider the following schedule. Determine whether each schedule is strict, cascadeless, recoverable or not. Provide justification to your answer. i. R1(X),W1(X),R1(Y),W1(Y),C1,R2(X),W2(X),C2 ii. R1(X),W1(X),R1(Y),W1(Y),R2(X),W2(X),C2,C1 iii. R1(X),R2(X),W1(X),R1(Y),W1(Y),C1,W2(X),C2	CO2	PO2	**10**
			UNIT – V			
	9	a)	Discuss the following RAID levels in terms of mechanism, advantages and disadvantages with neat diagram. • RAID 0 • RAID 1 • RAID 5	*CO1*	*PO1*	**10**
		b)	Analyze the impact of various disk performance measures on the overall efficiency of disk-based storage systems.	*CO2*	*PO2*	**10**
			OR			
	10	a)	Explain any three types of indexing in databases. Provide examples for each type and discuss their advantages, and disadvantages.	*CO2*	*PO2*	**10**
		b)	Construct a B+-Tree for the keys 1, 3, 5, 7, 9, 2, 4, 6, 8, and 10, with each node holding a maximum of 3 keys and 4 pointers, demonstrating the step-by-step insertion process and resulting tree structure.	*CO3*	*PO3*	**10**

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