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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: Artificial Intelligence and Machine Learning **Duration: 3 hrs.**

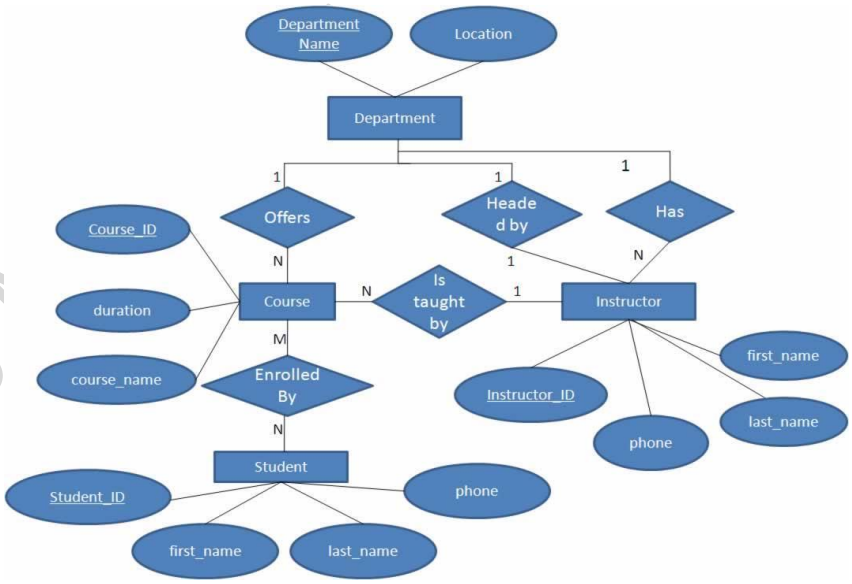
Course Code: 22AM3PCDBM **Max Marks: 100**

Course: Database Management Systems

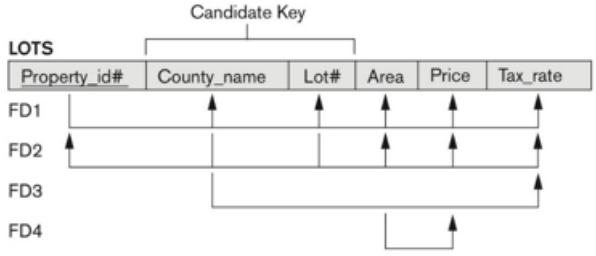
Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

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)	Describe three-schema architecture with a neat diagram and list the problems associated with it.	*CO1*	*PO1*	**5**
	b)	Using the Book database shown in Table 1a and Table 1b answer the following: **Customer** CustID | CustName | AccntNo. 100 | Joe Smith | 010839 101 | Andy Blake | 111248 102 | Sue Brown | 061544 Table 1a **BookOrders** OrderID | Title | CustID | Price 1001 | The Dark Tower | 102 | 12.00 1002 | Incubus Dreams | 101 | 19.99 1003 | Song of Susannah | 102 | 23.00 1004 | The Time Traveler's Wife | 100 | 21.00 1005 | The Dark Tower | 101 | 12.00 1006 | Tanequil | 102 | 15.00 1007 | Song of Susannah | 101 | 23.00 Table 1b i. Identify the Primary key in each table. ii. Identify the Foreign key in the BookOrders table. iii. Are there any candidate keys in either table? iv. Does the BookOrders table exhibit referential integrity? Justify v. Do the tables contain redundant data? If so which table(s) and what is the redundant data?	*CO2*	*PO2*	**5**
	c)	Consider the Book database shown in Table 1a and Table 1b answer the following: i. Create the tables using DDL command. ii. Insert two rows of data in each table using DML command. iii. Update the title of the book for a particular CustID. iv. List all the details from BookOrders where OrderID=1006.	*CO2*	*PO2*	**10**

			OR			
	2	a)	For the given relations: Stud_detail (usn, name, gender, age) Course_detail (cname, time, room_number, fid) Enrolled (usn, cname) Faculty_detail (fid, fname) Write SQL Queries to perform the following operations: i. Create tables by specifying Primary key and Foreign Key. ii. If room_number is not entered the default value should be 101, use alter command to change the schema. iii. The entered gender should be either 'F', 'M' or 'unknown', use alter command to change the schema. iv. Rename the column cname to course_name. v. Drop usn in Enrolled table.	*CO2*	*PO2*	**10**
		b)	Elaborate the main characteristics of database approach. How it differs from traditional file processing systems?	*CO1*	*PO1*	**5**
		c)	Write SQL syntax for the following with an example for each: (i) SELECT (ii) ALTER (iii) UPDATE (iv) DROP (V) TRUNCATE	*CO1*	*PO1*	**5**
			UNIT - II			
	3	a)	Convert the Entity Relationship (ER) diagram shown in Figure 3a into relational schema by providing justification for each step.  Figure 3a	*CO1*	*PO1*	**5**
		b)	Design an ER diagram with the following specifications for a UNIVERSITY database to keep track of students' transcripts. i. The university keeps track of each student's name, student number, Social Security number, current address and phone number, permanent address and phone number,	*CO1*	*PO1*	**10**

			birth date, sex, class (freshman, sophomore, ...,graduate), major department, minor department (if any), and degree program (B.A., B.S., ..., Ph.D.). Some user applications need to refer to the city, state, and ZIP Code of the student's permanent address and to the student's last name. Both Social Security number and student number have unique values for each student. ii. Each department is described by a name, department code, office number, office phone number, and college. Both name and code have unique values for each department. iii. Each course has a course name, description, course number, number of semester hours, level, and offering department. The value of the course number is unique for each course. iv. Each section has an instructor, semester, year, course, and section number. The section number distinguishes sections of the same course that are taught during the same semester/year; its values are 1, 2, 3, ..., up to the number of sections taught during each semester. v. A grade report has a student, section, letter grade, and numeric grade (0, 1, 2, 3, or 4).			
		c)	Elaborate the relational database design using ER to relational mapping with an example.	*CO2*	*PO1*	**5**
			OR			
4		a)	Construct an ER diagram for the Hospital Management System considering at least five entities. Also mention Primary Key & Structural constraints.	*CO2*	*PO2*	10
		b)	Illustrate the steps involved in converting the ER constructs to corresponding relational tables with an example.	*CO1*	*PO1*	**10**
			UNIT - III			
5		a)	Consider the given schema: Suppliers (sid : integer, sname : string, address : string) Parts (pid : integer, pname : string, color : string) Catalog (sid : integer, pid : integer, cost : real) Write the relational algebra queries for the following: i. Find the name of the suppliers whose id =21. ii. Find the name of suppliers who supply some red parts iii. Find the sids of suppliers who supply some red or green parts iv. Find the sids of suppliers who supply every part. v. Find sid and pid for which cost >2000.	*CO2*	*PO2*	**10**
		b)	Specify the syntax for the following with suitable example for each: i. UNION ii. INTERSECTION iii. DIFFERENCE iv. MIN v. DIVISION	*CO1*	*PO1*	**10**
			OR			

	6	a)	Illustrate Entity Integrity and Referential Integrity constraints with examples.	*CO1*	*PO1*	**6**
		b)	Explain Theta Join, Equi Join, Natural Join, Outer Join with suitable examples using relational algebra notation.	*CO1*	*PO1*	**8**
		c)	Describe select and project operations in relational algebra with an example for each.	*CO1*	*PO1*	**6**
			UNIT - IV			
	7	a)	i. Find the candidate keys present in the given relation R1(A, B, C, D) and Functional Dependency {AB→CD, D→B, C→A} ii. For the given relation R2(A, B, C, D, E, F) and Functional Dependency is {AB→C, C→DE, E→F, D→A, C→B} Find the Closure of Attributes for AB^+, A^+, ABF^+, DB^+, EF^+, CB^+, CBC^+, DEF^+, D^+, F^+ iii. Identify the Super keys and Candidate keys of R2. Justify your answer.	*CO2*	*PO2*	**10**
		b)	Given a relation R (P, Q, R, S) and Functional Dependency (FD) = {PQ → RS, Q → R}, determine whether R is in 2NF? If not convert it into 2 NF.	*CO2*	*PO2*	**5**
		c)	Illustrate four informal guidelines that may be used as measures to determine the quality of relation schema design.	*CO1*	*PO1*	**5**
			OR			
	8	a)	Given relation *R* with four attributes *ABCD*. For each of the following sets of Functional Dependencies (FDs): $ABC \rightarrow D,\ D \rightarrow A$ $A \rightarrow B,\ BC \rightarrow D,\ A \rightarrow C$ Assume these are the only dependencies that hold for *R*, do the following: i. Identify the candidate key(s) for *R*. ii. Identify the normal form that *R* satisfies (1NF, 2NF, 3NF, or BCNF). If *R* is not in BCNF, decompose it into a set of BCNF relations that preserve the dependencies.	*CO4*	*PO3*	**10**
		b)	i. Illustrate any three Normal Forms (NF). ii. If the given relation is not in 1NF, 2NF and 3NF, then normalize it. Justify your answer for the same. Note that {Property_id#} and {County_name, Lot#} are the candidate keys. Refer the Functional Dependencies (FD1 to FD4) given in the Figure 5b.  Figure 5b	*CO2*	*PO3*	**10**

			UNIT - V			
	9	a)	Illustrate the types of problems encountered when two simple transactions run concurrently. Explain with suitable examples.	*CO1*	*PO1*	**10**
		b)	Construct precedence graph for the schedule S1 and check if it is serializable or not. Explain the algorithm. **S1:** R1(X) R2(Z) R1(Z) R3(X) R3(Y) W1(X) W3(Y) R2(Y) W2(Z) W2(Y).	*CO1*	*PO2*	**10**
			OR			
	10	a)	Consider a schedule S with five transactions T1, T2, T3 T4 and T5. Construct precedence graph for the schedule S and check whether the given schedule S is conflict serializable or not?	*CO2*	*PO2*	**10**
		b)	Are the following two schedules S1 and S2 conflict equivalent? Justify.	*CO2*	*PO2*	**5**

		c)	Consider the following two transactions:
			T1: read(A);
			read(B);
			if A = 0 then B: = B + 1;
			write(B).
			T2: read(B);
			read(A);
			if B = 0 then A: = A + 1;
			write(A).
			Add lock and unlock instructions to transactions T1 and T2, so that they observe the two-phase locking.
				CO2	*PO2*	**5**

Sl.No.	T_1	T_2	T_3	T_4	T_5
1	R(x)				
2		W(x)			
3			R(x)		
4	R(y)				
5				R(z)	
6		W(y)			
7	R(v)				
8			W(v)		
9				R(v)	
10				W(y)	
11					W(y)
12					W(z)

T1	T2
R (A)	
W (A)	
	R (A)
	W (A)
R (B)	
W (B)	

Schedule S1

T1	T2
R (A)	
W (A)	
R (B)	
W (B)	
	R (A)
	W (A)

Schedule S2

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