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

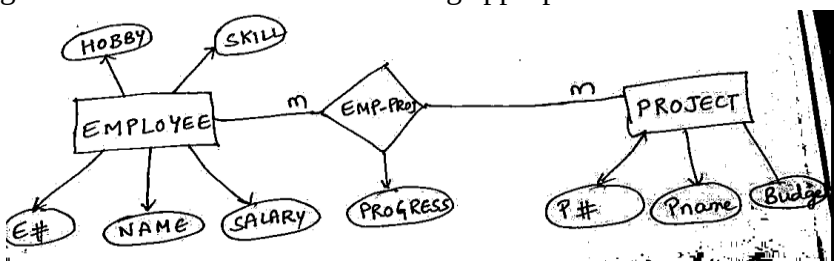
Autonomous Institute Affiliated to VTU

February 2025 Semester End Main Examinations

Programme: B.E. **Semester: IV**
Branch: Information Science and Engineering **Duration: 3 hrs.**
Course Code: 23IS4PCDBM **Max Marks: 100**
Course: Database Management System

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)	Draw ER diagram for the following requirements Universal Records has decided to store information about musicians who perform on its albums (as well as other company data) in a database. ➢ Each musician that records at Universal has an ID(Key) and name. ➢ Each instrument used in songs recorded at Universal has a unique identification number (Key), a name and a musical key. ➢ Each album recorded on the Universal label has a unique identification number (Key), a title, a copyright date and a format. ➢ Each song recorded at Universal has a Song ID (Key), a title and an author. ➢ Each musician may play several instruments, and a given instrument may be played by several musicians. ➢ Each album has a number of songs on it, but no song may appear on more than one album. ➢ Each song is performed by one or more musicians, and a musician may perform a number of songs. ➢ Each album has exactly one musician who acts as its producer. A musician may produce several albums, of course.	CO2	PO1	10
	b)	List the steps for converting ER Model to Relations. Convert the given ER Model into relations using appropriate conversion rules. 	CO2	PO1	10
		OR			

	2	a)	Describe the three-schema architecture. Why do we need mappings among schema levels?	*CO1*		**06**
		b)	Discuss any two main characteristics of the database approach and how it differs from traditional file systems.	*CO1*		**06**
		c)	Design an ER diagram for a Pet Service given the following requirements and mention the different notations used in ER diagram. A pet clinic treats many different types of pets. The owner of the pet consumes the services of the pet clinic and the pet store which provides pet grooming services. The attributes of the owner are ID, Fname, Lname, Contactno, Alternate Contactno and address. Assume necessary attributes for the other entities. Provide the cardinality of relationships and justify your answer.	*CO2*	*PO1*	**08**
			UNIT - II			
	3	a)	Consider the following tables **PERSON** (driver_id: String, name: String, address: String) **CAR** (reg_num: String, model: String, year: int) **ACCIDENT** (report_num: int, accident_date: date, location: String) **OWNS** (driver_id: String, reg_num: String) **PARTICIPATED**(driver_id:String,reg_num:String,report_num: int, damage_amount: int) **Write SQL queries for the given below questions:** a. Create the table for **Participated** by properly specifying the primary key and the foreign key. b. Find the total number of people who owned cars that involved in accidents in 2024. c. Find the number of accidents in which cars belonging to a specific model were involved. d. Find the Average Damage Amount. e. Update the damage amount to50000 for the car with a specific reg-num for which the accident report number was 25.	*CO3*	*PO2*	**10**
		b)	List the types of schema based constants with an example for each.	*CO1*		**05**
		c)	Interpret the following with syntax and examples. I)Subquery ii) Correlated Subquery	*CO2*	*PO1*	**05**
			OR			
	4	a)	You are the Database Programmer working in XYZ Company and are allowed to access only Employee Relation. You need to write the SQL query for the following by considering the schema Emp_id | name | salary | dept 1. To search for the employees whose name begins with the letter 'R'. 2. To search for the employees whose salary is less than 50,000.	*CO3*	*PO2*	**05**

			3. To search for the employees who are working in 'Research' OR 'IT' department. 4. Delete the employees who have not been allotted for any department. 5. 25% salary hike for the employees who are working in 'Research' department and experience is more than 10 years.			
		b	Briefly discuss different types of update operations on relational databases. show an example of a violation of the referential and entity integrity in each of the update operations.	*CO2*	*PO1*	**06**
		c.	Discuss i. All the forms of alter commands with examples. ii. With an example, explain the concept of View in SQL iii. On delete options for referential constraints	*CO2*	*PO1*	**09**
			UNIT - III			
	5	a)	Consider the following relational database schema consisting of the five relation schemas **BOOK**(ISBN,Book_title,Category,Price,Copyright_date,Year, Page_count,P_id) **PUBLISHER**(P_id,Pname,address,State,Phone,Emailid) **AUTHOR**(A_id,Aname,City,State,Zip,Phone,URL) **AUTHOR_BOOK**(A_id,ISBN) **REVIEW**(R-id,ISBN,Rating) Write Relational Algebra Queries for the following: 1. Retrieve title,price of all the textbooks with page count greater than 500. 2. Retrieve title and price of all the books published by TMH. 3. Retrieve book title,reviewers_id and rating of all the textbooks. 4. Retrieve ID,name,address and phone of publishers publishing Novels 5. Retrieve name,address and phone of all the publishers located in New York State.	*CO3*	*PO2*	**10**
		b)	For the relations R and S given below R A | B | C 1 | 2 | 3 4 | 5 | 6 7 | 8 | 9 S B | C | D 2 | 3 | 10 2 | 3 | 11 6 | 7 | 12 Compute **(i)** $\Pi_{A,C}(R)$ **(ii)** $\sigma_{B=2}(S)$ **(iii)** Natural Join **(iv)** Left outer Join	*CO2*	*PO1*	**04**
		c)	Define Eric Brewer's CAP theorem in NOSQL. Explain why almost only two properties can be executed simultaneously among the three properties.	*CO1*		**06**

			OR			
	6	a)	Define the CAP Theorem. Outline the main CRUD operations of MongoDB?	*CO1*		**10**
		b)	Give the advantages and disadvantages of NOSQL	*CO1*		**10**
			UNIT - IV			
	7	a)	Consider the 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}}. Given the Key of R as {AB} Decompose R into 2NF. Decompose R into 3NF.	*CO3*	*PO2*	**10**
		b)	Given the following relation <table><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td>1</td><td>4</td><td>3</td></tr><tr><td>1</td><td>5</td><td>3</td></tr><tr><td>4</td><td>6</td><td>3</td></tr><tr><td>3</td><td>2</td><td>2</td></tr></table> Which of the following dependencies may hold in the above relation? If the dependency cannot hold,state the reason. i) XY→ Z, Z→Y ii) XZ→X, Y→Z iii)YZ→X, Z→X iv)XZ→Y, Y→Z	*CO2*	*PO1*	**04**
		c)	State the Armstrong's Axiom rules with an example for each.	*CO2*	*PO1*	**06**
			OR			
	8	a)	Compute the closure of the following set F of functional dependencies for relation schema R = {A, B, C, D, E}. A → BC CD → E B → D E → A Find the closure attribute for **A^+, D^+, E^+, BD^+, DE^+**. List the candidate keys for R.	*CO3*	*PO2*	**10**
		b)	Consider a relation R with five attributes ABCDE. You are given the following dependencies: A→B,BC→E,ED→A. i) List all keys for R. ii) Is R in 3NF? iii) Is R in BCNF?	*CO3*	*PO2*	**06**
		c)	Show the different classification of Functional Dependencies with an example for each.	*CO1*		**04**
			UNIT - V			
	9	a)	Discuss the ACID properties of a database transaction.	*CO1*		**04**

		b)	Consider the three transactions T1, T2, and T3, and the schedules S1 and S2 given below. Draw the serializability (precedence) graphs for S1 and S2, and state whether each schedule is serializable or not. If a schedule is serializable, write down the equivalent serial schedule(s). T1: r1 (X); r1 (Z); w1 (X); T2: r2 (Z); r2 (Y); w2 (Z); w2 (Y); T3: r3 (X); r3 (Y); w3 (Y); S1: r1 (X); r2 (Z); r1 (Z); r3 (X); r3 (Y); w1 (X); w3 (Y); r2 (Y); w2 (Z); w2 (Y); S2: r1 (X); r2 (Z); r3 (X); r1 (Z); r2 (Y); r3 (Y); w1 (X); w2 (Z); w3 (Y); w2 (Y);	*CO3*	*PO2*	**10**
		c)	Draw a state transition diagram illustrating the states for transaction execution.	*CO1*		**06**
			OR			
	10	a)	Discuss the problems that occur when concurrent execution is uncontrolled along with examples.	*CO1*		**10**
		b)	Discuss the Two-Phase Locking Protocol (2PL). Check whether the given Transaction is following 2PL if not do the needful changes to follow 2PL.Show the shrinking and growing phase in the given transaction. Lock-X(B) read(B) B ←B-50 write(B) Unlock(B) Lock-X(A) read(A) A ←A + 50 write(A) Unlock(A)	*CO3*	*PO2*	**10**

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