U.S.N.										

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

Autonomous Institute Affiliated to VTU

April 2024 Semester End Main Examinations

Programme: B.E. **Semester: III**
Branch: Computer Science and Engineering **Duration: 3 hrs.**
Course Code: 23CS3PCDBM / 19CS4PCDBM **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)	Considering the table details as Employee (EMPno, Ename, Job, MGR, HIREdate, Salary) Write SQL Query for the following i. Display all the information of the Employee. ii. Display unique jobs from Employee table. iii. List names of the employees in ascending order of their salaries.	*CO1*	*PO1*	**6**
	b)	Explain three schema architecture with neat diagram.	*CO2*	*PO2*	**8**
	c)	Explain the characteristics of database approach	*CO1*	*PO2*	**6**
		OR			
2	a)	Consider the following tables in a database: Student(sid: integer, sname: string, age: integer, gender: string) Course(cid: integer, cname: string, credits: integer) Enrollment(sid: integer, cid: integer, grade: string) The "Enrollment" table stores the grades ('A', 'B', 'C', 'D', 'F') of students in various courses they have enrolled in. Write SQL queries for the following scenarios: i. Retrieve the names of all students who have received an 'A' grade in any course. ii. Find the average age of students for each gender. iii. Retrieve the names of courses along with the total number of enrollments in each course. iv. Find the number of students who have enrolled in more than three courses. v. Display details of students whose age is below 20.	*CO3*	*PO3*	**10**
	b)	Create the tables Product and Category with the following constraints and attributes respectively. Product: Product_Id: Primary Key	*CO4*	*PO3,*	**5**

			Name: NOT NULL Category_Id: Foreign Key referring to Category(Category_Id) Price: Check price between 10 to 1000 InStock: Default value of 'Yes' Category: Category_Id: Primary Key Name: Unique			
		c)	Define trigger. Create a trigger so that the total and average of the subject marks is inserted whenever a new record is inserted into table. Given student table as STUDENT (Sid, Name, Subj1-marks, Subj2-marks, Total, Average)	*CO1*	*PO1*	**5**
			UNIT – II			
	3	a)	Define the following terms with example i. Weak entity ii. Cardinality ratio iii. Degree of relationship iv. Entity v. Composite Attribute	*CO1*	*PO1*	**5**
		b)	Given the schema : i. passenger (pid, pname, pgender, pcity) ii. agency (aid, aname, acity) iii. bus (bid, bdate, time, src, dest) iv. booking (pid, aid, bid, bdate) Analyse the schema and answer the following question using relational algebra queries: i. Give the details of all buses from Dhangadhi to Kathmandu. ii. Find the name of passengers who booked at least one bus. iii. Find the bus number for the passenger with pid p04 for bus to Butwal before 20/05/2021. iv. Find the name of passenger who has not booked any bus. v. Find the details of all male passengers associated with Ugratara Agency.	*CO4*	*PO3*	**10**
		c)	Explain aggregate functions in relational algebra with an example.	*CO1*	*PO1*	**5**
			OR			
	4	a)	Explain division operation with an example in relational Algebra.	*CO2*	*PO2*	**4**
		b)	Discuss the Equijoin and Natural join with suitable examples in relational algebra.	*CO1*	*PO1*	**6**
		c)	Design an Entity-Relationship (ER) diagram for the following requirements (capture all the relationship constraints in the diagram): i. Each Employee is identified by EMP_ID, EMP_Name and Address (Street num, Area name, City).	*CO3*	*PO3*	**10**

			ii. Each Customer is identified by CUST_ID, CUST_Name, Mobile Number (multiple values). iii. Each Product is identified by Product_ID, Product_name, Price and Quantity. iv. Each Employee can take order from more than one Customer. v. Each Customer can place request for more than one Product. vi. Each Employee can deliver more than one Product.			
			UNIT - III			
	5	a)	Consider schema U = { A, B, C, D, E, F } and the set of functional dependencies: {AB→C, B→E, CF→D} Find closure of AB.	*CO3*	*PO3*	**5**
		b)	Suppose you are given a relation *R* with four attributes *ABCD*. For each of the following sets of FDs, *i.* $ABC \rightarrow D, D \rightarrow A$ *ii.* $A \rightarrow B, BC \rightarrow D, A \rightarrow C$ Assuming those are the only dependencies that hold for *R*, do the following: a. Identify the candidate key(s) for *R*. b. Identify the best normal form that *R* satisfies (1NF, 2NF, 3NF, or BCNF). c. If *R* is not in BCNF, decompose it into a set of BCNF relations that preserve the dependencies.	*CO4*	*PO3*	**10**
		c)	Describe the Fourth Normal Form (4NF) in database normalization and provide instances where it is violated, explaining the consequences with examples.	*CO2*	*PO2*	**5**
			UNIT – IV			
	6	a)	Consider the three transactions T1, T2 and T3 and schedules S1 and S2 given below. Determine whether each schedule is serializable or not? T1 : r1(x); r1(z); w1(x);w1(z) T2 : r2(y); r2(z); w2(z); T3 : r3(y); r3(x); w3(y); S1 : r1(x); r3(y); r3(x); r2(y); r2(z); w3(y); w2(z); r1(z); w1(x); w1(z) S2 : r1(x); r3(y); r2(y); r3(x); r1(z); r2(z); w3(y); w1(x); w2(z); w1(z)	*CO3*	*PO3*	**10**
		b)	Consider the following two transactions: T1: Read(X) X := X + 10 Write(X) T2: Read(Y) Y := Y * 2 Write(Y)	*CO3*	*PO3*	**5**

			Write a version of the above two transactions that use two-phase locking protocol.			
		c)	Illustrate with a state transition diagram the states for transaction execution and explain.	*CO3*	*PO3*	**5**
			UNIT – V			
	7	a)	Design NoSQL queries considering MongoDB for the following. Consider a library database with a collection named "books" containing documents with fields: (ISBN, Title, Author, Genre, Pages). Example : { ISBN: "978-0061120084", Title: "Mockingbird", Author: "Harper Lee", Genre: "Fiction", Pages: 336 } i. Retrieve all documents from the "books" collection. ii. Retrieve all books written by "J.K. Rowling". iii. Retrieve all books in the "Fiction" genre sorted by their title in ascending order. iv. Retrieve the count of books in the "Mystery" genre. v. Retrieve the title and author of the book with ISBN "978-0061120084".	*CO4*	*PO3*	**10**
		b)	Explain the advantages and drawbacks of NoSQL.	*CO1*	*PO1*	**5**
		c)	List and explain different types of NoSQL storage types	*CO1*	*PO1*	**5**

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