MAJOR EXAMINATION-2023

Course Code: BCCS-1202
Course Name: Database Systems
Program & Sem: B.Tech (CSE), 2nd Semester

Date: 22-06-2023 (Thru)
Time: 10:00 - 1:00 PM
Max Marks: 45

Instructions:
(i) This Question paper contains Ten questions.

Part A: Memory Recall

Answer all the Questions. Each question carries two marks. **(5Qx 2M= 10M)**

Q.NO. 1. Explain any two differences between Cartesian product, Inner Join, and Natural Join by taking an example of a dummy table.

Q.NO. 2. Explain with an example the concept of Conceptual schema (at least 2 Points).

Q.NO. 3. Explain any two differences between Candidate key and composite key by taking an example of a dummy table.

Q.NO. 4. Consider the following relational database at a college.

Student (Name, rollno, Address)
Teacher (TeacherID, TeacherName, TeacherSubject)
College (rollno, TeacherID)

Write a **relational algebra expression** for the following requests.

(a) Find the name of the student who lives in Gwalior.

(b) Find the name of the teacher who teaches database systems.

Q.NO. 5. What is participation constraint in ER diagram? Explain with an example.

Part B: Thought Provoking

Answer All the Questions. Each question carries *five* marks. **(3Qx5M=15M)**

Q.NO.6 Consider a university database system. Design an ER diagram that captures the relationships between students, courses, and instructors. Include entity sets, relationship sets, attributes, and cardinalities. Justify your design choices and explain how the diagram represents the key aspects of the university's data model.

Q.NO.7. What is SQL Aggregate functions. Explain each function with the help of a dummy table. Also differentiate between ORDER BY and GROUP BY Clause.

Q.NO.8 Imagine you are a detective investigating a complex case that involves two main suspects: Alice, and Carol. Each suspect possesses unique information that could help solve the mystery. However, there's a catch—their knowledge is spread across two separate tables: **Suspect_Alice, and Suspect_Carol.** In your investigation, you have three different types of joins at your disposal: INNER JOIN, LEFT JOIN, and RIGHT JOIN. Each join provides a distinct perspective on the suspects and their connections. Now, here's the question: **As a detective, faced with this intricate case, which type of join would you choose to unravel the truth behind the mystery—INNER JOIN, LEFT JOIN, or RIGHT JOIN—and why?**

Part C: Problem Solving

Answer all the Questions. Each question carries *Ten* marks **(2Qx10M=20M)**

Q.NO.9 (a) Consider the relation R1 (ABCDEFGHIJ). The functional dependencies are given as

AB ⟶ C, AD ⟶ GH, BD ⟶ EF, A ⟶ I, H ⟶ J.

Explain whether the above relation is in 2NF or not. If not, convert it into 2NF Form.

(b) Check the highest normal form of relation R2 (ABCDE) with following FDs

AB ⟶ CD, D ⟶ A, BC ⟶ DE

Q.NO.10 Consider the Table given below and **write down SQL command and relational algebra expression for each question.**

Table: EMPLOYEE

Firstname	Lastname	SSN	birthdate	Address	Sex	Salary	Departmentno.
James	Borg	111	10-Nov-37	Texas	M	55000	1
Franklin	Wong	222	8-Dec-55	California	F	40000	5
John	Smith	333	9-Jan-65	California	M	30000	5
Jennifer	Wallace	444	20-Nov-50	Texas	F	43000	4
Alicia	Jalaya	555	13-Nov-60	Texas	F	25000	4
Ramesh	Narayan	666	29-Mar-69	Delhi	M	38000	5
Joyce	Daniel	777	21-Jun-75	Washington	M	25000	5
Ahmad	Khan	888	22-Feb-80	Delhi	M	25000	4

(a) Select the employee whose salary is greater than 30,000/-

(b) Select the employee who work in Department 4 and have salary greater than 25,000/-

(c) select the employee who either work in Department 4 and salary greater than 25000/- or working in department 5 and salary greater than 30,000/-

(d) Retrieve all employees in Department 5 whose salary is between 30,000 and 50,000 (including both)

(e) Retrieve the name of employee having salary greater than the average salary of all employees.