Unique paper Code : 32345201_OC

Name of the Course : B.Sc.(H) Computer Science

Name of the Paper : Introduction to Database Systems (Generic Elective - II)

Semester : II

Year of Admission : 2015, 2016, 2017 & 2018

Duration: Three hours Maximum Marks: 75

Instructions for candidates:

Attempt any four questions.

All questions carry equal marks.

*The complete answer to a question must appear in a single **PDF** file.*

You may make suitable assumptions in a question and state them clearly.

Q1. Illustrate the following with the help of an example in context to relational data model:

- Relation schema
- Attribute
- Tuple
- Degree of a relation
- Cardinality of a relation

Give one advantage and one disadvantage of the relational model as compared to traditional file systems.

Illustrate the concept of a weak entity, its partial key and its identifying relationship using a suitable example.

Consider the following relations **R1** and **R2** having the same schema:

R1

Id	Name
1008	Anisha
1012	Suman
2000	Tarun
2002	Rani

R2

Id	Name
1015	Anita
2005	Varun
2002	Rani
1008	Anisha

Find the result of the following operations:

- **R1 NATURAl JOIN R2**
- **R2 DIFFERENCE R1**
- **R1 INTERSECTION R2**
- **R1 UNION R2**

Q2. Enumerate any four types of users of the database system.

Consider the database **EMP** with the tables **Employee**, **Company and Works:**

Employee(empNo, empName, street, empCity, salary)

Company(compNo,compName,compCity)

Works(empNo,compNo)

Identify the primary keys and foreign keys of all given tables.

Write SQL commands for the following:

- Rename the attribute **empNo** of **Employee** table to **EID**.
- Find the names of all employees who live in the same city as the company for which they work.
- Find the name of the employee who earns the highest salary.
- Find the details of all employees in descending order of their salary.
- Find the names of all companies located in **"Mumbai"**.

Write a SQL statement to modify the city of the company **"ABC Corporations"** to "**Delhi**".

Q3. A Sports database is to be constructed to keep track of the teams and games of a sport league. A team has a team name (**Tname**) and unique team id (**Tid**). A player has a name (**Pname**), unique player id (**Pid**) and the team id (**Tid)** to which he/she belongs. It is desired to keep track of the type of the game **(Type)**, its players **(Pid)**, result of a game **(res)** and game id (**Gid**). Construct an ER diagram for the Sports database with following constraints:

1. A team has a number of players, but a player belongs to one team.
2. A player may play many games, and a game may have many players.

Consider the universal relation **R = {A,B,C,D,E,F,G,H,I,J}** and the set of functional dependencies: **F = { AB -> C, BD -> EF, AD->GH, G -> I, H -> J}**. Identify the key for the given relation. Assuming all attributes are single-valued and

non-composite, show that the given relation **R** is first normal form (1NF). Check if the relation is in 2NF. If not, decompose **R** into **2NF**. Further decompose the resulting relations into **3NF**, if required.

Q4. Describe three-tier architecture of the database with the help of a diagram.

Consider the following relations **Customer_Details** and **Product_Details** having the following schema:

Customer_Details

Cust_Code	Cust_Name	Cust_ContactNo

Order_Details

O_Code	Cust_Code	O_Date	O_Amount

The **Cust_Code** field is a foreign key in the **Order_Details** table that references the **Customer_Details** table.

Write a SQL statement using **BETWEEN** operator that produces the same result as the following SQL statement:

```
SELECT *
FROM Order_Details
WHERE O_Date >= '1/1/1997' AND O_Date <= '1/1/1998';
```

Write SQL commands to perform the following operations:

- Create a database schema **Retail,** comprising two tables **Customer_Details** and **Order_Details.**
- Drop the column **O_Date** from the **Order_Details** table.
- Delete the table schema of the table **Order_Details**.

Q5. What is meant by data independence? Give one example of each of the logical and physical data independence.

Consider the following relation **EMP_DEPT:**

Empno	Ename	BDate	mobileNo	Dnumber	Dname	MgrNo
E101	Rahul	02/10/1982	98346728457	D3	HR	E106
E104	Deepti	06/05/1983	87392747599	D1	Sales	E112

E110	Swati	05/07/1985	77563835658	D5	IT	E101
E123	Ankur	03/03/1987	38438475675	D2	Admin	E105

Consider the following operations on the given relation **EMP_DEPT**:

- Insert a new department with **Dnumber = "D4"**, **Dname = "Research"**, and **MgrNo = "E101"**.
- Delete a record with **Empno = "E110"**.

Will the above two operations result in any anomaly? Justify your answer.

Q6. Give three advantages and one disadvantage of the database system approach as compared to traditional file system approach?

Suggest cardinality ratios of the given relationships based on common-sense meaning. In each case justify your answer.

Entity 1	Entity 2	Relationship name
Student	Course	Takes
Customer	Product	Purchases
Country	President	Governed_By
Person	Smart Phone	Owns

Consider the following relations:

Student

EnrolNo	**Name**	**Dept_no**
CS001	Varun Sharma	10
CS002	Kajal Jain	10
PHY003	Shikha Chawla	20
CHEM004	Suresh	30

Department

Dept_no	**Dept_name**
10	Computer Science
20	Physics
30	Chemistry

Assume that **Dept_no** of **Student** relation is referencing **Dept_no** of **Department** relation. Consider a situation that an attempt is made to delete the tuple with **Dept_no = 30** from the **Department** table. Suggest two methods that a DBMS may deploy to ensure the database integrity in response to such an attempt?