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Daffodil International University
**Department of Software Engineering**
**Faculty of Science & Information Technology**
**Midterm Examination, Spring 2026**
**Course Code: SE 223; Course Title: Database System**
**Sections & Teachers: NJ (A), SS (B), TRT (C, D, K), KRA (E, F), CP (G, H), AUA (I), AR (J)**

**Time: 1:30 Hrs** **Marks: 25**

**Answer ALL Questions**

| | | | | |
|---|---|---|---|---|
| **1.** | | A Public Library Network operates multiple branches across India. Each branch includes details such as branch ID, location (comprising street, city, district, and postal code), and contact phone number. Branches are managed by librarians or assistants. The librarians or assistants handle daily operations at their assigned branch. Each employee receives an employee ID, full name, role, and monthly salary. Every branch maintains a collection of books. Book details include ISBN, copy ID, title, genre, borrowing fee per day, purchase price, availability status, and the names of the primary authors and publisher. Typically, branches have multiple copies of popular books, distinguished by the copy ID. The status shows if a particular copy is available for borrowing. To borrow books, patrons must register as members at a local branch. Member information consists of member ID, first and last name, residential address, and registration date. Registered members can borrow up to five books simultaneously. Borrowing records include borrow ID, member's full name and ID, book copy ID, title, daily fee, borrow date, and return date. The borrower ID is unique across the entire network. | | **CLO-1, Level-4]** |
| | *a)* | **Figure out** the relational database and design the necessary tables for the above Library Management System. | **[Marks-2]** | |
| | *b)* | **Explain** the concept of data abstraction in the context of this library system, including the three levels. | **[Marks-3]** | |
| | *c)* | **Analyze** the given scenario and determine the most appropriate application architecture (2-tier or 3-tier) for the system with a proper explanation. | **[Marks- 3]** | |
| | *d)* | **Examine** the functions of a Database Administrator (DBA) by breaking down at least four key responsibilities involved in maintaining a database system. | **[Marks- 2]** | |
| **2.** | *a)* | Based on the library scenario described,<br><br>**Illustrate** an Entity-Relationship Diagram (ERD). Clearly identify entities, their attributes, and the relationships between them (including cardinality and participation constraints). | **[Marks-4]** | |

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**b)** [Marks- 2] — CLO-2 *Level-4*

**Table: Buyer**

| *Buyer_ID* | *Buyer_Name* | *Location* | *Email* |
|---|---|---|---|
| 201 | Aarav | Mumbai | ab@gmail.com |
| 202 | Priya | Delhi | lk@gmail.com |
| 203 | Rohan | Bangalore | bd@gmail.com |
| 204 | Neha | Chennai | ac@gmail.com |

**Table: Purchase**

| *Purchase_ID* | *Purchase_Date* | *Amount* | *B_ID* |
|---|---|---|---|
| 301 | 2023-05-15 | 1500 | 202 |
| 302 | 2021-11-20 | 3200 | 204 |
| 303 | 2024-01-10 | 800 | 201 |
| 304 | 2020-08-05 | 4500 | 201 |

From this schema, **identify** and explain: Candidate keys, Alternate keys, and provide justifications for each selection.

**c)** [Marks-4]

**Analyze** the Buyer and Purchase tables from *Question 2(b)* and formulate appropriate relational algebra expressions to derive the required query results.

a. Retrieve the names of all buyers who have not made any purchases yet.
b. Find the buyer's name who made a purchase on 2023-09-25.
c. Display all information for buyers located in Delhi.
d. List all Buyer_IDs that appear in the Purchase table.

**a)** [Marks- 2] — [CLO-3, Level-3]

Using the table from Question 2 (b)

**Demonstrate** the results of *Inner Join* and *Full Outer Join* between Buyer and Purchase table, and show the resulting tables with all relevant columns.

**b)** [Marks-3]

**Apply** appropriate SQL queries to retrieve the required results using the Buyer and Purchase tables from Question 2(b).

A. Write SQL commands to create both tables, incorporating appropriate constraints.
B. Write SQL commands to insert the provided sample data into both tables.
C. Use the ALTER TABLE command to add a new column named "Phone_number" (with data type VARCHAR(20)) to the Buyer table.