



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. | <p>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.</p> |            | CLO-1,<br>Level-4] |
|    | a) <b>Figure out</b> the relational database and design the necessary tables for the above Library Management System.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | [Marks-2]  |                    |
|    | b) <b>Explain</b> the concept of data abstraction in the context of this library system, including the three levels.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | [Marks-3]  |                    |
|    | c) <b>Analyze</b> 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) <b>Examine</b> the functions of a Database Administrator (DBA) by breaking down at least four key responsibilities involved in maintaining a database system.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | [Marks- 2] |                    |
| 2. | <p>a) Based on the library scenario described,</p> <p><b>Illustrate</b> an Entity-Relationship Diagram (ERD). Clearly identify entities, their attributes, and the relationships between them (including cardinality and participation constraints).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | [Marks-4]  |                    |

|                    | b)            | <div><div>Table: Buyer</div><table><tr><th><u>Buyer_ID</u></th><th>Buyer_Name</th><th>Location</th><th>Email</th></tr><tr><td>201</td><td>Aarav</td><td>Mumbai</td><td>ab@gmail.com</td></tr><tr><td>202</td><td>Priya</td><td>Delhi</td><td>lk@gmail.com</td></tr><tr><td>203</td><td>Rohan</td><td>Bangalore</td><td>bd@gmail.com</td></tr><tr><td>204</td><td>Neha</td><td>Chennai</td><td>ac@gmail.com</td></tr></table></div> <div><div>Table: Purchase</div><table><tr><th><u>Purchase_ID</u></th><th>Purchase_Date</th><th>Amount</th><th>B_ID</th></tr><tr><td>301</td><td>2023-05-15</td><td>1500</td><td>202</td></tr><tr><td>302</td><td>2021-11-20</td><td>3200</td><td>204</td></tr><tr><td>303</td><td>2024-01-10</td><td>800</td><td>201</td></tr><tr><td>304</td><td>2020-08-05</td><td>4500</td><td>201</td></tr></table></div> <p>From this schema, <b>identify</b> and explain: Candidate keys, Alternate keys, and provide justifications for each selection.</p> | <u>Buyer_ID</u> | 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 | <u>Purchase_ID</u> | 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 | [Marks- 2] | CLO-2<br>Level-4 |
|--------------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------------------|----------|-------|-----|-------|--------|--------------|-----|-------|-------|--------------|-----|-------|-----------|--------------|-----|------|---------|--------------|--------------------|---------------|--------|------|-----|------------|------|-----|-----|------------|------|-----|-----|------------|-----|-----|-----|------------|------|-----|------------|------------------|
| <u>Buyer_ID</u>    | 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    |                     |          |       |     |       |        |              |     |       |       |              |     |       |           |              |     |      |         |              |                    |               |        |      |     |            |      |     |     |            |      |     |     |            |     |     |     |            |      |     |            |                  |
| <u>Purchase_ID</u> | 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             |                     |          |       |     |       |        |              |     |       |       |              |     |       |           |              |     |      |         |              |                    |               |        |      |     |            |      |     |     |            |      |     |     |            |     |     |     |            |      |     |            |                  |
|                    | c)            | <p>Analyze the Buyer and Purchase tables from <i>Question 2(b)</i> and formulate appropriate relational algebra expressions to derive the required query results.</p> <p>a. Retrieve the names of all buyers who have not made any purchases yet.<br/>b. Find the buyer's name who made a purchase on 2023-09-25.<br/>c. Display all information for buyers located in Delhi.<br/>d. List all Buyer_IDs that appear in the Purchase table.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | [Marks-4]       |                     |          |       |     |       |        |              |     |       |       |              |     |       |           |              |     |      |         |              |                    |               |        |      |     |            |      |     |     |            |      |     |     |            |     |     |     |            |      |     |            |                  |
| 3.                 | a)            | <p>Using the table from Question 2 (b)</p> <p>Demonstrate the results of <i>Inner Join</i> and <i>Full Outer Join</i> between Buyer and Purchase table, and show the resulting tables with all relevant columns.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | [Marks- 2]      | [CLO-3,<br>Level-3] |          |       |     |       |        |              |     |       |       |              |     |       |           |              |     |      |         |              |                    |               |        |      |     |            |      |     |     |            |      |     |     |            |     |     |     |            |      |     |            |                  |
|                    | b)            | <p>Apply appropriate SQL queries to retrieve the required results using the Buyer and Purchase tables from Question 2(b).</p> <p>A. Write SQL commands to create both tables, incorporating appropriate constraints.</p> <p>B. Write SQL commands to insert the provided sample data into both tables.</p> <p>C. Use the ALTER TABLE command to add a new column named "Phone_number" (with data type VARCHAR(20)) to the Buyer table.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | [Marks-3]       |                     |          |       |     |       |        |              |     |       |       |              |     |       |           |              |     |      |         |              |                    |               |        |      |     |            |      |     |     |            |      |     |     |            |     |     |     |            |      |     |            |                  |