

National University of Computer and Emerging Sciences, Lahore Campus



Course: Database Systems
Program: BS (Computer Science)
Out Date: 30-Jan-2024
Due Date: **Wed 14-Feb-2024 (start of class)**
Section: BCS-4A, BCS-4B
Assignment: 1 (Relational Model)

Course Code: CS2005
Semester: Spring 2024
Total Marks:
Weight:
Page(s): 3

Instructions:

- This assignment is an individual assignment.
- Clearly mention any assumption you have made.
- You are required to submit the hard copy of your assignment at the start of your class.
- For any query, please contact your TA.

TOPIC: Relational Data Model

Q1. Consider the following database state:

Table1: Books

<u>Book ID</u>	Title	Author	Genre	Price
1	The Bell Jar	Sylvia Plath	Autobiography	12.99
2	Crime and Punishment	Fyodor Dostoevsky	Mystery	9.99
3	1984	George Orwell	Thriller	14.99
4	The Prophet	Kahlil Gibran	Poetry	NULL
5	Gulistan	Saadi Shirazi	NULL	8.99

Table2: Orders

<u>Order ID</u>	Book ID	Customer ID	Quantity	Order Date	Order Status
120	1	12	2	2024-02-1	Processing
121	2	16	3	2024-02-1	Completed
122	3	18	4	2024-02-2	Shipped
123	NULL	19	1	2024-02-2	Processing
124	2	20	6	2024-02-2	Cancelled
125	5	21	3	2024-02-3	NULL

Primary keys are underlined, and Book ID is a foreign key in the Orders table.

Discuss all integrity constraints violated by each operation, if any, and the different ways of enforcing these constraints. If the operation is unsuccessful due to some integrity constraint, then discuss the reason as well as the solution. If the operation is successful, then show the new state of both relations/tables. Also assume that Book ID can be null in Orders Table. Note that all following operations are independent.

1. For Delete

a) Assume foreign key with cascading option is implemented.

- Delete the book where Genre is NULL.
- Delete the book where Price is less than \$10.00.
- Delete the order where Book ID is 1.
- Delete the book where Book ID is 4.

b) Assume that foreign key with Set NULL option is implemented.

- i. Delete the book where Genre is *Autobiography*.
- ii. Delete the order where Book ID is *NULL*.
- iii. Delete the book where Author is '*George Orwell*'
- iv. Delete all books.

c) Assume that foreign key with No Action is implemented.

- i. Delete the book where Price is *NULL*.
- ii. Delete the book where Book ID is 4.
- iii. Delete the book where Book ID is 2.

2. For Insert

a) Assume foreign key with cascading option is implemented.

- i. Insert <6, "Broken Wings", "Kahlil Gibran", "Poetry", NULL > into Books.
- ii. Insert <5, "A Tale of Two Cities", "Charles Dickens", "Historical Novel", \$9.99 > into Books.
- iii. Insert <NULL, "Animal Farm", "George Orwell", "Satire", \$10.99 > into Books.
- iv. Insert <126, 5, 21, 4, "2024-02-3", "Processing"> into Orders

b) Assume that foreign key with Set NULL option is implemented.

- i. Insert <7, "The Zahir", "Paulo Coelho", "Novel", \$9.99 > into Books.
- ii. Insert <125, 5, 21, 4, "2024-02-3", "Cancelled"> into Orders
- iii. Insert <NULL, "A Tale of Two Cities", "Charles Dickens", "Historical Novel", \$9.99 > into Books.
- iv. Insert <126, 6, 21, 2, "2024-02-3", "Processing"> into Orders

c) Assume that foreign key with No Action is implemented.

- i. Insert <8, "Pride and Prejudice", "Jane Austen", "Novel" > into Books.
- ii. Insert <125, 7, 23, 1, "2024-02-3", "Shipped"> into Orders

3. For Update

a) Assume foreign key with cascading option is implemented.

- i. For Book ID=5 change it to 2 in book table.
- ii. For Book ID=5 change it to 6 in book table.
- iii. For Book ID=2 change the price \$6.99.
- iv. For Order ID = 121 change Book ID = 12.

b) Assume that foreign key with Set NULL option is implemented.

- i. For Book ID=5 change it to 7 in book table
- ii. For Book ID=4 change the Author to 'KG'.
- iii. For Orders having NULL Order Status change Book ID = 2.

- c) Assume that foreign key with No Action is implemented.
- For Book having book ID=2 change it to 6 in book table.
 - For Book having Book ID=4 change price to \$10.99.
 - For Orders having NULL Order Status change Book ID = 8.

Q2. Consider the following database schema.

Flight (*FlightId, DepartureDate, ArrivalDate, PilotId*)

Pilot (*PilotId, PilotName, LisenceNo, PhoneNo*)

Customer (*CusId, Cusname, PassportNo, Dob*)

Booking (*BookingId, FlightId, CusId*)

- Identify the primary keys of all relations.
- Identify the secondary keys of all relations, if any.
- Identify the foreign keys of all relations, if any.
- Give an example of insertion in Flight relation that violates referential integrity constraint.
- Give an example of insertion in Flight relation that violates entity integrity constraint.

Q3. SOFTEC is a prestigious event at FAST-NU. A number of different events are held under the Softec umbrella. These include Software Competition, Programming Competition, IdeasXtreme, etc. Numerous participants from various universities and institutes across the country participate and register for these events. Softec society plans to develop a system for all these events. You have to design a database system that can maintain information about different competitions, students, faculty members (from Fast University) and judges (from Industry) involved. Your system should allow the students to be evaluated by judges.

Note: For simplicity each competition has a single faculty member as head and a single judge

You are required to:

- What do you think are the main relations (i.e. tables) in this database?
- Define attributes for these relations. The attributes of each relation must have the appropriate data types/domains.
- Identify the primary keys, secondary keys (if any), and foreign keys (if any) in each relation.
- Populate each relation with at least 5 sample tuples (i.e. rows) so that none of the constraints is violated.
- Should we design a distributed DBMS or simple centralized one? Explain?