Name Xue, Bing Date: Nov 22nd, 2022

(last name, first name)

NYU ID: bx2109

Course Section Number: CSCI-GA.2433-001

**Project Part 2**

Total in points (100 points total): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Professor’s Comments:

Affirmation of my Independent Effort: Bing Xue

(Sign here)

Report on Project Part 2

Team Member:

Bing Xue (bx2109)

Logical schema:

Schemas:

Order: {NO, Book\_NO, user\_NO, amount, number, date, status}

The information related to the user's purchase or sale is recorded (order number, book number, operation user, amount, number of books, operation date, order nature, and status), and the billing information mentioned in the title is also reflected here, greatly eliminating redundancy.

Book\_info: {NO, ISBN, title, author, publisher}

Recorded book number, ISBN, name, author, publisher, and other information, where author and publisher may be redundant, but inevitable, if these two attributes are split out and then add writen\_by and other relationships instead of greater requirements for data storage, this side of the information are merged in it, for the requested function is more appropriate.

Userinfo: {NO, username, password, name, gender, age}

Recorded management system management information (number, user name, password, real name, gender, age), users can log in to the management system through username and password, user creation information is not considered here, because only the super administrator can create users, and the information created is not that important.

Sale: {NO, stock, price}

It is important to note that the weak entity set and relationship originally designed in the ER diagram are merged to take advantage of the correspondence between Book and Sale, and the primary key in Book\_info is added to Sale, which reduces redundant data storage. The reason for not merging Book\_info with Sale is that it reflects the logic of: users order book, while price and stock are the information that often needs to be modified.

Account: {NO, credit}

To maintain the account balance, again, account and access were merged to reduce the intermediate and unnecessary storage of serial numbers. The information in it was duplicated from the order, so the redundant information was eliminated.

Dependency:

Order.Book\_NO -> Book\_info.NO

Order.user\_NO -> Userinfo.NO

Sale.NO -> Book\_info.NO

Graphical user interface, application, Teams

Description automatically generated

We use ER-to-Relational mapping to create our logical schema based on the ER diagram.

Step 1: Mapping of Regular Entity Types.

Step 2: Mapping of Weak Entity Types.

Step 3: Mapping of Binary 1:1 Relationship Types.

Step 4: Mapping of Binary 1:N Relationship Types.

Step 5: Mapping of Binary M:N Relationship Types.

Step 6: Mapping of Multivalued Attributes.

Step 7: Mapping of N-ary Relationship Types.

Step 8: Options for Mapping Specialization or Generalization.

The routine is listed above, and we don’t have Multivalued Attributes, N-ary Relationship Type, Specialization, or Generalization in the conceptual graph.

When it comes to Mapping of Binary 1:1 Relationship Types, we generally adopt Foreign key approach. To adopt this method, it is better to choose an entity type with total participation in R in the role of S. We didn’t adopt the Cross-reference or relationship relation approach **due to** the drawback of having an extra relation, and requiring extra join operations when combining related tuples from the tables. We didn’t adopt the Merged relation approach because it may violate 2NF on the tables.

For the Mapping of Binary 1:N Relationship Types, we adopt two different approaches: Foreign key approach and Cross-reference or relationship relation approach. To adopt this method, it is better to choose an entity type with total participation in R in the role of S. The drawback is having an extra relation, and requiring extra join operations when combining related tuples from the tables. But through this, we can ensure 2NF on the tables.

As mentioned above, we normalize several tables. Noteworthy, we neglect the dependency of books’ publication information on its ISBN. Because we need to retrieve book information frequently, and this process is time-sensitive (when we respond to the customer), we combine the publication information altogether to achieve a faster response.