**Section A.** Compose SQL queries for MAS Database.

1. Return me the organization “Divesh Srivastava” is in.
2. Return me the number of citations of "Enabling Schema-Free XQuery with meaningful query focus" in each year.

**Section B.** Database design for bookstore application.

Suppose a bookstore needs to create a database to manage its customers, books and transactions.

The bookstore sells books and magazines. Each book or magazine has a unique ID (10-digit number). A customer may query about a certain book by providing book title and other information. They may query for all sorts of information about a book, for example, authors, publisher, price, availability etc. They may also want to get recommendations for popular books, authors and categories.

The bookstore offers a membership scheme that customers can register for. To sign up for a member, customers need to fill a form providing information like name, address, phone number, birthday, and email address. One phone number can only be used to register one member. Each member will be assigned a unique member ID (6-digit number) printed on the member card. Customers pay a yearly membership fee and can renew at any time. Membership expires if the customer does not renew. For example, customer ‘A’ signed up for membership on 09/09/2022 for one year. If ‘A’ does not renew, the membership expires on 08/09/2023. Being a member, customers get 10% off regular prices on all books and magazines sold at the bookstore. The bookstore will provide special promotions on certain books with extra discounts for members only from time to time. For example, before the new semester, there will be ‘back to school’ promotions on tuition books for 2 weeks. Recommendations and promotions will be sent to members’ email address regularly.

When customers make payment at the counter, transaction information is recorded. Customers need to present their member cards or input their phone numbers to enjoy members exclusive discounts. They will receive a receipt with a unique ID (10-digit number) after payment is done. Customers may buy one or more books in one transaction. Transaction records are not only used for auditing, they also help managers of the bookstore to understand the sales on weekly, monthly and yearly bases. They want to know popular books, categories, and authors so that they can better prepare for stocks and future plans. They sent greeting cards to loyal members on their birthday months.

**Read the above description carefully and answer the following questions. *Read all the questions first before answering.***

**Questions**

1. Conduct conceptual design using ER model (output: ER diagram)
2. Conduct logical design using relational model (output: schema diagram) by translating the ER model designed in the previous question.

***Note****: For questions 1 & 2, list all relevant integrity constraints (e.g., primary keys, and etc. Data types could be ignored here.).*

1. List all FDs based on the above description.

***Note****: Consider relation R. If X → R is a FD on R, then for any A R, X → A is implied and you don’t need to list it.*

1. Examine if the resulting relational schema is in BCNF and prove it. If not, conduct schema refinements. Make sure the final relational schema is in BCNF.

5. Compose SQL queries on the final schema to answer the following questions from customers and managers of the bookstore:

5.1. I like the author ‘AA’ very much, could you recommend some books from ‘AA’ that are available? (‘AA’ is author name)

5.2. Could you kindly check if I am a member of your store? My phone number is 9999-9999.

5.3. Could you kindly check the expiry date of my membership? Here is my member card (ID = 123456).

5.4. Is there any promotion on book ‘BB’ if I am a member? (‘BB’ is the book title)

5.5. What is the original price of book ‘CC’? (‘CC’ is the book title)

5.6. What is the total cost if customer ‘XYZ’ bought one book ‘DD’ and two copies of book ‘EE’? XYZ’s phone number is 9999-9999. (‘XYZ’ is customer’s name. ‘DD’ and ‘EE’ are book titles)

5.7. Tell me the member who spent the most money in the bookstore last year.

5.8. Tell me the best selling book of last year, i.e., the book with the most copies sold in the last year.