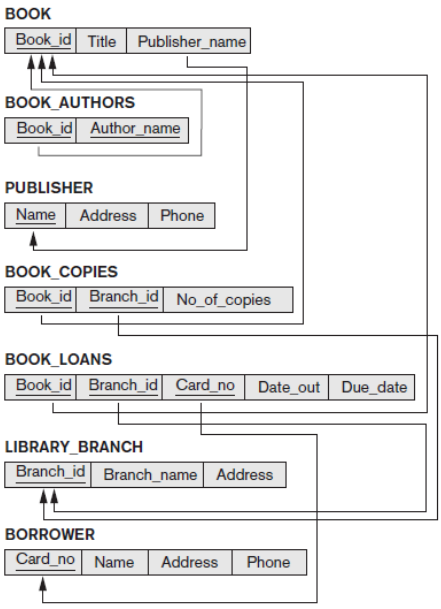
Database Systems – Summer 2022

Relational Model & Algebra Total: 100 points

Q1. (15 points)



Consider the LIBRARY relational database schema shown in the figure above, which is used to keep track of books, borrowers, and book loans. Referential integrity constraints are shown as directed arcs in Figure. Write down **relational expressions** for the following queries:

a. How many copies of the book titled *The Lost Tribe* are owned by the library branch whose name is 'Sharpstown'?

b. How many copies of the book titled *The Lost Tribe* are owned by each library branch?

c. Retrieve the names of all borrowers who do not have any books checked out.

Q2. (20+15 points) [Use MySQL or a similar software for this problem]

Use the schema provided in Figure 1.2 of your textbook to create database and populate it with sufficient sample data. Provide a description of your create table and insert queries (just a few inserts) you used to create the aforementioned database. If this step is missing then I will not grade rest of the solution. Remember to work with PKs & FKs.

Now specify the following queries in **SQL** and also take print screen of the output to associate with each query:

a. Retrieve the names of all senior students majoring in 'cs' (computer science).

b. Retrieve the names of all courses taught by Professor King in 2007 and 2008.

c. For each section taught by Professor King, retrieve the course number, semester, year, and number of students who took the section.

d. Retrieve the name and transcript of each senior student (Class = 4) majoring in CS. A transcript includes course name, course number, credit hours, semester, year, and grade for each course completed by the student.

Q3. (50 points) [Use MySQL or a similar software for this problem]
Use the schema provided in Figure 5.5 of your textbook to create database and populate it with sufficient sample data. Provide a description of your create table and insert queries (just a few inserts) you used to create the aforementioned database. If this step is missing then I will not grade rest of the solution. Remember to work with PKs & FKs.
Use your understanding of database operations to find use cases and write queries for the following criteria: (also take print screen of the output to associate with each query)

a. Demonstrating use of join between two tables: specify a valid question (use case) that would result in a join operation of any two tables, also provide the SQL query.
b. Demonstrating use of join between three tables: specify a valid question (use case) that would result in a join operation of any three tables, also provide the SQL query.
c. Demonstrating use of join between two tables and aggregating the results (group by): specify a valid question (use case) that would result in a join operation of any two tables and then aggregation, also provide the SQL query.
d. Demonstrating use of join between three tables and aggregating the results (group by): specify a valid question (use case) that would result in a join operation of any three tables and then aggregation, also provide the SQL query.
e. Demonstrating use of join between three tables, aggregating the results (group by) and filtering the final result using having: specify a valid question (use case) that would result in a join operation of any three tables and then aggregation along with having, also provide the SQL query.