[Q.1] Answer the following question (a) for a simple ship tracking conceptual schema

(a) Derive the logical ship tracking database schema by ER to relational mapping algorithm

[Q.2] Answer the following questions for a simple library application.

The data requirements of the library application are summarized as follows: BOOK entity is identified by BookId, it has title and multiple author names. PUBLISHER entity consists of Name, Address, and Phone attributes. Name is the key for the PUBLISHER.

LIBRARY_BRANCH entity has BranchId as a key and BranchName attribute additionally. BORROWER entity has BrowerId as key and additionally has name, address, phone attributes. Each LIBRARY_BRANCH has one or more copies of the same book. In such a case, noOfCopies attribute needs to be maintained by the relationship. A book is published by only one publisher. A book can be loaned to a borrower at a specific library branch.

(a) Draw ER diagram for the conceptual schema of the library database application.
(b) Map the conceptual schema to logical database schema.
(c) Explain at least two referential integrity constraints.
(d) Write SQL statements for the following queries on the library database (assume the library database is populated):

a. How many copies of the book titled “Database Systems” are owned by the library branch “Lehman”?

b. Retrieve the names of all borrowers who do not have any books checked out (use exists clause).

c. For each library, retrieve the name and the total number of books loaned out from the branch.

d. For each book authored (co-authored) by “Robert Feinerman”, retrieve the title and the number of copies owned by the library branch “Lehman”.