

# Project 1

Due Date: May 9, 2025, at 11:59 pm  
10% of the final grade

Answer the following questions **independently**. As they are related to the Week 7 lab exercises. If you have questions about the lab exercises, you may discuss them with the tutors. However, please **do not discuss the project** with the tutors.

You may use any software tool to construct the design model and document the ER diagrams or the relational database schema. Please use **only** the ER notations that were mainly used in the lectures. Do not use any variations of the ER diagram notations.

Submit your assignment as a **single PDF file** containing all your answers to the questions below.

1. Consider a LIBRARY database in which data is recorded about a city library system. The basic data requirements are summarized as follows:

There are different library branches located in different locations of the city. A book in the library records the book ID code, title, author list, publisher information, ISBN, date published, etc. Each book may have a number of copies located in different library branches. A publisher has detailed information, such as name, address and phone numbers, etc. A member of the library, who is allowed to borrow books, has the information such as the member ID number, name, gender, birth date, address, phone number, etc. When a book is borrowed, it records the book ID code, branch ID, member ID, the date borrowed and the due date of returning the book, etc.

Use the Entity Relationship (ER) diagram to design a conceptual data model for the library system application. Based on the real world scenarios, state any unspecified requirements and make appropriate assumptions to complete the specification. [5 marks]

Note that there is no standard answer to this question. Any reasonable answers are acceptable. Marks are calculated using the following matrix:

- (a) The data requirements are clearly represented using entity types (strong entities/weak entities) or relationship types. (1 mark)
- (b) All required attributes occur in the ER diagram and attached to the entity types or relationship types correctly. (1 mark)
- (c) Keys (and partial keys) are correctly designed and underlined. (1 mark)
- (d) For all relationship types, Cardinality Ratio and Participation Constraint are correct. Alternatively, (min, max) notation labelling is acceptable. (1 mark)
- (e) Any unspecified requirements and assumptions (e.g., any additional components that are not specified by the original data requirements) should be clearly explained in natural language. (1 mark)

2. Consider a database for an airline. The system tracks customers and their reservations, flights and their status, seat assignments for individual flights, and the schedules and routing of future flights.
- Using the algorithm taught in lectures (the 7 steps), convert the ER diagram in the figure below into a relational database schema. Specify all primary and foreign keys, and provide detailed transformation steps (based on the 7 steps) along with intermediate results in your answer. [5 marks]

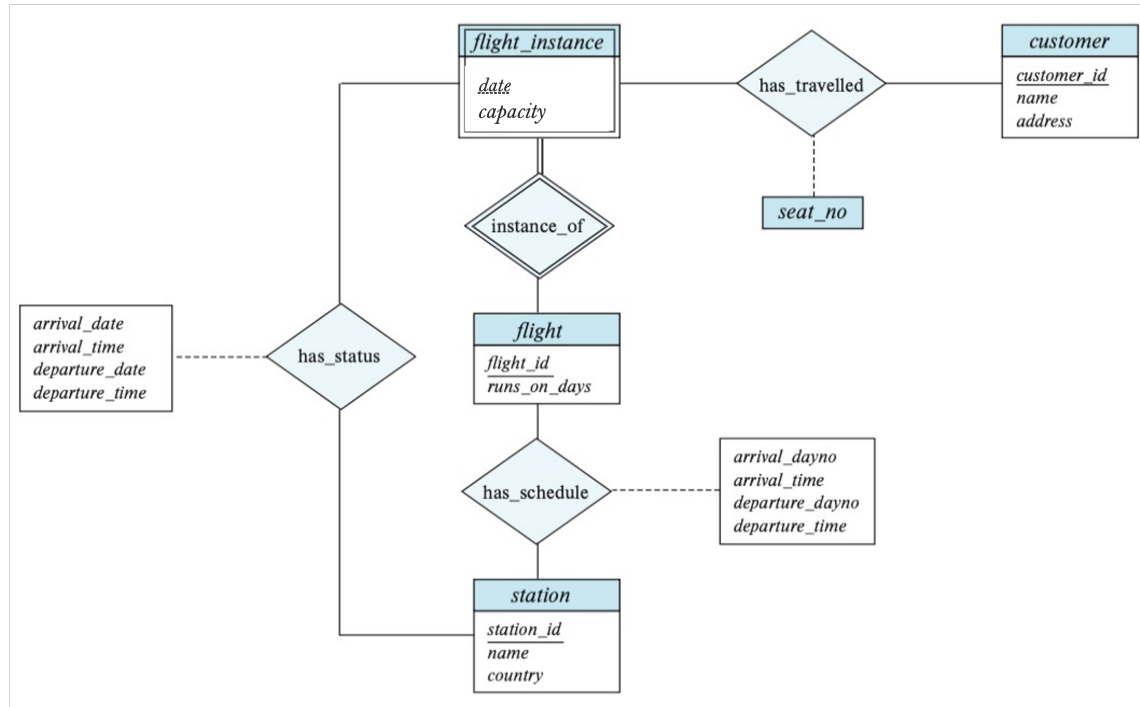


Figure 1: ER Diagram for an Airline Database