7.19 - Consider the ER diagram of Figure 7.20, which shows a simplified schema for an airline reservations system. Extract from the ER diagram the requirements and constraints that resulted in this schema. Try to be as precise as possible in your requirements and constraints specification.

**Answer:**

(1) The database represents each AIRPORT, keeping its unique AirportCode, the AIRPORT Name, and the City and State in which the AIRPORT is located.

(2) Each airline FLIGHT has a unique number, the Airline for the FLIGHT, and the Weekdays on which the FLIGHT is scheduled (for example, every day of the week except Sunday can be coded as X7).

(3) A FLIGHT is composed of one or more FLIGHT LEGs (for example, flight number CO1223 from New York to Los Angeles may have two FLIGHT LEGs: leg 1 from New York to Houston and leg 2 from Houston to Los Angeles). Each FLIGHT LEG has a DEPARTURE AIRPORT and Scheduled Departure Time, and an ARRIVAL AIRPORT and Scheduled Arrival Time.

(4) A LEG INSTANCE is an instance of a FLIGHT LEG on a specific Date (for example, CO1223 leg 1 on July 30, 1989). The actual Departure and Arrival AIRPORTs and Times are recorded for each flight leg after the flight leg has been concluded. The Number of available seats and the AIRPLANE used in the LEG INSTANCE are also kept.

(5) The customer RESERVATIONs on each LEG INSTANCE include the Customer Name, Phone, and Seat Number(s) for each reservation.

(6) Information on AIRPLANEs and AIRPLANE TYPEs are also kept. For each AIRPLANE TYPE (for example, DC-10), the TypeName, manufacturing Company, and Maximum Number of Seats are kept. The AIRPORTs in which planes of this type CAN LAND are kept in the database. For each AIRPLANE, the Airplaneld, Total number of seats, and TYPE are kept.
8.19 - Identify all the important concepts represented in the library database case study described here. In particular, identify the abstraction of classification (entity types and relationship types), aggregation, identification, and specialization/generalization. Specify (min, max) cardinality constraints whenever possible. List details that will affect the eventual design but which have no bearing on the conceptual design. List the semantic separately. Draw an EER diagram of the library database.

Answer:

8.21 - Figure 8.12 shows an example of an EER diagram for a small private airport database that is used to keep track of airplanes, their owners, airport employees, and pilots. From the requirements for this database, the following information was collected: Each airplane has a registration number [Reg#], is of a particular plane type [of_type], and is stored in a particular hangar [stored_in]. Each plane_type has a model number [Model], a capacity [Capacity], and a weight [Weight]. Each hangar has a number [Number], a capacity [Capacity], and a location [Location]. The database also keeps track of the owners of each plane [owns] and the employees who have maintained the plane [maintain]. Each relationship instance in owns relates an airplane to an owner and includes the purchase date [Pdate]. Each relationship instance in maintain relates to an employee to a service record [service]. Each airplane undergoes service many times; hence, it is related by [plane_service] to a number of service records. A service record includes as attributes the date of maintenance [Date], the number of hours spent on the work [Hours], and the type of work done [Workcode]. We use a
A weak entity type [service] to represent airplane service, because the airplane registration number is used to identify a service record. An owner is either a person or a corporation. Hence, we use a union type (category) [owner] that is a subset of the union of corporation [Corporation] and person [Person] entity types. Both pilots [Pilot] and employees [Employee] are subclasses of person. Each pilot has specific attributes license number [Lic_Num] and restrictions [Restr]; each employee has specific attributes salary [Salary] and shift [Shift]. All person entities in the database have data kept on their social security number [Ssn], name [Name], address [Address], and telephone number [Phone]. For corporation entities, the data kept includes name [Name], address [Address], and telephone number [Phone]. The database also keeps track of the types of planes each pilot is authorized to fly [Flies] and the types of planes each employee can do maintenance work on [Works_on]. Show how the small airport EER schema of Figure 8.12 may be represented in UML notation. (Note: We have not discussed how to represent categories (union types) in UML, so you do not have to map the categories in this and the following question.)

Answer:
8.27 - Consider the following EER diagram that describes computer systems at a company. Provide your own attributes and key for each entity type. Supply max cardinality constraints justifying your choice. Write a complete narrative description of what this EER diagram represents.

**Answer:**

The EER diagram represents the relationships and components of computer systems at a company. Each entity type is defined with its own attributes and key, along with max cardinality constraints.

- **Computer** entity type is categorized into **Laptop** and **Desktop**.
- **Component** is further divided into **Accessory** and **Software**.
- **Accessory** includes **Keyboard**, **Mouse**, and **Monitor**.
- **Software** includes **Operating System**, **Installed**, and **InstalledOS**.
- **Options** are related to both **Computer** and **Component**.

The diagram illustrates the structure and relationships between these components, such as how a computer is sold with specific accessories and how software supports various components.