Task 1:
Study the Case study and try to elaborate your understanding (point wise) as if you have talk with the domain expert. Group Discussion.

Answer:

Task 1: Discussion with the Domain Expert (Group Discussion)

1. Need a database for the airline system for underlying company operations.

2. Airport as an entity must have a unique Airport Code, Airport name, its location (City and State) and the list of airplanes types that it supports.

3. Airline Flight under an airport has a unique number, airline for the flight and weekdays to be operated.

4. We should consider each flight trip consisting of a leg number, departure airport with scheduled time and arrival airport with scheduled arrival time.

5. A flight trip consists of multiple trips and we must know the specific date for the specific trip and the number of available seats and the airplane used.

6. Customer reserve a trip so we must include the customer details which can contain customer's name, phone, seat numbers for the reservation. Also, the type of residency and payment system must be included for a specific reservation made by a customer.

7. The main data that must be available includes Sales data and should be able to see the sales according to region of sales and the time of sales.

8. Airplane types and the information about airplane type such as the manufacturing company, type name and maximum numbers of seats should be included.

9. Airplanes are the instance of airplane types which contains the airplane id, total number of seats and the type of the airplane.

10. Information on crew members is a hidden entity in this database system. It contains the information of all the crew members within an airlines system including pilots, flight attendant and other crew members.

11. Crew scheduling could be another entity which keeps track of scheduling of each crew members that are assigned to specific flight-trip.

12. Maintenance records is an entity that track all maintenance activities performed on each airplane including inspections, repairs, and component replacements. It also includes attributes such as date and time of maintenance, the nature of the maintenance, the parts and the materials used and also the maintenance company.

Task 2:
Figure out the visible entities and invisible entities.

Answer:

Visible Entities are:

1. Airport
2. Airplane
3. Airplane-type
4. Airlines
5. Flight-trip
6. Trip
7. Customer
8. Sales-data

Invisible Entities are:

1. Delayed Flights
2. Crew members
3. Crew scheduling
4. Maintenance info
5. Lane info
6. Baggage

Task 3:
List the attributes and relations between the entities.

Answer:

The database is designed for an airlines system that operates to run its business.
According to the case study, database should represent these entities along with it's attributes.

1) Airport
   - Airport-code(unique)
   - Airport-name
   - City
   - State
   - Lane info

   This entity represents various airports with their respective location and the type of airplanes it supports for landing/takeoff.

2) Airplane
   - Airplane-Id
   - Total No of Seats
   - Airplane-type

   This entity represents individual airplanes, it's total seats and the type of the airplane. Type can used to refer to another entity 'Airplane-type' described below.

3) Airplane-type
   - type
   - Max Seats (maximum number of seats)
   - Manufacturing company

   It represents the type with the max seats it could have and the company that manufactures it.

4) Airlines
   - Airline-number
   - Airline name
   - Weekdays

   This entity represents the scheduled flights and the airline that operates it.

5) Flight Trip
    - Leg number
    - Departure Airport-code
    - Scheduled departure_time
    - Arrival airport
    - Scheduled arrival_time

    This entity represents each flight trip that is scheduled for a specific time

6) Trip
    - Available seats
    - Airplane id
    - Date and Time
    - Trip id(unique)

    This entity is an instance of ‘flight-trip’. It represents airplane for the trip with it’s number

7) Customer
    - Customer id(unique)
    - Name
    - Phone
    - Seat number
    - Residency type
    - Payment option

    This entity represents each customer and their information along with the payment data.

8) Sales-data
    - Sales id
    - Customer id
    - Amount paid
    - Region of sales
    - Date and Time of sales

    This entity contains Sales id for every transaction with the Customer id and their spending.

Hidden entities:

1) Delayed Flights:
    - Trip id
    - Cause of Delay
    - Date and Time
    - Status (issue resolved or not)

2) Crew Members
    - Crew id
    - Airlines id
    - Role
    - Name
    - Salary

3) Crew Scheduling:
    - Crew id
    - Trip id

4) Maintenance info
    - Maintenance id
    - Maintenance type
    - Date and Time
    - Parts Involved
    - Maintenance provider

5) Lane info
    - Lane id
    - Airport id
    - Lane location (could be airport terminal, runway etc)
    - Airplane support (includes the type of airplane it supports)
    - Lane Status (under maintenance or not)

6) Baggage:
    - Baggage id
    - Customer id
    - Weight
    - Trip id

The relations between the entities are listed and explained below:

1) Airport and Flight Trip
   An Airport can have multiple Flight Trips, and each Flight Trip can have one Departure Airport and one Arrival Airport.

2) Trip and Airplane
   Each trip would contain an instance of airplane telling us the number of seats in the airplane and its type. Each trip has a one-to-one relationship with an airplane.

3) Airplane and Airplane-type
   Airplane is an instance of Airplane-type. Many airplanes can be of the same type and each airplane can belong to only one airplane type.

4) Customer and Sales data
   Every Sales id (included in Sales data) is linked to a customer id representing who reserved the seats. A customers can have multiple sales but each sale is associated with only one customer.

5) Customer and Trip
   A customer can belong to only one trip instance and each trip instance can have multiple customer reservation.

6) Customer and Baggage
   A customer can have multiple baggage but each baggage is associated with only one customer.

7) Flight trip and Trip
   Trip is an instance of flight trip on a specified date.

8) Airport and Airline
   This relation represents the usage of airports based on the weekdays and time of airlines. One airport can have multiple airlines and one airline can be in multiple airports. So, it's a many to many relationships.

9) Airport and Lane info:
   An airport can have multiple lanes and each lane is associated with only one airport.

10) Crew and Airlines
    An airline can have multiple crew members and each crew member is associated with a specific airline.