PROJECT PHASE 3

GROUP : 9
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1. After mapping ER to relational model

    a. Mapping of Regular Entity types:
    For each strong Entity type E, a relation R is created which includes all the attributes of the entity type E. One or more attributes are chosen as the primary key of the relation R.
    We have created a relation for each of the entity type.

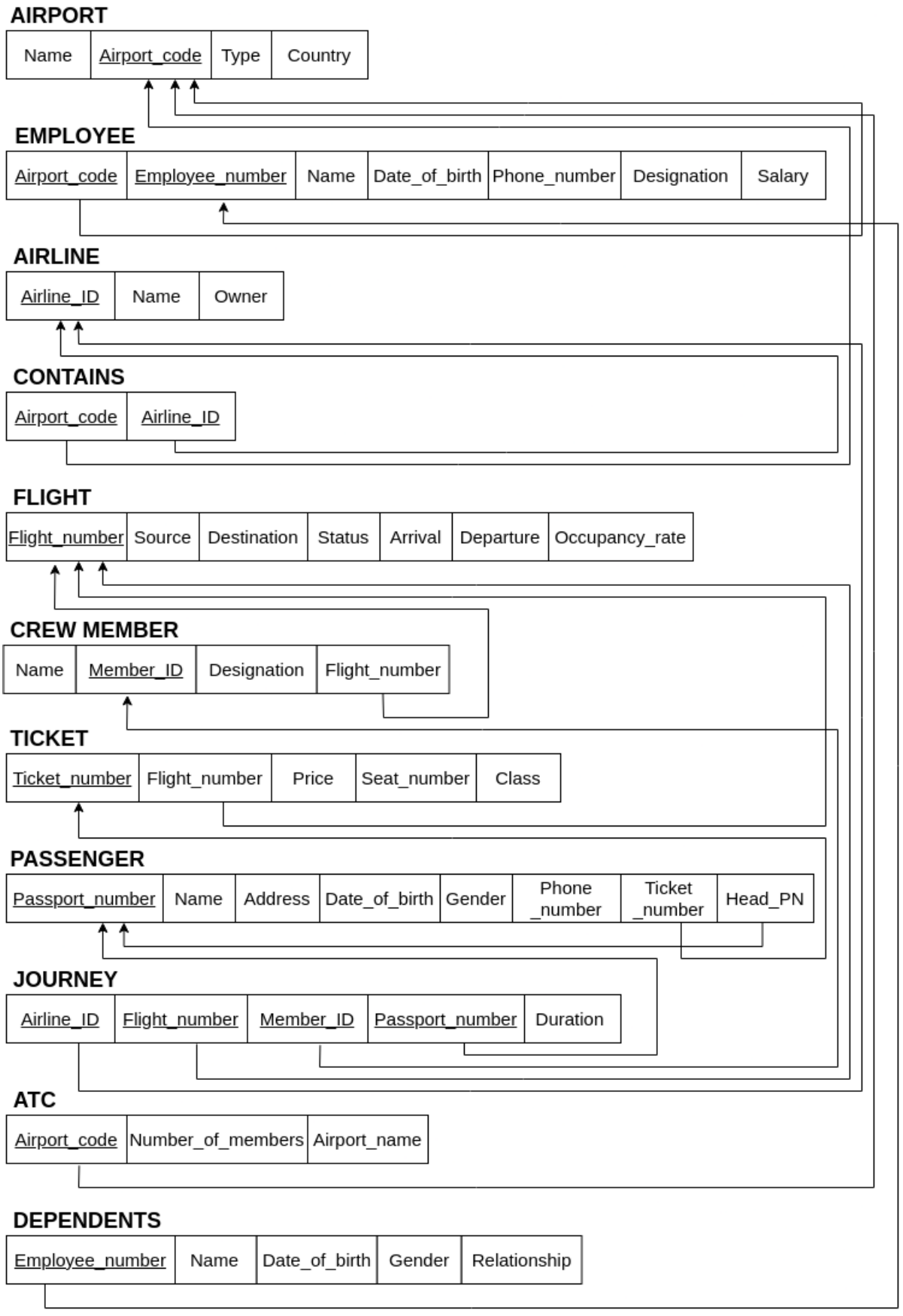
    b. Mapping of Weak Entity types:
    For each weak Entity type E, a relation R is created which includes all the attributes of the entity type E. Now add a foreign key attribute in R which references to the primary key attribute of the owner entity type, which is described by the identifying relationship of E.
    We add Airport_code for ATC and Employee_number for DEPENDENTS.

    c. Mapping of 1:1 binary relationship types:
    Choose any relation, say S, and add a foreign key attribute in S which references to the primary key attribute of other participating entity type.
    We have added a foreign key Ticket_number in the relation PASSENGER.

    d. Mapping of 1:N binary relationship types:
    Choose the relation, say S, which represents the participating entity type at the N-side of the relationship type. Add a foreign key attribute in S which references to the primary key attribute of the other participating entity type.
    We have added Airport_code in EMPLOYEE, Head_PN (Passport_number of head of the family/friends) in PASSENGER.

    e. Mapping of M:N binary relationship types:
    Create a new relation R for each of the M:N relationship types and include the primary keys of both the participating entity types as the foreign key attributes of R.
    We have added a new relation CONTAINS which has Airport_code and Airline_ID as its attributes.

    f. Mapping of N-ary relationship types:
    For each n-ary relationship type R, create a new relationship relation S to represent R. Include as foreign key attributes in S the primary keys of the relations that represent the participating entity types.
    We have created a new relation JOURNEY which includes the primary key attributes of all the participating entity types.

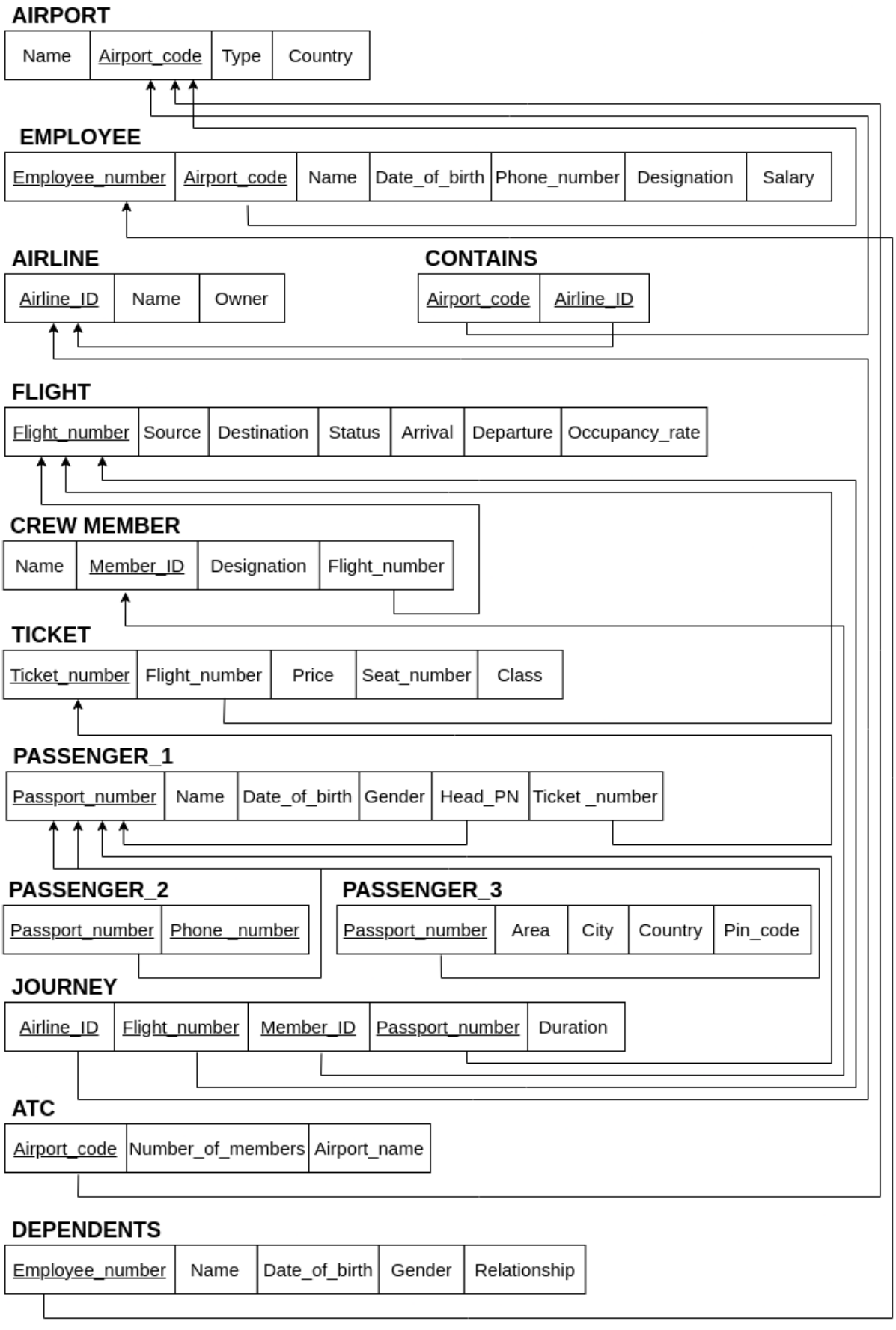

AIRPORT
Name
Airport_code
Type
Country
EMPLOYEE
Airport_code
Employee_number
Name
Date_of_birth
Phone_number
Designation
Salary
AIRLINE
Airline_ID
Name
Owner
CONTAINS
Airport_code
Airline_ID
FLIGHT
Flight_number
Source
Destination
Status
Arrival
Departure
Occupancy_rate
CREW MEMBER
Name
Member_ID
Designation
Flight_number
TICKET
Ticket_number
Flight_number
Price
Seat_number
Class
PASSENGER
Passport_number
Name
Address
Date_of_birth
Gender
Phone _number
Ticket _number
Head_PN
JOURNEY
Airline_ID
Flight_number
Member_ID
Passport_number
Duration
ATC
Airport_code
Number_of_members
Airport_name
DEPENDENTS
Employee_number
Name
Date_of_birth
Gender
Relationship

2. Relational model after conversion to 1NF

In order to remove multivalued attributes of the relation R, we create a new relation S and include primary key attribute of R and multivalued attribute of R as the primary key attributes of S. Also, remove the multivalued attribute from the relation R.

In order to remove composite attributes of the relation R, we create a new relation S and include primary key attribute of R and add some attributes (which describe the composite attribute of R) to S. Also, remove the composite attribute from the relation R.

We have split PASSENGER into PASSENGER_1, PASSENGER_2 and PASSENGER_3 Where PASSENGER_2 handles multivalued attribute Phone_number and PASSENGER_3 handles composite attribute Address. We have added attributes Area, City, Country and Pin_code in relation PASSENGER_3 to describe the address of a passenger.

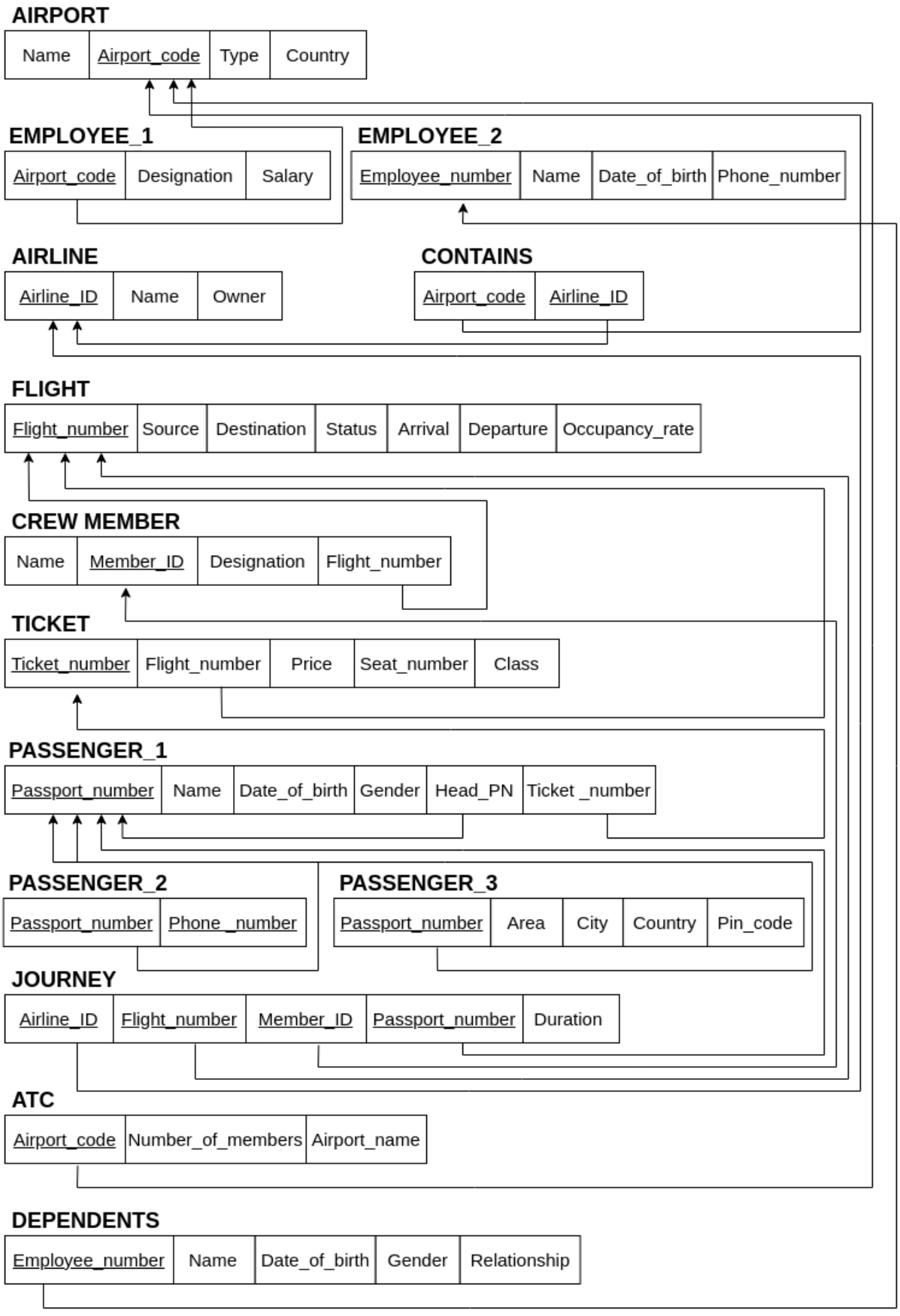

AIRPORT
Name
Airport_code
Type
Country
EMPLOYEE
Employee_number
Airport_code
Name
Date_of_birth
Phone_number
Designation
Salary
AIRLINE
Airline_ID
Name
Owner
CONTAINS
Airport_code
Airline_ID
FLIGHT
Flight_number
Source
Destination
Status
Arrival
Departure
Occupancy_rate
CREW MEMBER
Name
Member_ID
Designation
Flight_number
TICKET
Ticket_number
Flight_number
Price
Seat_number
Class
PASSENGER_1
Passport_number
Name
Date_of_birth
Gender
Head_PN
Ticket _number
PASSENGER_2
Passport_number
Phone _number
PASSENGER_3
Passport_number
Area
City
Country
Pin_code
JOURNEY
Airline_ID
Flight_number
Member_ID
Passport_number
Duration
ATC
Airport_code
Number_of_members
Airport_name
DEPENDENTS
Employee_number
Name
Date_of_birth
Gender
Relationship

3. Relational model after conversion to 2NF

Every non-prime attribute should be fully functionally dependent on a primary key or a set of primary key attributes.

In order to follow 2NF, we have split EMPLOYEE into EMPLOYEE_1 and EMPLOYEE_2. EMPLOYEE_1 has Airport_code as its primary key and other attributes Designation and Salary are fully functionally dependent on it.

EMPLOYEE_2 has Employee_Number as its primary key and attributes Name, Date_of_birth and Phone_number are fully functionally dependent on it.


AIRPORT
Name
Airport_code
Type
Country
EMPLOYEE_1
Airport_code
Designation
Salary
EMPLOYEE_2
Employee_number
Name
Date_of_birth
Phone_number
AIRLINE
Airline_ID
Name
Owner
CONTAINS
Airport_code
Airline_ID
FLIGHT
Flight_number
Source
Destination
Status
Arrival
Departure
Occupancy_rate
CREW MEMBER
Name
Member_ID
Designation
Flight_number
TICKET
Ticket_number
Flight_number
Price
Seat_number
Class
PASSENGER_1
Passport_number
Name
Date_of_birth
Gender
Head_PN
Ticket _number
PASSENGER_2
Passport_number
Phone _number
PASSENGER_3
Passport_number
Area
City
Country
Pin_code
JOURNEY
Airline_ID
Flight_number
Member_ID
Passport_number
Duration
ATC
Airport_code
Number_of_members
Airport_name
DEPENDENTS
Employee_number
Name
Date_of_birth
Gender
Relationship

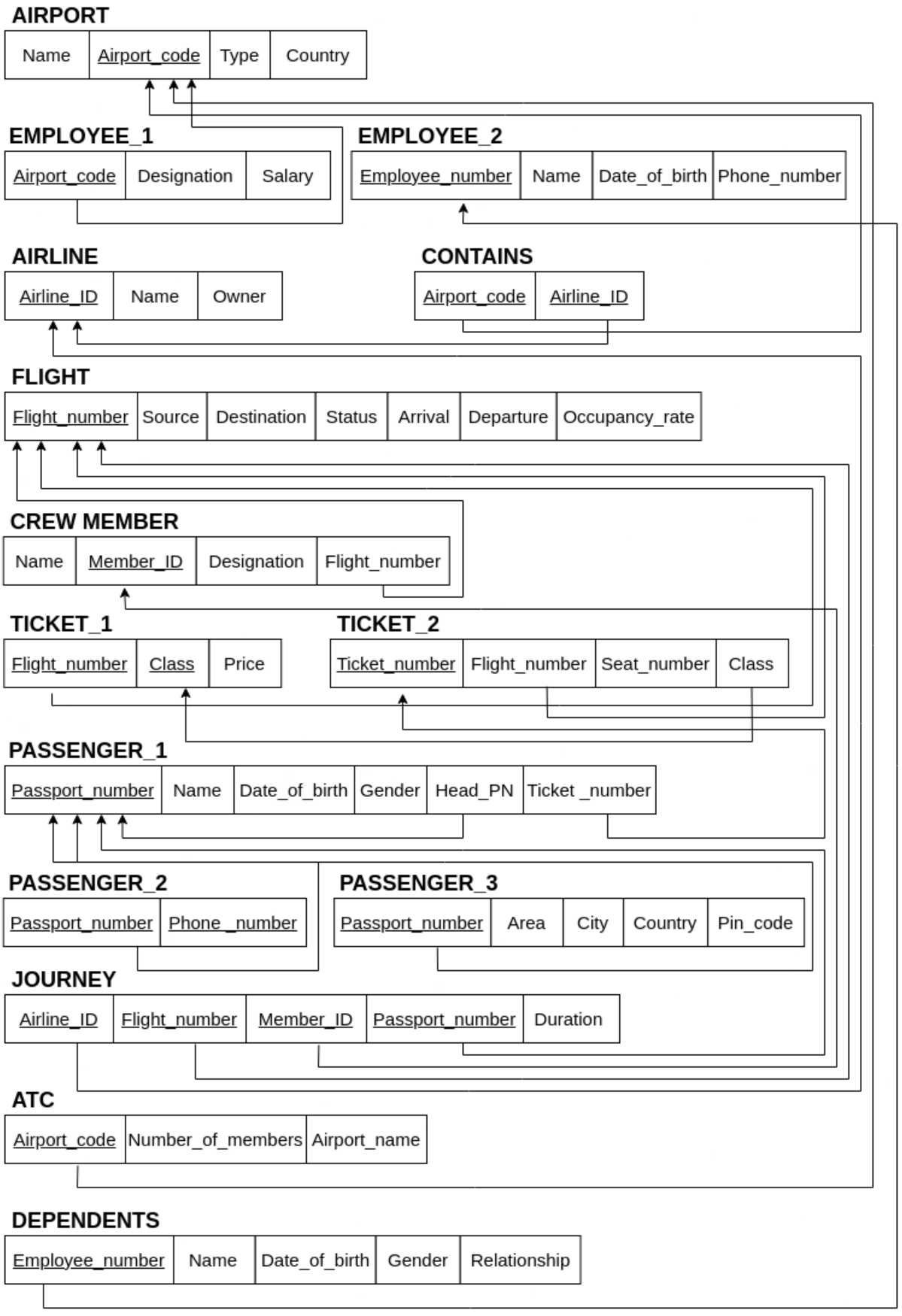
4. Relational model after conversion to 3NF

There should not be any transitive dependency in the relations.

In the relation TICKET, we can see that Ticket_number, Class are fully functionally dependent on Ticket_number & Price is fully functionally dependent on Ticket_number, Class.

So, Price is transitively dependent on the primary key Ticket_number.
In order to convert to 3NF, we split the relation TICKET into Ticket_1 and TICKET_2.

TICKET_1 contains Flight_number, Class as primary keys and Price as the attribute.
TICKET_2 contains Ticket_number as the primary key and Flight_number, Seat_number and Class as the other attributes.


AIRPORT
Name
Airport_code
Type
Country
EMPLOYEE_1
Airport_code
Designation
Salary
EMPLOYEE_2
Employee_number
Name
Date_of_birth
Phone_number
AIRLINE
Airline_ID
Name
Owner
CONTAINS
Airport_code
Airline_ID
FLIGHT
Flight_number
Source
Destination
Status
Arrival
Departure
Occupancy_rate
CREW MEMBER
Name
Member_ID
Designation
Flight_number
TICKET_1
Flight_number
Class
Price
TICKET_2
Ticket_number
Flight_number
Seat_number
Class
PASSENGER_1
Passport_number
Name
Date_of_birth
Gender
Head_PN
Ticket _number
PASSENGER_2
Passport_number
Phone _number
PASSENGER_3
Passport_number
Area
City
Country
Pin_code
JOURNEY
Airline_ID
Flight_number
Member_ID
Passport_number
Duration
ATC
Airport_code
Number_of_members
Airport_name
DEPENDENTS
Employee_number
Name
Date_of_birth
Gender
Relationship