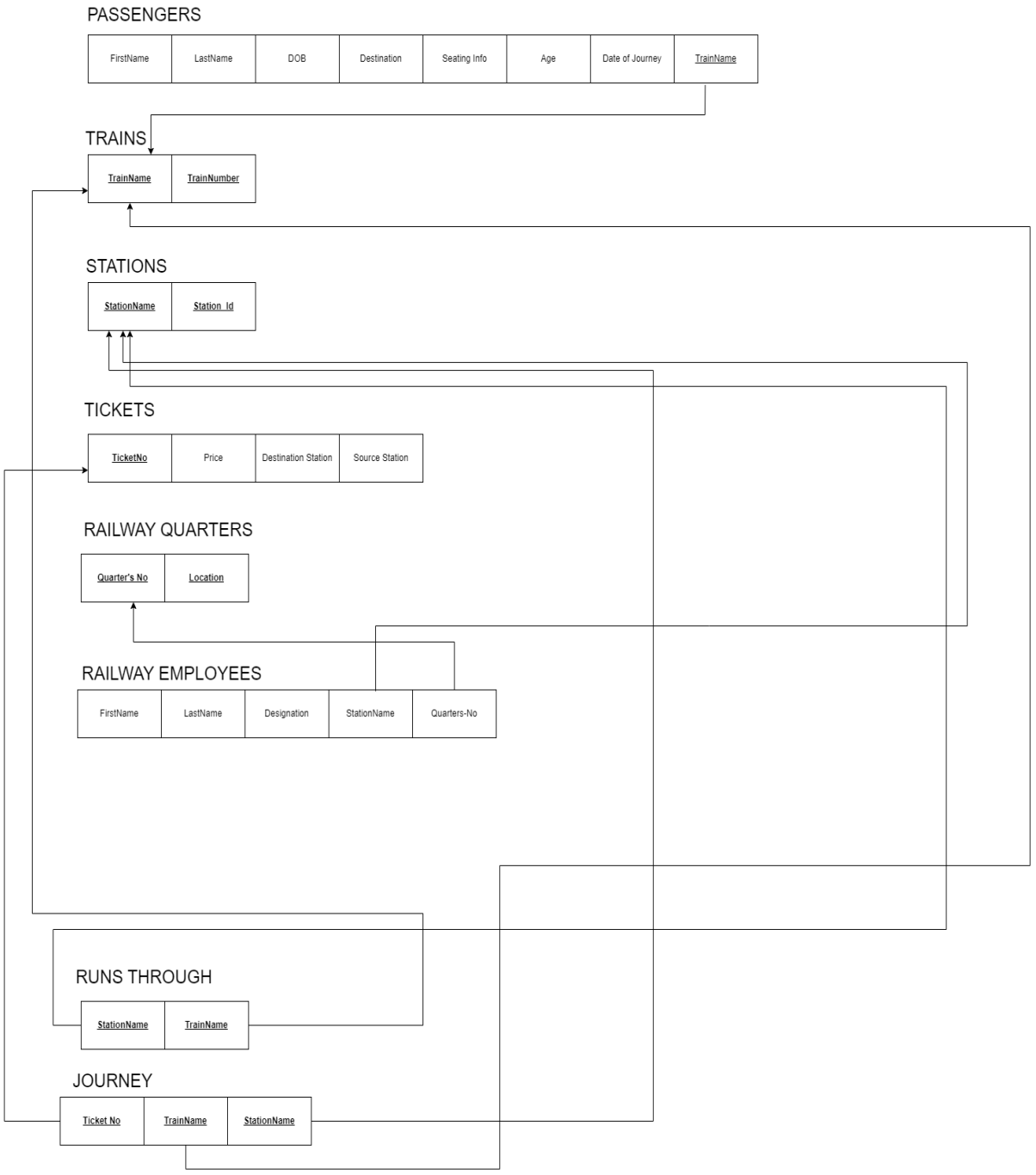
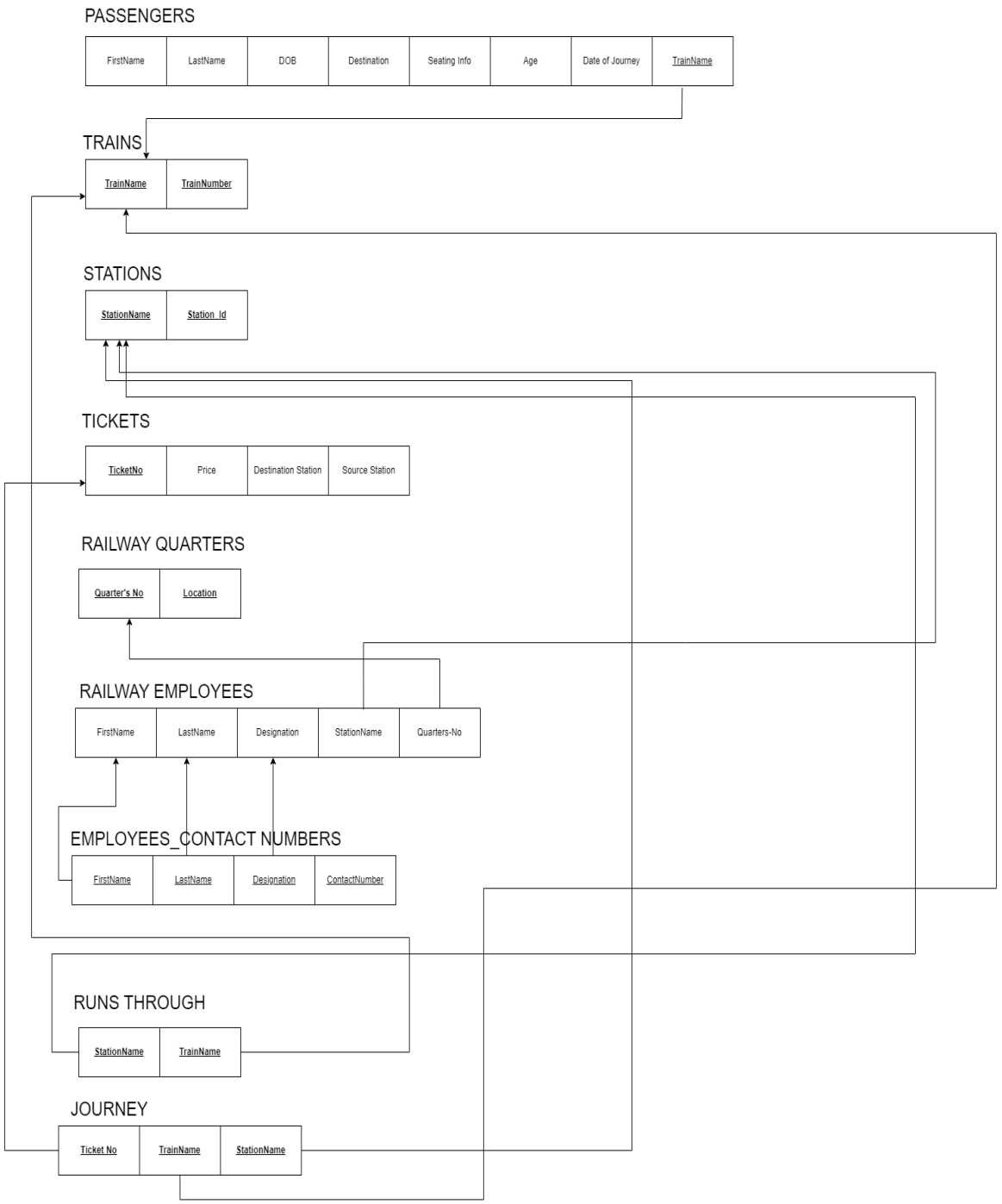
DATA AND APPLICATIONS PROJECT : PHASE-3

Task-1 : ER-Diagram to Relational Model


PASSENGERS
FirstName
LastName
DOB
Destination
Seating Info
Age
Date of Journey
TrainName
TRAINS
TrainName
TrainNumber
STATIONS
StationName
Station_Id
TICKETS
TicketNo
Price
Destination Station
Source Station
RAILWAY QUARTERS
Quarter's No
Location
RAILWAY EMPLOYEES
FirstName
LastName
Designation
StationName
Quarters-No
RUNS THROUGH
StationName
TrainName
JOURNEY
Ticket No
TrainName
StationName

Task-2 : Relational model after conversion to 1NF

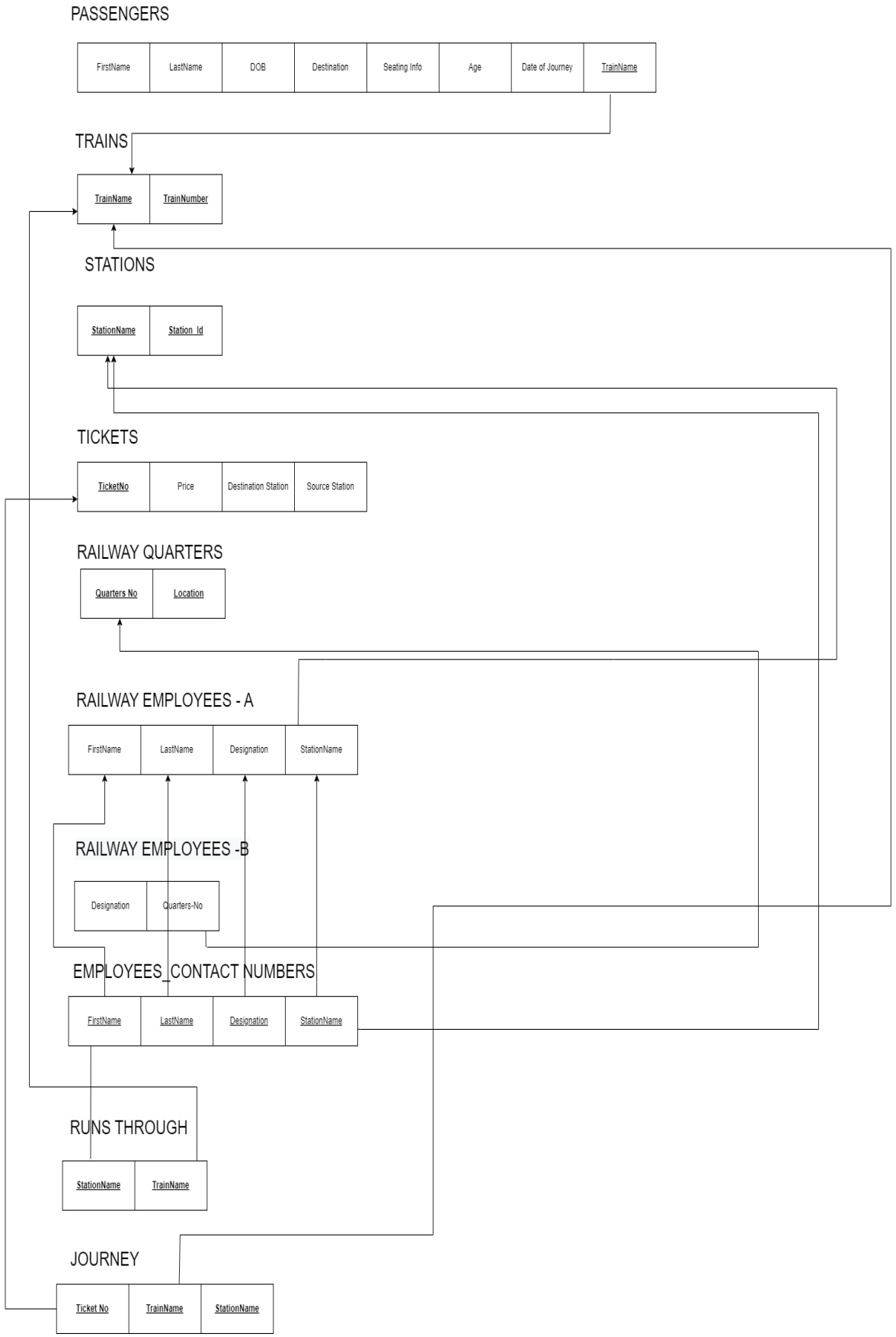
For a Relational model to be in 1st Normal Form (1NF), there shouldn't be any multivalued attributes. In the Relation RAILWAY EMPLOYEES, there exists a multivalued attribute ContactNumber. To remove this, a new Relation named EMPLOYEE_CONTACT NUMBERS is created. It contains the primary key of the Relation RAILWAY EMPLOYEES which is {FirstName, LastName, Designation} along with the attribute ContactNumber. In this Relation, each ContactNumber of a particular employee is written in a different tuple, so there exists no multivalued attribute.
Hence the Relational model is in 1NF


PASSENGERS
FirstName
LastName
DOB
Destination
Seating Info
Age
Date of Journey
TrainName
TRAINS
TrainName
TrainNumber
STATIONS
StationName
Station_Id
TICKETS
TicketNo
Price
Destination Station
Source Station
RAILWAY QUARTERS
Quarter's No
Location
RAILWAY EMPLOYEES
FirstName
LastName
Designation
StationName
Quarters-No
EMPLOYEES_CONTACT NUMBERS
FirstName
LastName
Designation
ContactNumber
RUNS THROUGH
StationName
TrainName
JOURNEY
Ticket No
TrainName
StationName

Task-3 : Relational model after conversion to 2NF

For a Relational model to be in 2nd Normal Form (2NF), it has to be in 1NF and also, all the non-prime attributes have to be fully functionally dependent on prime attributes and there shouldn't be any partial dependencies.

In the RAILWAY EMPLOYEES relation, {FirstName, LastName, Designation} can determine the non-prime attribute {Quarters-No}.
And also, {Designation} can solely determine {Quarters-No}. (This is because all the employees with the same designation reside in the same Quarters) .
Hence there is a partial dependency because the non-prime attribute {Quarters-No} can be determined by {Designation} itself. So we have to create a new table and put the attributes Designation, Quarters-No in it. Then we remove {Designation} from the original table.


PASSENGERS
FirstName
LastName
DOB
Destination
Seating Info
Age
Date of Journey
TrainName
TRAINS
TrainName
TrainNumber
STATIONS
StationName
Station_Id
TICKETS
TicketNo
Price
Destination Station
Source Station
RAILWAY QUARTERS
Quarters No
Location
RAILWAY EMPLOYEES - A
FirstName
LastName
Designation
StationName
RAILWAY EMPLOYEES -B
Designation
Quarters-No
EMPLOYEES_CONTACT NUMBERS
FirstName
LastName
Designation
StationName
RUNS THROUGH
StationName
TrainName
JOURNEY
Ticket No
TrainName
StationName

Task-4 : Relational model after conversion to 3NF

For a Relational model to be in 3rd Normal Form (3NF), it has to be in 2NF and also, there shouldn't be any transitive dependencies.
In our Relational model, there exist no transitive dependencies. Hence 2NF is equivalent to 3NF.