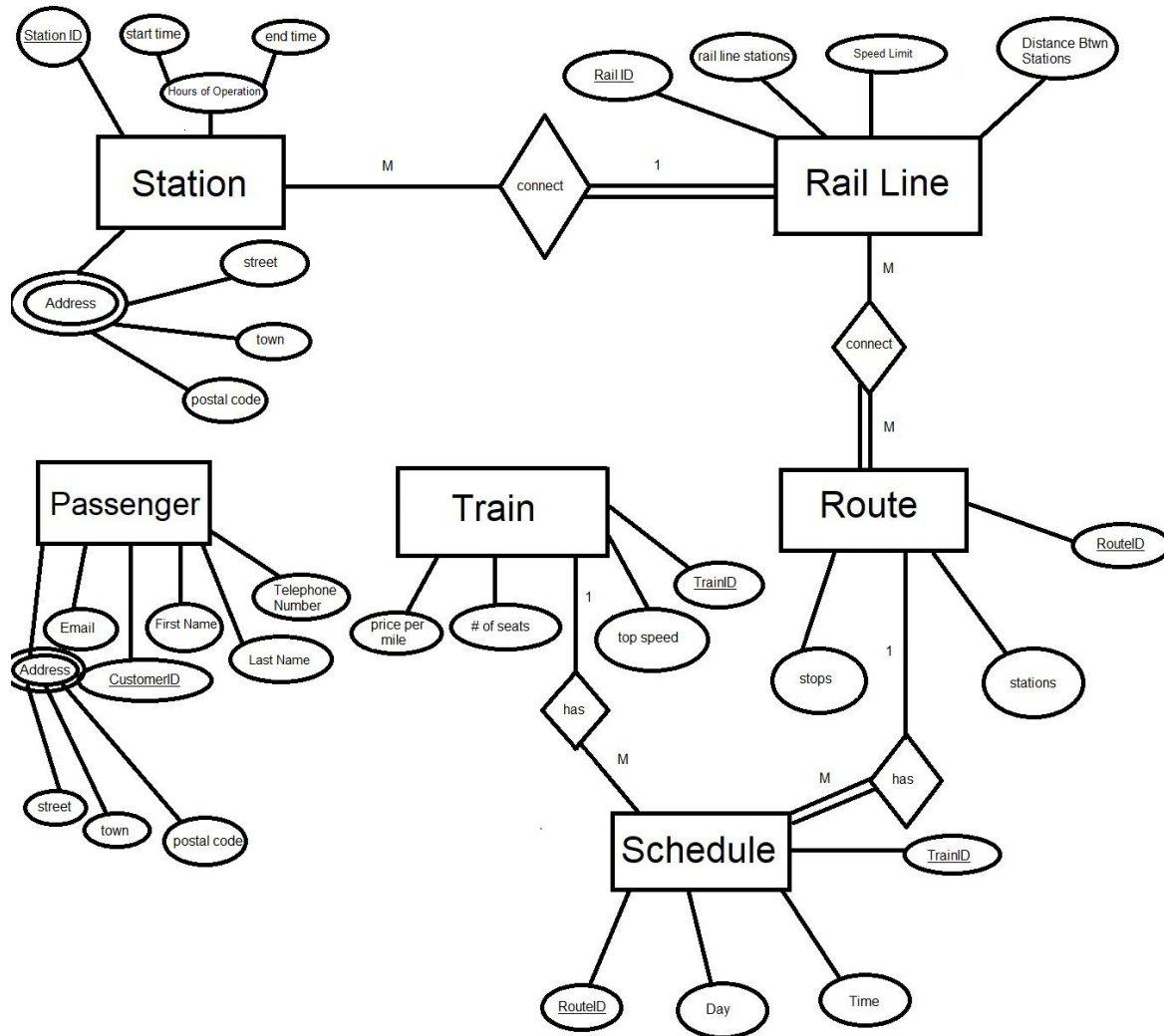1. Refer to the ER diagram in ExpressRailwayERDiagram.jpeg if this image is unclear:

2. Transform the ER diagram from part 1 into relational schemas

Entities

Station(StationID, Start Time, End Time, Street, Town, Postal Code)

Rail Line(RailID, Speed Limit)
Route(RouteID)
Train(TrainID, Price Per Mile, # of seats, Top Speed)
Schedule(RouteID, Day, Time, TrainID)
Customer(CustomerID, First Name, Last Name, Email Address, Address, Telephone Number)
Route_Stations(RouteID, StationID)
Rail_Line_Stations(RailID, StationID, distance_between_stations)

Route_Stops(RouteID, StationID)

***PLEASE NOTE: The Route_Stations, Rail_Line_Stations, and Route_Stops tables were added to maintain foreign key relationships for a list of stations. This may not be clear on the ER diagram; distance_between_stations is now stored in the rail_line_stations table.

Relationships:
1. stations <connect> rail lines M:1, PARTIAL/TOTAL
2. route <connect> rail lines M:M, TOTAL/PARTIAL   (many routes can connect many rail lines)
3. trains<has> schedule 1:M, PARTIAL/PARTIAL
4. schedule<has>route M:1, TOTAL/PARTIAL

Relational Schema:
STATION(StationID, Address, Hours of Operation)

RAIL_LINE(RailID, Speed Limit)

ROUTE(RouteID)

TRAIN(TrainID, Price Per Mile, # of seats, Top Speed)

SCHEDULE(RouteID, Day, Time, TrainID)
FK(TrainID)->TRAIN(TrainID)
FK(RouteID)->ROUTE(RouteID)

CUSTOMER(CustomerID, First Name, Last Name, Email Address, Address, Telephone Number)

ROUTE_STATIONS(RouteID, StationID)
FK(StationID)->STATION(StationID)
FK(RouteID)->ROUTE(RouteID)

RAIL_LINE_STATIONS(RailID, StationID, distance_between_stations)
FK(RailID)->ROUTE(RailID)
FK(StationID)->STATION(StationID)

ROUTE_STOPS(RouteID, StationID)
FK(StationID)->STATION(StationID)
FK(RouteID)->ROUTE(RouteID)

Assumptions:
- Customer does not interact directly with the system; therefore, it is a stand-alone entity/table.
- A route can connect any rail line (M:M). This is resolved through the addition of new tables Route_Stations, Rail_Line_Stations, and Route_Stops so that the stops and distance between stations can be easily queried and foreign references maintained
- IDs are unique for each entity and assigned when inserted into the tables . A customer gets assigned a randomized, unique ID.