# Department of Computing

**CS220: Database Systems**

**Lab 10**

**Relational Model and Normalization**

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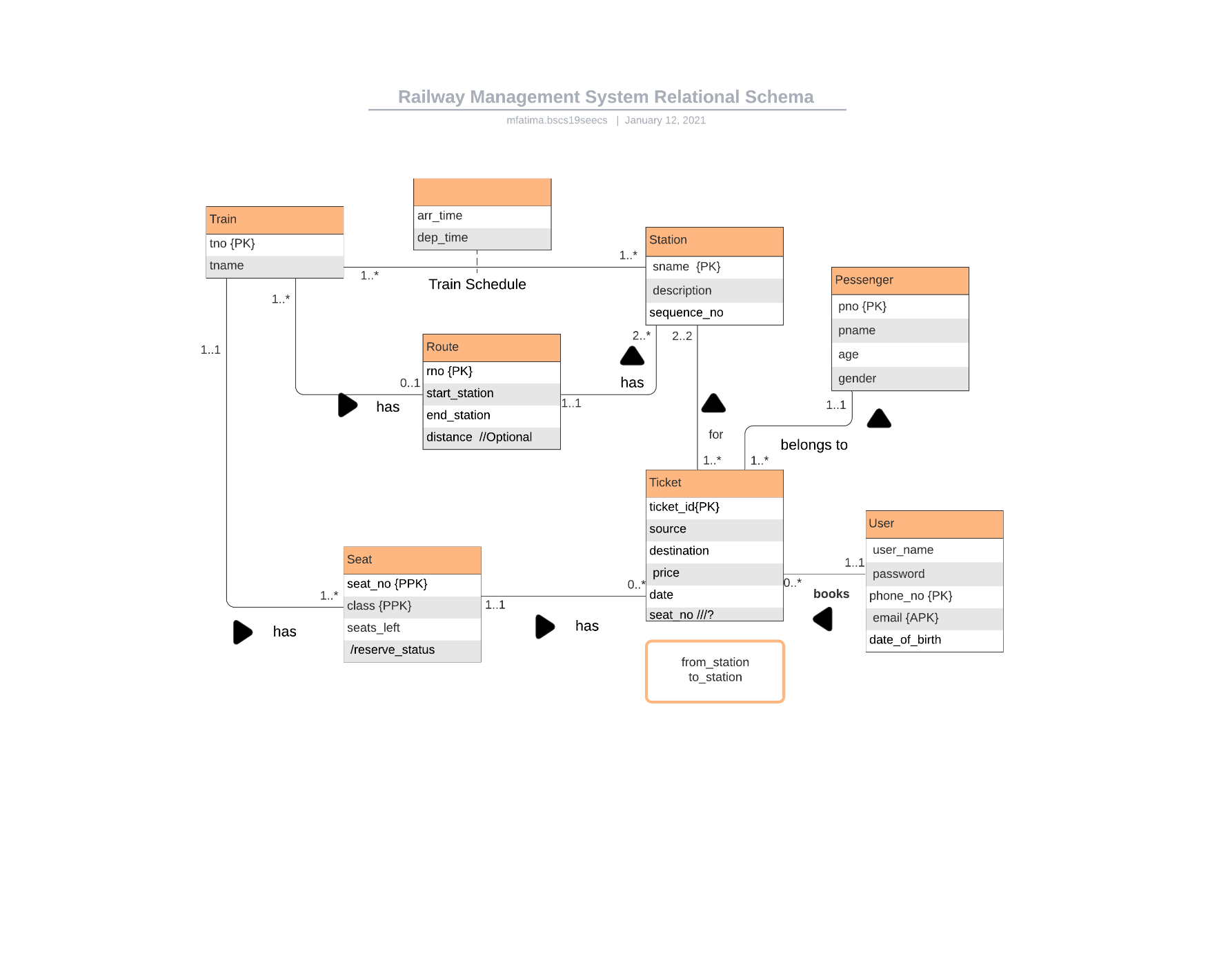
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**ER Diagram**



**Explanation**

User can book multiple tickets and for multiple passengers.

A ticket belongs to only one passenger and is booked by a single user. It is booked for train seat and has data of two stations, one is source and other is destination.

A train has a route, which consists of 2 or more stations, each specified with a sequence number.

Multiple trains can travel on a route.

A station belongs to only one route.

Train Schedule is a relationship between Train and Station, contains arrival and departure time of train for each station.

# Relational Mapping

Train( tno, tname, **rno**)

Route(rno, **start\_station**, **end\_station**, distance)

Seat(tno, class, seat\_no, seats\_left)

Station(sname, description, **rno**, sequence\_no)

Schedule(tno, sname, arr\_time, dep\_time)

User(phone\_no, email, user\_name, password, date\_of\_birth)

Passenger(pno, pname, age, gender)

Ticket(ticket\_id, **pno, phone\_no, source, destination, tno, seat\_no, class,** date, price, status)

**Normalized Schema**

Relational schema is already normalized, since there is no multi-valued attribute (1NF) also all non-prime attributes are fully functionally dependent on primary keys (2NF). Moreover, no transitive dependency exists (3NF).

**Train:** tno **->** tname, rno

**Route:** rno **->** start\_station, end\_station, distance

**Seat:** tno, class, seat\_no **->** seats\_left

**Station:** sname **->** description, rno, sequence\_no

**Schedule:** tno, sname **->** arr\_time, dep\_time

**User:** phone\_no **->** email, user\_name, password, date\_of\_birth

**Passenger:** pno **->** pname,age,gender

**Ticket:** ticket\_id **->** pno, phone\_no, source, destination, tno, seat\_no, class, date, price, status