Tables:

Station(
      id INT NOT NULL,
      name VARCHAR(255) NOT NULL,
      PRIMARY KEY(id)
)

Passenger(
      id int NOT NULL,
      name varchar(255) NOT NULL,
      cnic char(13) NOT NULL UNIQUE,
      email varchar(100) NOT NULL,
      password varchar(100) NOT NULL,
      phone_number char(11) NOT NULL,
      PRIMARY KEY(id)
)

Staff(
      id int NOT NULL,
      name varchar(255) NOT NULL,
      role varchar(50) NOT NULL,
      phone_number char(11) NOT NULL,
      salary int CHECK (salary > 0),
      PRIMARY KEY(id)
)

Train(
      id int NOT NULL,
      name varchar(100) NOT NULL,
      PRIMARY KEY (id)
)

Route(
  route_id INT NOT NULL,
  route_name VARCHAR(255) NOT NULL,
  PRIMARY KEY(route_id)
)

Seat(
  id INT NOT NULL,
  train_id INT NOT NULL,
      class VARCHAR(50) CHECK(class IN ('Economy','Business','AC')),

```
        status VARCHAR(50) CHECK(status IN ('Free','Occupied')),
    PRIMARY KEY(id),
    FOREIGN KEY(train_id) REFERENCES Train(id)
)
```

Ticket(
```
    id INT NOT NULL,
    train_id INT NOT NULL,
    passenger_id INT NOT NULL,
    seat_id INT NOT NULL,
    payment_id INT,
    travel_date DATE NOT NULL,
    PRIMARY KEY(id),
    FOREIGN KEY(train_id) REFERENCES Train(id),
    FOREIGN KEY(passenger_id) REFERENCES Passenger(id),
    FOREIGN KEY(seat_id) REFERENCES Seat(id)
)
```

Payment(
```
    id INT NOT NULL,
    ticket_id INT NOT NULL,
    amount DECIMAL(10,2) NOT NULL,
    PRIMARY KEY(id),
    FOREIGN KEY(ticket_id) REFERENCES Ticket(id)
)
```

Staff_Assignment(
```
    staff_id INT NOT NULL,
    station_id INT NOT NULL,
    shift_date DATE NOT NULL,
    shift_type VARCHAR(20) CHECK(shift_type IN ('Morning','Evening')) NOT NULL,
    PRIMARY KEY(staff_id, shift_date, shift_type),
    FOREIGN KEY(staff_id) REFERENCES Staff(id),
    FOREIGN KEY(station_id) REFERENCES Station(id)
)
```

Route_Station(
```
    id INT NOT NULL,
    route_id INT NOT NULL,
    station_id INT NOT NULL,
    arrival_time TIME,
    departure_time TIME,
        UNIQUE(route_id, station_id),
    PRIMARY KEY(id),
```

```
    FOREIGN KEY(route_id) REFERENCES Route(route_id),
    FOREIGN KEY(station_id) REFERENCES Station(id)
)
```

Index usage reasoning:

- On seats status since the number of seats will always be a lot considering practical railways
- On station name since in actual railways there are many routes and each route has a lot of stations for example british railway has around 2500 stations
- On staff id, the shift type(Morning/Evening) and the shift date, since a railway has thousands of employees, couple that with our rule of max 40 hours meaning 8 shifts a week, take it to the scale of years and you would get hundred of thousands of entries, indexing will make it much faster to search among them
- On passenger name and cnic since there will be a lot of passenger entries perhaps more than hundred thousand practically

Roles:

- Passenger role(can view their own tickets book tickets)
- Station Manager role(assign shifts to staff)
- Administrator role(all privileges)