Database
Midterm Exam

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Class
1i

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1 Analysis

a.) Create the Entity-Relationship Diagram for the following business rule, assume relevant attributes

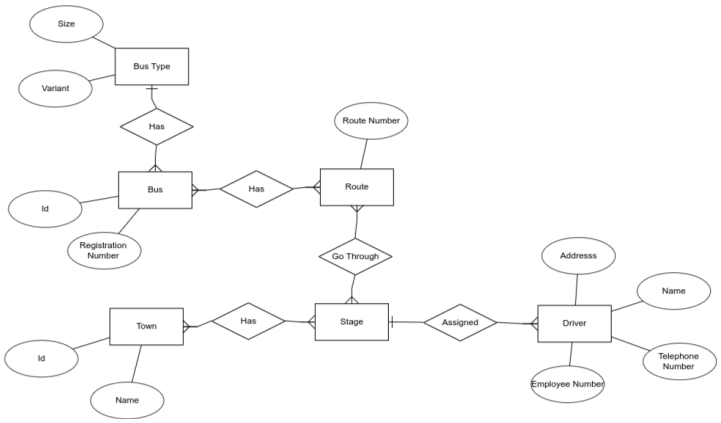

Figure 1: The Entity Relationship Diagram for the problem

b.) Transform the ERD into Relational Schema

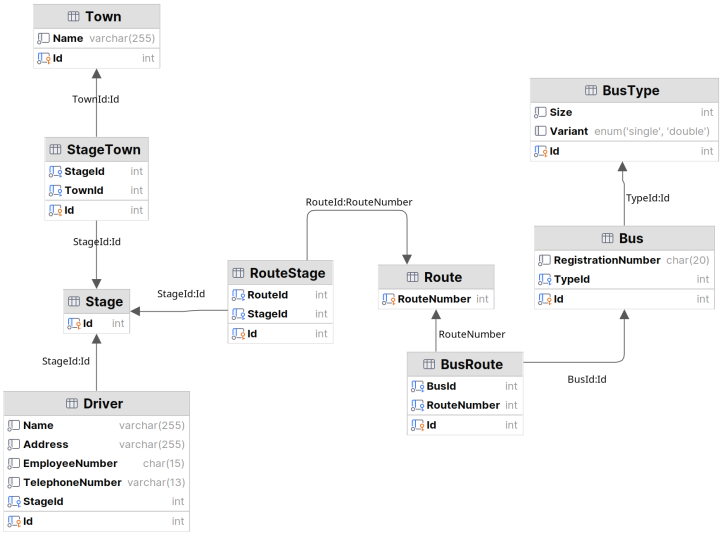

Figure 2: The relational version of the diagram

Query Steps

- Create the database and use it as the default schema.

```
CREATE DATABASE bus_system;
USE bus_system;
```

- Create the tables

```
CREATE TABLE Bus
(
    Id                 INT      NOT NULL PRIMARY KEY AUTO_INCREMENT,
    RegistrationNumber CHAR(20) NOT NULL,
    TypeId             INT      NOT NULL
);

CREATE TABLE BusType
(
    Id      INT NOT NULL PRIMARY KEY AUTO_INCREMENT,
    Size    INT NOT NULL,
    Variant ENUM ('single', 'double') DEFAULT ('single')
);

CREATE TABLE BusRoute
(
    Id          INT NOT NULL PRIMARY KEY AUTO_INCREMENT,
    BusId       INT NOT NULL,
    RouteNumber INT NOT NULL
);

CREATE TABLE Route
(
    RouteNumber INT NOT NULL PRIMARY KEY AUTO_INCREMENT
);

CREATE TABLE RouteStage
(
    Id      INT NOT NULL PRIMARY KEY AUTO_INCREMENT,
    RouteId INT NOT NULL,
    StageId INT NOT NULL
);

CREATE TABLE Stage
(
    Id INT NOT NULL PRIMARY KEY AUTO_INCREMENT
);
```

```
CREATE TABLE StageTown
(
    Id      INT NOT NULL PRIMARY KEY AUTO_INCREMENT,
    StageId INT NOT NULL,
    TownId  INT NOT NULL
);

CREATE TABLE Town
(
    Id   INT          NOT NULL PRIMARY KEY AUTO_INCREMENT,
    Name VARCHAR(255) NOT NULL
);

CREATE TABLE Driver
(
    Id              INT          NOT NULL PRIMARY KEY AUTO_INCREMENT,
    Name            VARCHAR(255) NOT NULL,
    Address         VARCHAR(255) NOT NULL,
    EmployeeNumber  CHAR(15)     NOT NULL,
    TelephoneNumber VARCHAR(13)  NOT NULL,
    StageId         INT          NOT NULL
);
```

- Create relationships

```
ALTER TABLE Bus
    ADD FOREIGN KEY (TypeId) REFERENCES BusType (Id);
ALTER TABLE BusRoute
    ADD FOREIGN KEY (BusId) REFERENCES Bus(Id);
ALTER TABLE BusRoute
    ADD FOREIGN KEY (RouteNumber) REFERENCES Route(RouteNumber);
ALTER TABLE StageTown
    ADD FOREIGN KEY (StageId) REFERENCES Stage (Id);
ALTER TABLE StageTown
    ADD FOREIGN KEY (TownId) REFERENCES Town (Id);
ALTER TABLE RouteStage
    ADD FOREIGN KEY (RouteId) REFERENCES Route (RouteNumber);
ALTER TABLE RouteStage
    ADD FOREIGN KEY (StageId) REFERENCES Stage (Id);
ALTER TABLE Driver
    ADD FOREIGN KEY (StageId) REFERENCES Stage (Id);
```

2 Application

A. Create the SQL command to satisfy the following queries. Write at the space provided.

1. Find all information about John Smith

```
SELECT * FROM EMPLOYEE WHERE Fname='John' AND Lname='Smith';
```

2. What department started on 5 April, 1998?

```
SELECT Dname FROM DEPARTMENT WHERE Mgr_start_date='1988-04-05';
```

3. Where does James Borg lives?

```
SELECT Address FROM EMPLOYEE WHERE Fname='James' AND Lname='Borg';
```

4. Who are the spouses of the employees?

```
SELECT Dependent_name FROM DEPENDENT WHERE Relationship='Spouse';
```

5. What is the project located at Sugarland?

```
SELECT Pname FROM PROJECT WHERE Plocation='Sugarland';
```

B. Create the SQL command to satisfy the following queries connecting different tables.

6. Who is the manager of Research department?

```
SELECT
    Fname, Lname
FROM DEPARTMENT
JOIN EMPLOYEE
ON DEPARTMENT.Mgr_ssn=EMPLOYEE.Ssn
WHERE Dname='Research';
```

7. Who are the employees that work on project newbenefits?

```
SELECT
    Fname, Lname
FROM PROJECT
JOIN EMPLOYEE ON PROJECT.Dnum=EMPLOYEE.Dno
WHERE Pname='Newbenefits';
```

8. Who are dependents of Franklin Wong?

```
SELECT
    Dependent_name
FROM DEPENDENT
JOIN EMPLOYEE
ON EMPLOYEE.Ssn=DEPENDENT.Essn
WHERE Fname='Franklin' AND Lname='Wong';
```

9. Who are the dependents of employees who're assigned to project 'Computerization'?

```
SELECT
    Dependent_name
FROM DEPENDENT
JOIN EMPLOYEE
ON DEPENDENT.Essn=EMPLOYEE.Ssn
JOIN PROJECT
ON PROJECT.Dnum=EMPLOYEE.Dno
WHERE Pname='Computerization';
```

10. In what department do employees belong, who's dependent are their sons?

```
SELECT
    Dname
FROM DEPARTMENT
JOIN EMPLOYEE
ON DEPARTMENT.Dnumber=EMPLOYEE.Dno
JOIN DEPENDENT
ON DEPENDENT.Essn=EMPLOYEE.Ssn
WHERE Relationship='Son';
```