Database
Midterm Exam

Name
Dicha Zelianivan Arkana

NIM
2241720002

Class
1i

Department
Information Technology

Study Program
D4 Informatics Engineering

1 Analysis

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

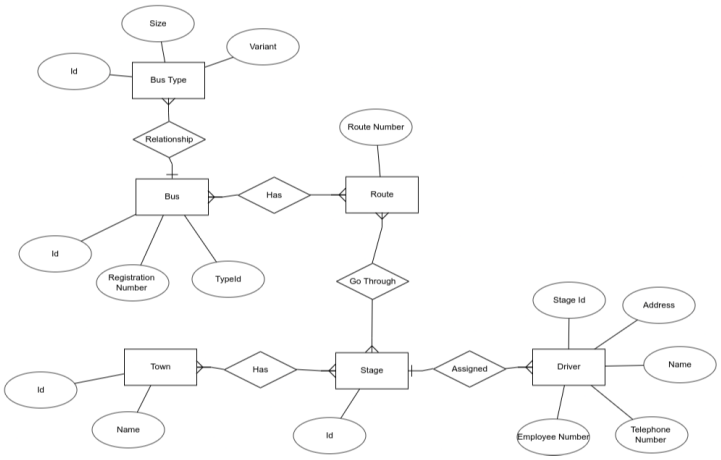


Figure 1: The Entity Relationship Diagram for the problem

b.) Transform the ERD into Relational Schema

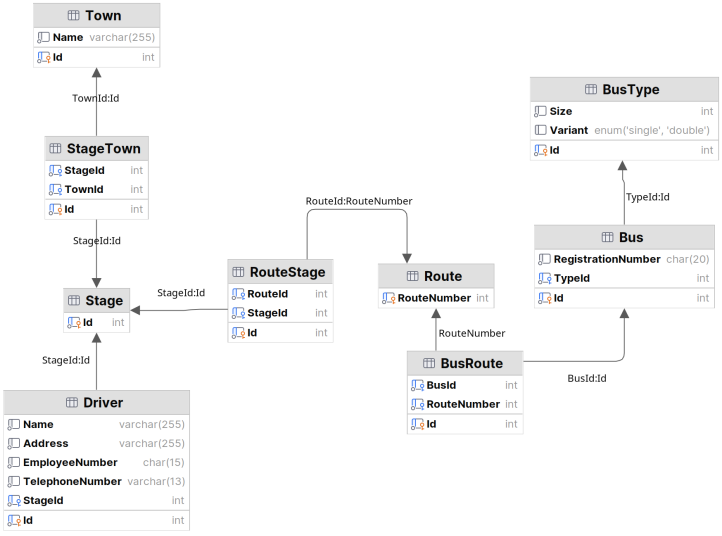


Figure 2: The relational version of the diagram

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. DDL Query

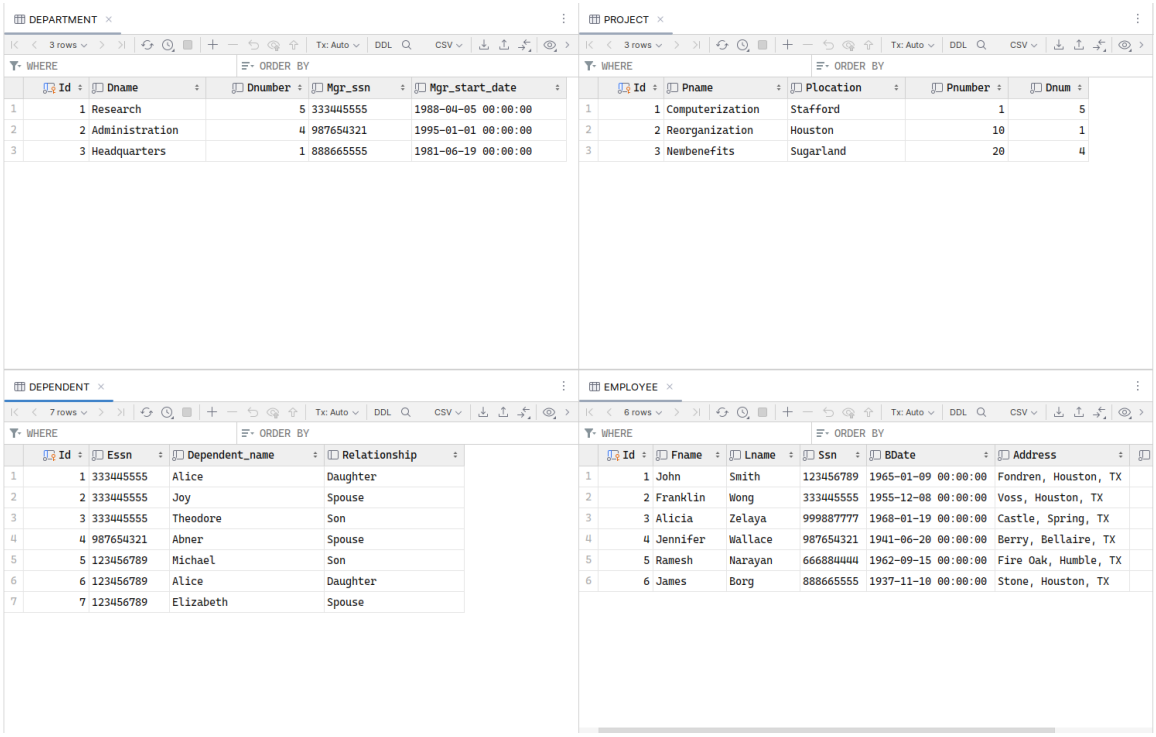
```
CREATE TABLE EMPLOYEE
(
    Id      INT          NOT NULL PRIMARY KEY AUTO_INCREMENT,
    Fname   VARCHAR(255) NOT NULL,
    Lname   VARCHAR(255) NOT NULL,
    Ssn     CHAR(9)      NOT NULL,
    BDate   DATETIME     NOT NULL,
    Address VARCHAR(255) NOT NULL,
    Salary  INT          NOT NULL,
    Dno     INT          NOT NULL
);

CREATE TABLE PROJECT
(
    Id        INT          NOT NULL PRIMARY KEY AUTO_INCREMENT,
    Pname     VARCHAR(255) NOT NULL,
    Plocation VARCHAR(255) NOT NULL,
    Pnumber   INT          NOT NULL,
    Dnum      INT          NOT NULL
);

CREATE TABLE DEPENDENT
(
    Id             INT          NOT NULL PRIMARY KEY AUTO_INCREMENT,
    Essn           CHAR(9)      NOT NULL,
    Dependent_name VARCHAR(255) NOT NULL,
    Relationship   ENUM ('Daughter', 'Spouse', 'Son')
);

CREATE TABLE DEPARTMENT
(
    Id             INT          NOT NULL PRIMARY KEY AUTO_INCREMENT,
    Dname          VARCHAR(255) NOT NULL,
    Dnumber        INT          NOT NULL,
    Mgr_ssn        CHAR(9)      NOT NULL,
    Mgr_start_date DATETIME     NOT NULL
);
```

B. **Query Result**



DEPARTMENT

	Id	Dname	Dnumber	Mgr_ssn	Mgr_start_date
1	1	Research	5	333445555	1988-05-05 00:00:00
2	2	Administration	4	987654321	1995-01-01 00:00:00
3	3	Headquarters	1	888665555	1981-06-19 00:00:00

PROJECT

	Id	Pname	Plocation	Pnumber	Dnum
1	1	Computerization	Stafford	1	5
2	2	Reorganization	Houston	10	1
3	3	Newbenefits	Sugarland	20	4

DEPENDENT

	Id	Essn	Dependent_name	Relationship
1	1	333445555	Alice	Daughter
2	2	333445555	Joy	Spouse
3	3	333445555	Theodore	Son
4	4	987654321	Abner	Spouse
5	5	123456789	Michael	Son
6	6	123456789	Alice	Daughter
7	7	123456789	Elizabeth	Spouse

EMPLOYEE

	Id	Fname	Lname	Ssn	BDate	Address
1	1	John	Smith	123456789	1965-01-09 00:00:00	Fondren, Houston, TX
2	2	Franklin	Wong	333445555	1955-12-08 00:00:00	Voss, Houston, TX
3	3	Alicia	Zelaya	999887777	1968-01-19 00:00:00	Castle, Spring, TX
4	4	Jennifer	Wallace	987654321	1941-06-20 00:00:00	Berry, Bellaire, TX
5	5	Ramesh	Narayan	666884444	1962-09-15 00:00:00	Fire Oak, Humble, TX
6	6	James	Borg	888665555	1937-11-10 00:00:00	Stone, Houston, TX

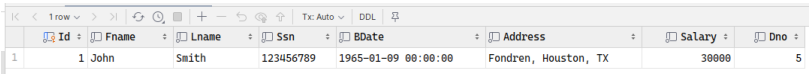
Figure 3: The result of the DDL queries above

2.1 Questions

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

1. Find all information about John Smith

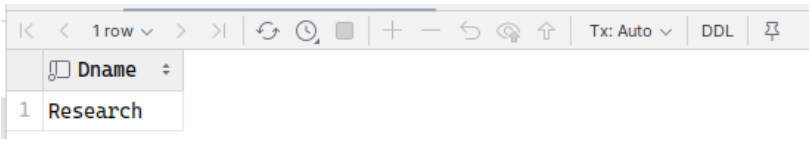
```
SELECT * FROM EMPLOYEE WHERE Fname='John' AND Lname='Smith';
```



	Id	Fname	Lname	Ssn	BDate	Address	Salary	Dno
1	1	John	Smith	123456789	1965-01-09 00:00:00	Fondren, Houston, TX	30000	5

2. What department started on 5 April, 1998?

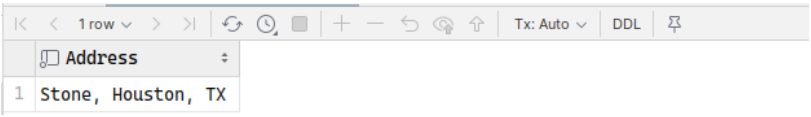
```
SELECT Dname FROM DEPARTMENT WHERE Mgr_start_date='1988-04-05';
```



	Dname
1	Research

3. Where does James Borg lives?

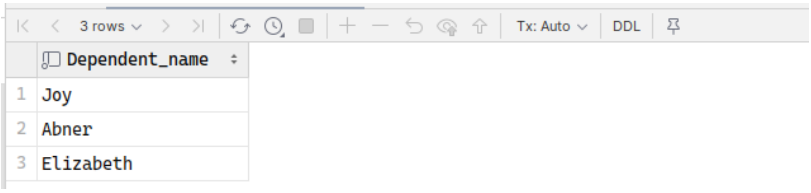
```
SELECT Address FROM EMPLOYEE WHERE Fname='James' AND Lname='Borg';
```



	Address
1	Stone, Houston, TX

4. Who are the spouses of the employees?

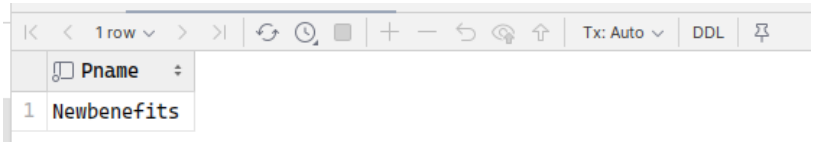
```
SELECT Dependent_name FROM DEPENDENT WHERE Relationship='Spouse';
```



	Dependent_name
1	Joy
2	Abner
3	Elizabeth

5. What is the project located at Sugarland?

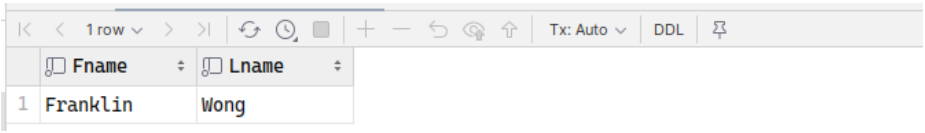
```
SELECT Pname FROM PROJECT WHERE Plocation='Sugarland';
```



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

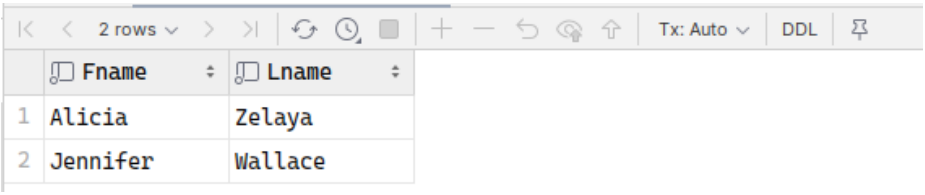
6. Who is the manager of Research department?

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



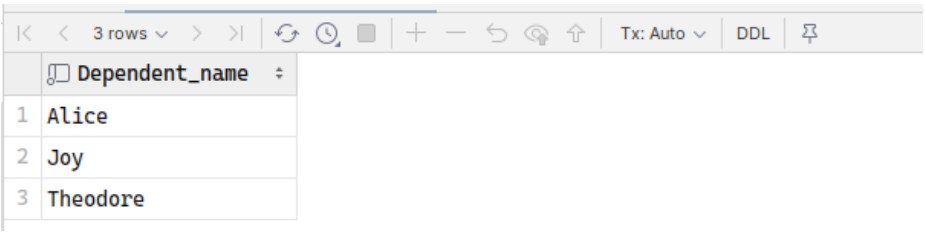
7. Who are the employees that work on project newbenefits?

```
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';
```

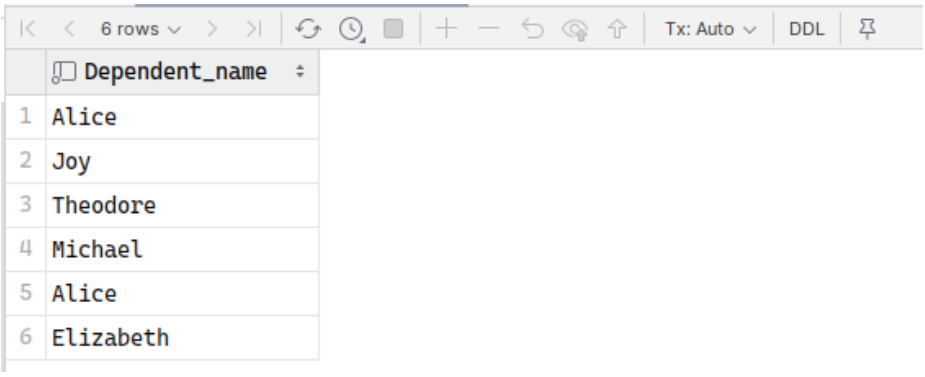


3 rows | Tx: Auto | DDL

	Dependent_name
1	Alice
2	Joy
3	Theodore

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';
```



6 rows | Tx: Auto | DDL

	Dependent_name
1	Alice
2	Joy
3	Theodore
4	Michael
5	Alice
6	Elizabeth

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';
```

	Dname
1	Research
2	Research