# Assignment 1

# SYSC 5703 – Integrated Database Systems

Fall 2013

Submitted To
Professor Samuel A. Ajila

By

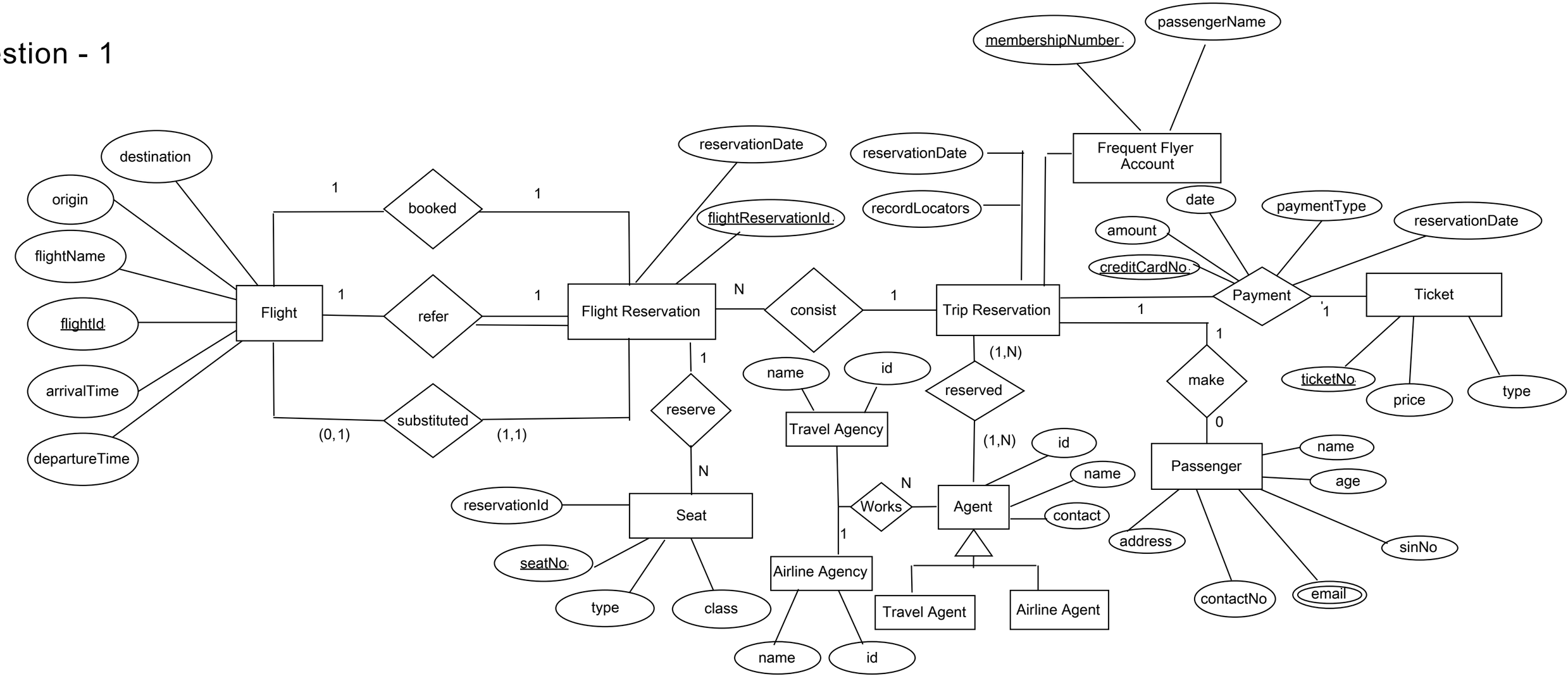
Ferhan Jamal (100953487)
Nikhil Nayyar (100941327)

Carleton University

Ferhan Jamal (100953487) – ferhan.jamal@carleton.ca
Nikhil Nayyar (100941327) – nikhil.nayyar@carleton.ca

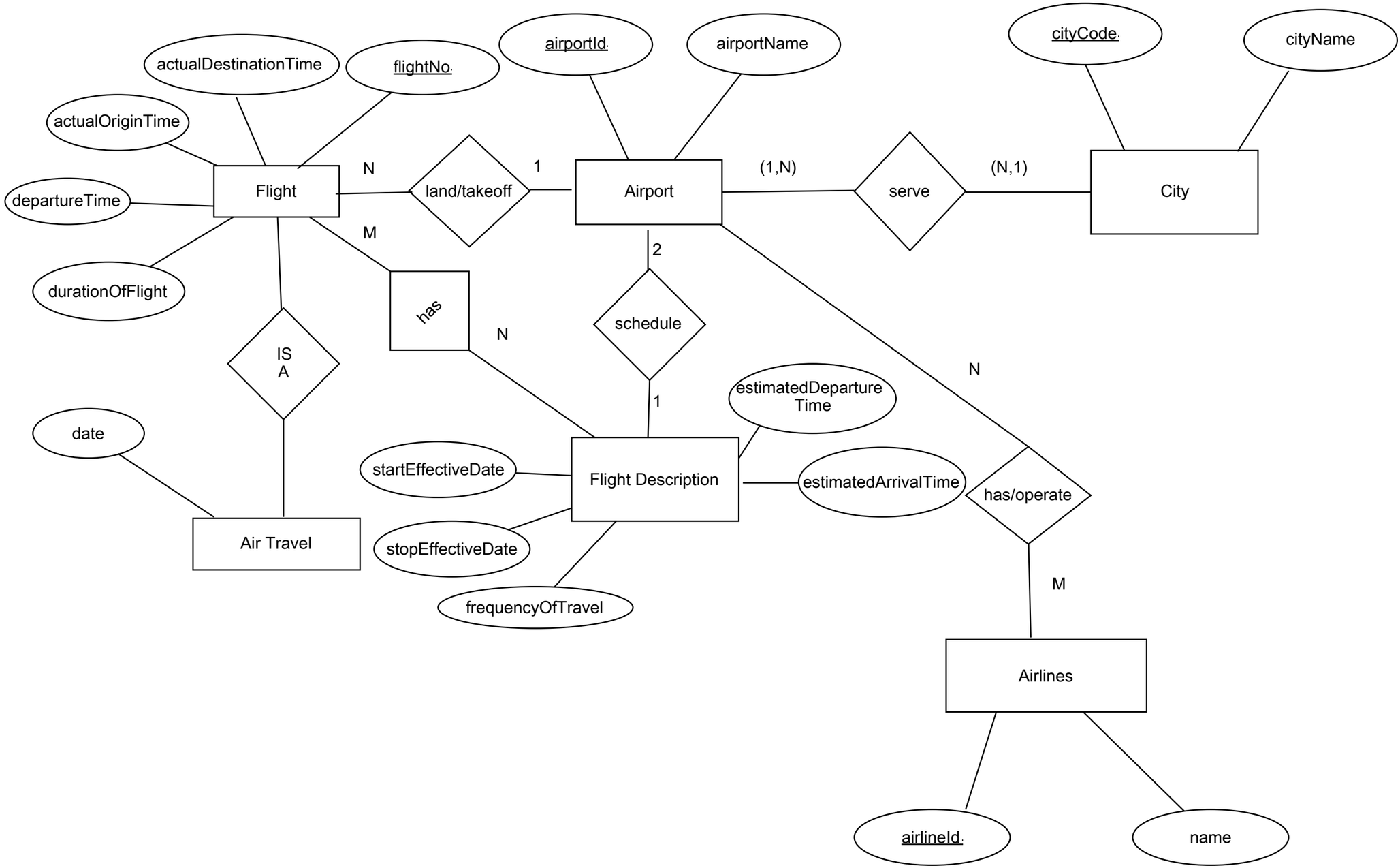
# Section One - Entity Relationship Diagram

## Question - 1



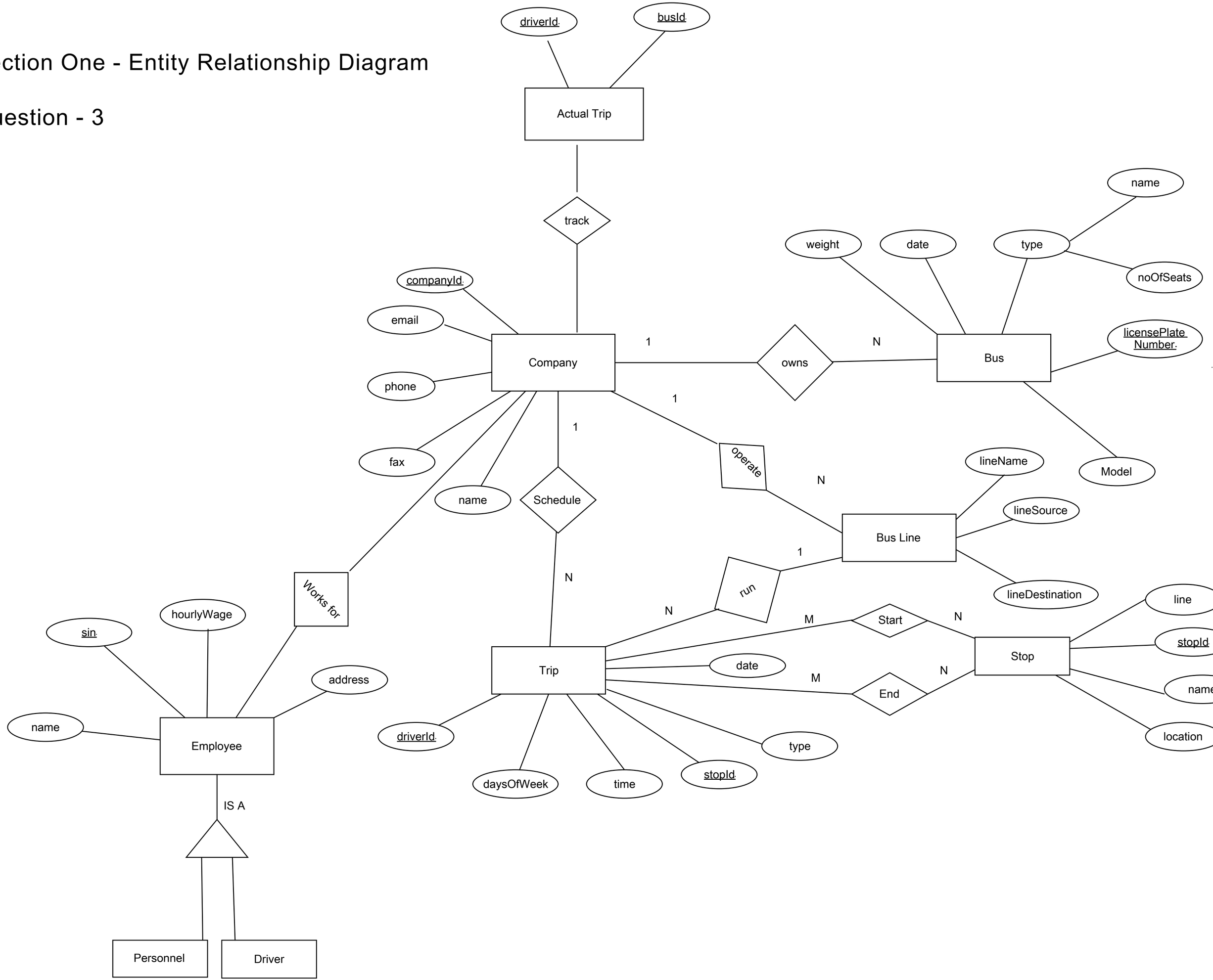
# Section One - Entity Relationship Diagram

## Question - 2



# Section One - Entity Relationship Diagram

## Question - 3



# Section Two Solutions - SQL and Relational Algebra

Student (*Id, Name, Country*)
Course (*CrsCode, CrsName, Type, Instructor*)
Results(*Id, CrsCode, Grade)*

All the key fields are underlined. The *Type* field specifies the course type, e.g. MATH, STAT, SYSC, TTMG, ELEC, etc. The Results relation lists the grade that students (in Student relation) obtain for courses (in Course relation). Write the following queries in (1) relational algebra (2) SQL

**a. Find the *Id* of students who take TTMG or SYSC course.**

1) $S = \pi_{id} (\pi_{crscode} (\sigma_{type='TTMG' \vee type='SYSC'} COURSE ) \bowtie RESULTS)$

2)
```
SELECT R.ID FROM RESULTS R JOIN COURSE C ON C.CRSCODE =
R.CRSCODE WHERE C.TYPE="TTMG" OR  C.TYPE ='SYSC' ;
```

**b. Find the *Id* of students who take every course.**

1) $S = (\pi_{id,\ crscode} RESULTS) / (\pi_{crscode} COURSE )$

2)
```
SELECT X.ID
    FROM (
SELECT ID, COUNT(*) NUMOFCOURSESTAKEN
FROM RESULTS
GROUP BY ID
) X
        JOIN (
SELECT COUNT(*) AS COURSESAVAILABLE
FROM COURSE
) Y
ON X.NUMOFCOURSETAKEN = Y.COURSESAVAILABLE;
```

Ferhan Jamal (100953487 – ferhan.jamal@carleton.ca)
Nikhil Nayyar (100941327) -nikhil.nayyar@carleton.ca

**c. Find the *Id* of students who take every SYSC course or take every TTMG course.**

*1)* $S = (\pi_{id,\ crscode}\ RESULTS) \ / \ (\pi_{crscode}\ (\sigma_{type='SYSC'}\ COURSE)) \cup (\pi_{id,\ crscode}\ RESULTS) \ / \ (\pi_{crscode}\ (\sigma_{type='TTMG'}\ COURSE))$

*2)*
```
SELECT X.ID
FROM (
        SELECT R.ID, COUNT(*) AS NUMBEROFSYSCCOURSESTAKEN
        FROM RESULTS R
        JOIN COURSE C
                ON R.CRSCODE = C.CRSCODE
        WHERE C.TYPE = 'SYSC'
        GROUP BY R.ID
        ) X
JOIN (
        SELECT COUNT(*) AS SYSCCLASSESAVAILABLE
        FROM COURSE
        WHERE TYPE = 'SYSC'
        ) Y
        ON X.NUMBEROFSYSCCOURSESTAKEN = Y.SYSCCLASSESAVAILABLE

UNION

SELECT X.ID
FROM (
        SELECT R.ID, COUNT(*) AS NUMBEROFTTMGCOURSESTAKEN
        FROM RESULTS R
        JOIN COURSE C
                ON R.CRSCODE = C.CRSCODE
        WHERE C.TYPE = 'TTMG'
        GROUP BY R.ID
        ) X
JOIN (
        SELECT COUNT(*) AS TTMGCLASSESAVAILABLE
        FROM COURSE
        WHERE TYPE = 'TTMG'
```

```
) Y
ON X.NUMBEROFTTMGCOURSESTAKEN = Y.TTMGCLASSESAVAILABLE
```

**d. Find the *Name*s of students who take some SYSC course given by *Instructor* named Samuel.**

1) $S = \pi_{name}(\pi_{id}(\pi_{crscode}(\sigma_{type='SYSC' \wedge instructor='SAMUEL'} COURSE) \bowtie RESULTS) \bowtie STUDENT)$

2)
```
SELECT X.NAME
FROM STUDENT X
JOIN (
        SELECT R.ID
        FROM RESULTS R
        JOIN COURSE C
                ON C.CRSCODE = R.CRSCODE
        WHERE C.TYPE = 'SYSC'
                AND C.INSTRUCTOR = 'SAMUEL'
        ) Y
        ON X.ID = Y.ID
```