CIS 5500: Database and Information Systems
Homework 2: Relational DB Design

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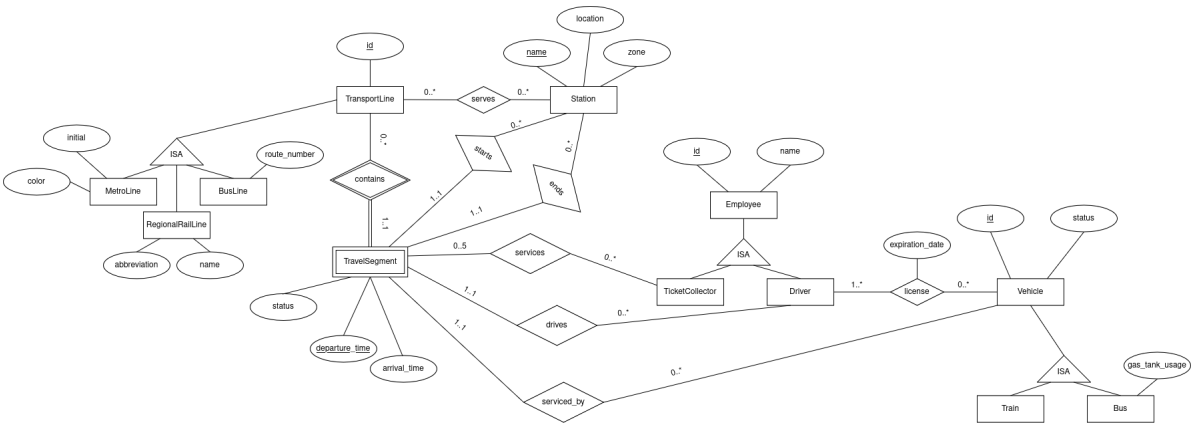
1. **Question 1 (30 points)**

   A. **(20 points)**



   B. **(5 points)**

> **Ans:** It is possible to have a start or end stop that does not have a TransportLine assigned to it. We can add a not exists constraint to the stations table to check that a station can be a stop if and only if it exists in the TransportLine table double check this!

   C. **(5 points)**

> **Ans:** Add an attribute to the relationship `serves` that is called `no_of_platforms`. We also add an attribute to the Station entity set `maximum_no_of_platforms`. We add a constraint that ensures that `no_of_platforms` is less than or equal to `maximum_no_of_platforms`.

2. **Question 2 (20 points)**

   A. **12 points**

Ans:

```
CREATE TABLE Artists(
ArtistID INT PRIMARY KEY,
Name VARCHAR(50) NOT NULL,
Nationality VARCHAR(50) NOT NULL,
BirthYear INT(4) NOT NULL
);

CREATE TABLE Customers(
CustomerID INT PRIMARY KEY,
Name VARCHAR(50) NOT NULL,
Email VARCHAR(100) NOT NULL
);

CREATE TABLE Artworks(
ArtworkID INT PRIMARY KEY,
OwnerID INT FOREIGN KEY REFERENCES Customers(CustomerID),
CreatorID INT FOREIGN KEY REFERENCES Artists(ArtistID),
Title VARCHAR(50) NOT NULL,
AYear INT(4),
Medium VARCHAR(50)
);

CREATE TABLE Exhibitions(
ExhibitionID INT PRIMARY KEY,
ExhibitionName VARCHAR(100) NOT NULL
);

CREATE TABLE DisplayedIn(
ArtworkID INT,
ExhibitionID INT,
PRIMARY KEY (ArtworkID, ExhibitionID),
FOREIGN KEY (ArtworkID) REFERENCES Artworks(ArtworkID),
FOREIGN KEY (ExhibitionID) REFERENCES
    Exhibitions(ExhibitionID),
StartDate DATE,
EndDate DATE
);
```

   B. **4 points**

Ans: We can create an assertion as follows

```
        CREATE ASSERTION exhibition_cardinality
CHECK (
    NOT EXISTS (
        SELECT ExhibitionID
        FROM DisplayedIn
        GROUP BY ExhibitionID
        HAVING COUNT(*) NOT BETWEEN 5 AND 20
    )
);
```

C. **4 points**

Ans: We change the cardinality on the Artists entity set from 0..∗ to 1..∗. We also add the following assertion

```
CREATE ASSERTION artist_has_artwork
CHECK (
  NOT EXISTS (
    SELECT *
    FROM Artists A
    WHERE NOT EXISTS (
      SELECT *
      FROM Artworks W
      WHERE W.CreatorID = A.ArtistID
    )
  )
);
```

3. **Question 3 (40 points)**
   A. **4 points**
   B. **4 points**
   C. **6 points**
   D. **5 points**
   E. **2 points**
   F. **2 points**
   G. **12 points**
   H. **5 points**