CSC343 Worksheet 5 Solution

June 19, 2020

1. a)

```
CREATE TABLE MovieExec (
    name CHAR(30),
    address VARCHAR(255),
    cert# INT PRIMARY KEY,
    FOREIGN KEY (cert#) REFERENCES Movies(producerC#)
);

```

Example:

- Foreign-key
  - **Syntax 1:** FOREIGN KEY (< attributes >) REFERENCES < table >(< attributes >)
  - **Syntax 2:** REFERENCES < table >(< attributes >)
  - Binds an attribute of one relation to an anttribute in another table
  - Added when creating table

  Example:

```
// Example 1
CREATE TABLE Studio (
    name CHAR(30) PRIMARY KEY,
    address VARCHAR(255),
    presC# INT REFERENCES MovieExeC(cert#)
);

// Example 2
CREATE TABLE Studio (
    name CHAR(30) PRIMARY KEY,
    address VARCHAR(255),
    presC# INT,
    FOREIGN KEY (presC#) REFERENCES MovieExec(cert#)
);

```

b)
```
CREATE TABLE Movies (
    title CHAR(30) PRIMARY KEY,
    year INT PRIMARY KEY,
    length INT,
    genre VARCHAR(255),
    studioName VARCHAR(255),
    producerC# PRIMARY KEY
);
```

c) No change required. Violation occurs by the default policy.

```
CREATE TABLE MovieExec (
    name CHAR(30),
    address VARCHAR(255),
    cert# INT PRIMARY KEY,
    FOREIGN KEY (cert#) REFERENCES Movies(producerC#)
);
```

Correct Solution:

```
CREATE TABLE MovieExec (
    name CHAR(30),
    address VARCHAR(255),
    cert# INT PRIMARY KEY,
    FOREIGN KEY (cert#) REFERENCES Movies(producerC#)
        ON UPDATE CASCADE // Correction
        ON DELETE CASCADE // Correction
);
```

Notes:

- Maintaining Referential Integrity
  - Three different types of policies exist on Foreign Key
    1. *The Default Policy: Reject Violating Modifications.*
       * Is default policy
       * Rejects any modification violating referential integrity constant
    2. *The Cascade Policy*
       * Changes to the referenced attributes are mimicked at foreign key.
       * e.g. delete a tuple in **MovieExec**, deletes related referencing tuple(s) from **Studio**
    3. *The Set-Null Policy*
       * When a modification to the referenced relation affects a foreign-key value, the latter is changed to NULL.

* This applies to both UPDATE and DELETE

Example:

```
    CREATE TABLE Movies (
        title CHAR(30) PRIMARY KEY,
        year INT PRIMARY KEY,
        length INT,
        genre VARCHAR(255),
        studioName VARCHAR(255),
        producerC# REFERENCES MovieExec(cert#)
            ON DELETE SET NULL
            ON UPDATE CASCADE
    );
```

d)

```
    CREATE TABLE Movies (
        title CHAR(30) PRIMARY KEY,
        year INT PRIMARY KEY,
        length INT,
        genre VARCHAR(255),
        studioName VARCHAR(255),
        producerC# VARCHAR(255)
        FOREIGN KEY (title) REFERENCES StarsIn(movieTitle)
    );
```

e)

```
    CREATE TABLE StarsIn (
        movieTitle CHAR(30) PRIMARY KEY,
        movieYear INT PRIMARY KEY,
        starName VARCHAR(255) PRIMARY KEY,
        FOREIGN KEY (starName) REFERENCES MovieStar(name)
            ON DELETE CASCADE
    );
```

2. Yes. Set foreign-key constraint on StarsIn's movietitle to Movie's title.

```
    CREATE TABLE Movies (
        title CHAR(30) PRIMARY KEY,
        year INT PRIMARY KEY,
        length INT,
        genre VARCHAR(255),
        studioName VARCHAR(255),
        producerC# VARCHAR(255),
        FOREIGN KEY (title) REFERENCES StarsIn(movieTitle)
    );
```

3.
```sql
CREATE TABLE Product (
    maker CHAR(30),
    model INT PRIMARY KEY,
    type VARCHAR(255)
);

CREATE TABLE PC (
    model INT PRIMARY KEY,
    speed FLOAT,
    ram INT,
    hd INT,
    price FLOAT,
    FOREIGN KEY (model) REFERENCES Product(model)
);

CREATE TABLE Laptop (
    model INT PRIMARY KEY,
    speed FLOAT,
    ram INT,
    hd INT,
    screen INT,
    price FLOAT,
    FOREIGN KEY (model) REFERENCES Product(model)
);

CREATE TABLE Printer (
    model INT PRIMARY KEY,
    color BOOLEAN,
    type VARCHAR(255),
    price FLOAT,
    FOREIGN KEY (model) REFERENCES Product(model)
);


```

Correct Solution:

```sql
CREATE TABLE Product (
    maker CHAR(30),
    model INT PRIMARY KEY,
    type VARCHAR(255)
);

CREATE TABLE PC (
    model INT PRIMARY KEY,
    speed FLOAT,
    ram INT,
    hd INT,
    price FLOAT,
    FOREIGN KEY (model) REFERENCES Product(model)
        ON DELETE CASCADE
```

```
            ON UPDATE CASCADE
    );

    CREATE TABLE Laptop (
        model INT PRIMARY KEY,
        speed FLOAT,
        ram INT,
        hd INT,
        screen INT,
        price FLOAT,
        FOREIGN KEY (model) REFERENCES Product(model)
            ON DELETE CASCADE
            ON UPDATE CASCADE
    );

    CREATE TABLE Printer (
        model INT PRIMARY KEY,
        color BOOLEAN,
        type VARCHAR(255),
        price FLOAT,
        FOREIGN KEY (model) REFERENCES Product(model)
            ON DELETE CASCADE
            ON UPDATE CASCADE
    );


```

4.

```
    CREATE TABLE Classes (
        class CHAR(255) PRIMARY KEY,
        type CHAR(2),
        country CHAR(255),
        numGuns INT,
        bore FLOAT(3),
        displacement INT
    );

    CREATE TABLE Ships (
        name CHAR(255) PRIMARY KEY,
        class CHAR(255),
        launched DATE,
        FOREIGN KEY (class) REFERENCES Classes(class)
            ON DELETE CASCADE
            ON UPDATE CASCADE
    );

    CREATE TABLE Battles (
        name CHAR(255) PRIMARY KEY,
        date DATE
    );

    CREATE TABLE Outcome (
        ship CHAR(255),
        battle CHAR(255),
```

```
        result CHAR(7),
        PRIMARY KEY (ship, battle, result),
        FOREIGN KEY (battle) REFERENCES Battles(name),
            ON DELETE CASCADE
            ON UPDATE CASCADE
        FOREIGN KEY (ship) REFERENCES Ships(name),
            ON DELETE CASCADE
            ON UPDATE CASCADE
    );
```

5. a)

```
    CREATE TABLE Classes (
        class CHAR(255) PRIMARY KEY,
        type CHAR(2),
        country CHAR(255),
        numGuns INT,
        bore FLOAT(3),
        displacement INT
    );

    CREATE TABLE Ships (
        name CHAR(255) PRIMARY KEY,
        class CHAR(255),
        launched DATE,
        FOREIGN KEY (class) REFERENCES Classes(class)
            ON DELETE CASCADE
            ON UPDATE CASCADE
    );
```

b)

```
    CREATE TABLE Battles (
        name CHAR(255) PRIMARY KEY,
        date DATE
    );

    CREATE TABLE Outcome (
        ship CHAR(255),
        battle CHAR(255),
        result CHAR(7),
        PRIMARY KEY (ship, battle, result),
        FOREIGN KEY (battle) REFERENCES Battles(name),
            ON DELETE CASCADE
            ON UPDATE CASCADE
    );
```

c)

```
    CREATE TABLE Ships (
        name CHAR(255) PRIMARY KEY,
        class CHAR(255),
        launched DATE,
        FOREIGN KEY (class) REFERENCES Classes(class)
            ON DELETE CASCADE
```

```
            ON UPDATE CASCADE
    );

    CREATE TABLE Outcome (
        ship CHAR(255),
        battle CHAR(255),
        result CHAR(7),
        PRIMARY KEY (ship, battle, result),
        FOREIGN KEY (battle) REFERENCES Battles(name),
            ON DELETE CASCADE
            ON UPDATE CASCADE
        FOREIGN KEY (ship) REFERENCES Ships(name),
            ON DELETE CASCADE
            ON UPDATE CASCADE
    );

```

6. a)

```
    Movies(title, year, length, genre, studioName, producerC#)

    CREATE TALBE Movies (
        ...
        year INT PRIMARY KEY CHECK (year >= 1915),
        ...
    );

```

Notes:

- CHECK Constraints
  - sets conditions that must hold for every value of an attribute

```
        // Example 1
        Studio(name, address, pressC#)


        CREATE TALBE Studio (
            ...
            presC# INT REFERENCES MovieExec(cer#)
                CHECK (presC# >= 10000)
        );

        // Example 2
        MovieStar(name, address, gender, birthdate)

        CREATE TALBE MovieStar (
            ...
            gender CHAR(1) CHECK (gender IN ('F', 'M')),
            ...
        );

```

b)
```
Movies(title, year, length, genre, studioName, producerC#)

CREATE TALBE Movies (
    ...
    length INT CHECK (length > 250 AND length < 60),
    ...
);

```

c)
```
Movies(title, year, length, genre, studioName, producerC#)

CREATE TALBE Movies (
    ...
    studioName VARCHAR(255) CHECK (studioName IN ('Disney', 'Fox', 'MGM', 'Paramount')),
    ...
);

```

7. a)
```
CREATE TABLE Laptop (
    ...
    speed FLOAT CHECK (speed >= 2.0),
    ...
);

```

b)
```
CREATE TABLE Printer (
    ...
    type VARCHAR(255) CHECK (type IN ('laser', 'ink-jet', 'bubble-jet')),
    ...
);

```

c)
```
CREATE TABLE Product (
    maker CHAR(30),
    model INT PRIMARY KEY,
    type VARCHAR(255) CHECK (type IN ('pc', 'laptop', 'printer'))
);

```

d)
```
CREATE TABLE Product (
    ...
    model INT PRIMARY KEY CHECK (type IN (
        (SELECT model FROM PC)
        UNION
        (SELECT model FROM Laptop)
        UNION
        (SELECT model FROM Printer)
    )),
    ...
);

```