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# **CMPT 354 Module 2 Assignment**

## Due: March 5, 2021 @ 11:59 PM

## Weighting: 8%

# Overview

The purpose of this assignment is to test your ability to use conceptual modelling, such as ER and EER diagrams, to capture important aspects of a system which need to be stored in a database.

This assignment must be completed individually.

# Submission

All submissions must be made through an electronic marking tool called Gradescope, which will also be used for providing feedback ([enroll with the entry code M68KZM).](http://www.gradescope.ca) You **must** record all your answers in the spaces provided in this document. Altering the format or layout of this document in anyway will attract penalties. You may however add landscape images in the submission boxes without changing the orientation of the page.

# Marking

The Module 2 assignment counts for 8% of course mark.

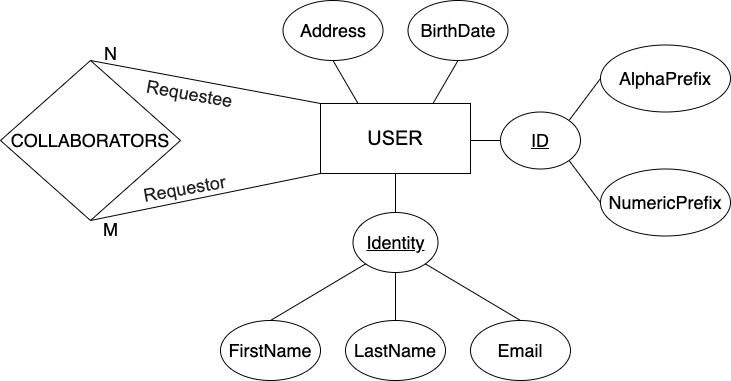
# Task

This assignment contains two different sections. Section A will contain a relational model schema along with other contextual information. Based on this information, you will need to analyse ten different database operations. For each, identify which, if any, integrity constraints would be violated by these operations and how they could be remedied by the database system. An example has been provided below.

Section B will provide you with three ER diagrams based off sample solutions from Assignment 1. For each of these diagrams, you will need to perform relational mapping and state the final relational schema for the ER diagram, including any foreign keys which were created during the process.

## Section A – Integrity Constraints

The following is an extract from a collaboration platform relational system. The original ER diagram has been provided to highlight additional key constraints which are not intuitive from the relational schema. Using the ER diagram, contextual information, relational schema and instance data provided, answer the following questions. **Note: You do not need to take into consideration changes which may have been made by operations in earlier questions**.

ER Diagram:

Contextual Information:

In order to promote users developing more meaningful collaborations with other users, no user is allowed to request to collaborate with more than two users at any given time. Additionally, if a user has only one collaborator, that requestee is not allowed to stop collaborating with that user.

Relational Schema:

User [alphaPrefix, numericSuffix, firstName, lastName, email, address, birthDate]

Collaborators [requestorAlphaPrefix, requestorNumericSuffix, requesteeAlphaPrefix, requesteeNumericSuffix]

Foreign Keys:

Collaborators.{requestorAlphaPrefix, requestorNumericSuffix} references

User.{alphaPrefix, numericSuffix}

Collaborators.{requesteeAlphaPrefix, requesteeNumericSuffix} references

User.{alphaPrefix, numericSuffix}

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| User | | | | | | |
| alphaPrefix | numericSuffix | firstName | lastName | email | address | birthDate |
| ABC | 123456 | Bill | Mush | bill@gmail.com | 7 Right Lne | 20/04/1996 |
| QUR | 358732 | Ellen | Lee | lee@outlook.edu | 2 Alpha Dr | 12/11/1987 |
| RBT | 987652 | Frank | Bardon | bar@yahoo.com | 1/1 Main St | 08/04/1998 |
| ABC | 164578 | Grace | Smith | soccer@shaw.ca | 45 Main St | 13/06/1990 |
| XZY | 286843 | Aaron | Smith | soccer@shaw.ca | 46 Main St | 14/07/1991 |

Instance Data:

|  |  |  |  |
| --- | --- | --- | --- |
| Collaborators | | | |
| requestorAlphaPrefix | requestorNumericSuffix | requesteeAlphaPrefix | requesteeNumericSuffix |
| ABC | 123456 | QUR | 358732 |
| QUR | 358732 | ABC | 123456 |
| ABC | 123456 | ABC | 164578 |
| ABC | 164578 | RBT | 987652 |
| XZY | 286843 | ABC | 164578 |

**Example**: Insert (125395, 097123, 'Jian', 'Zhang', 'j.zhang@sfu.ca, '46 University Dr', '12/12/1995') into User.

**Will this operation cause an integrity constraint violation?** Yes / No

**If yes, name the constraint(s) which will be violated**: Domain Constraint Violation

**If yes, explain how these integrity constraints could be enforced (all possible ways):**

1. This constraint could be enforced by rejecting the insert operation into the database.
2. The DBMS could replace the incorrect ‘alphaPrefix’ with a default value provided it does not violate the key constraint.

* 1. Insert (NULL, 097123, 'Grace', 'Zhang', 'bubbletea@sfu.ca', '40 University Dr', '12/12/1995') into User.

**Will this operation cause an integrity constraint violation?** Yes / No

**If yes, name the constraint(s) which will be violated**:

**If yes, explain how these integrity constraints could be enforced (all possible ways):**

* 1. Insert ('RBT', 987652, 'RBT', 987652) into Collaborators.

**Will this operation cause an integrity constraint violation?** Yes / No

**If yes, name the constraint(s) which will be violated**: Semantic Integrity Constraint

**If yes, explain how these integrity constraints could be enforced (all possible ways):**

1. This constraint could be enforced by rejecting the insert operation into the database.

* 1. Insert ('ABC', 987652, 'RBT', 987652) into Collaborators.

**Will this operation cause an integrity constraint violation?** Yes / No

**If yes, name the constraint(s) which will be violated**: Referential Integrity Constraint

**If yes, explain how these integrity constraints could be enforced (all possible ways):**

1. This constraint could be enforced by rejecting the insert operation into the database.

* 1. Modify the tuple ('ABC', 123456, 'ABC', 164578) in the Collaborators table and change it to ('ABC', 123456, 'RBT', 987652).

**Will this operation cause an integrity constraint violation?** Yes / No

**If yes, name the constraint(s) which will be violated**:

**If yes, explain how these integrity constraints could be enforced (all possible ways):**

* 1. Modify the ‘requestorNumericSuffix’ for all the tuples in Collaborators table with ‘requestorAlphaPrefix’ = 'ABC' to 123456.

**Will this operation cause an integrity constraint violation?** Yes / No

**If yes, name the constraint(s) which will be violated**: Semantic Integrity Constraint

**If yes, explain how these integrity constraints could be enforced (all possible ways):**

1. This constraint could be enforced by rejecting the modify operation into the database.

* 1. Modify the ‘firstName’ of the User tuple with ‘alphaPrefix’ = 'XZY' and ‘numericSuffix’ = 286843 to 'Grace'.

**Will this operation cause an integrity constraint violation?** Yes / No

**If yes, name the constraint(s) which will be violated**:

**If yes, explain how these integrity constraints could be enforced (all possible ways):**

* 1. Delete any tuple in Collaborators with ‘requestorNumericSuffix’ = 'QUR'.

**Will this operation cause an integrity constraint violation?** Yes / No

**If yes, name the constraint(s) which will be violated**: Domain Constraint

**If yes, explain how these integrity constraints could be enforced (all possible ways):**

1. reject this operation

* 1. Delete any tuple in the Collaborators table with ‘requestorNumericSuffix’ = 164578.

**Will this operation cause an integrity constraint violation?** Yes / No

**If yes, name the constraint(s) which will be violated**: Semantic Integrity Constraint

**If yes, explain how these integrity constraints could be enforced (all possible ways):**

1. reject this operation

* 1. Delete the tuple ('ABC', 123456, 'Bill', 'Mush', 'bill@gmail.com', '7 Right Lne', '20/04/1996') in the User table.

**Will this operation cause an integrity constraint violation?** Yes / No

**If yes, name the constraint(s) which will be violated**: Referential Integrity Constraints

**If yes, explain how these integrity constraints could be enforced (all possible ways):**

1. This constraint could be enforced by rejecting the insert operation into the database.
2. delete any collaboration which contains this user and make sure the rest of the user has at least one collaborator.

* 1. Insert the tuple ('XZY', '097123', 'Bob', 'Smith', 'bob54@sfu.ca', '48 University Dr', '12/11/1998') into User.

**Will this operation cause an integrity constraint violation?** Yes / No

**If yes, name the constraint(s) which will be violated**: Domain Constraint

**If yes, explain how these integrity constraints could be enforced (all possible ways):**

1. This constraint could be enforced by rejecting the insert operation into the database.
2. set a default increasing value for numbericSuffix

## Section B – Relational Mapping

The following three questions all contain ER or EER diagrams from the Module 1 assignment solutions. For each diagram, complete ER to relation mapping and state your final relational schema, including any foreign keys which were created in the process.

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**ENTER YOUR RELATIONAL SCHEMA AND FOREIGN KEYS HERE**

* PATIENT [MedicareNumber, UnitNumber, HouseNumber, StreetName, Suburb, Postcode, FirstName, LastName, vaccine\_name]
* PATIENT\_ALLERGIES [MedicareNumber, Allergie]
* PATIENT\_ALLERGIES.MediccareNumber references PATIENT.MedicareNumber
* PATIENT.vaccin\_name references VACCINE.Name
* VACCINE [Name, Description, Cost, safety\_code]
* VACCINE.safety\_code references SAFTEYCLASSIFICATION.Code
* SAFTEYCLASSIFICATION [Code, Description]
* SAFTEYCLASSIFICATION\_SIDEEFFECT [Code, SideEffect]
* SAFTEYCLASSIFICATION\_SIDEEFFECT. Code references SAFTEYCLASSIFICATION. Code
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**ENTER YOUR RELATIONAL SCHEMA AND FOREIGN KEYS HERE**

* patron [Licence, FirstName,MiddeltName,LastName, Phone, Address]
* patron\_ Infringements [Licence, FirstName,MiddeltName,LastName, Infringements]
* staff [staffID, phone, firstName, lastName]
* raceinstructors [yearsExperience, staffID]
* Hondacivic [SerialNumber, isAutomatic, isNOSEnabled, Lastservice, NumberOfSeats]
* Coupe [SerialNumber];
* Sedan [SerialNumber, seatType];
* Hatchback [SerialNumber, RimType, CalliperColour];
* Session [timestamp, Licence, FirstName, LastName, MiddleName, SerialNumber, staffID, FastestLapTime]
* patron\_ Infringements.FirstName, patron.MiddeltName, patron.LastName references patron. FirstName, patron.MiddeltName, patron.LastName
* Session.serialNumber references Hatchback.SerialNumber
* Session.staffID references staff.staffID
* Session.LastName references parton.lastname
* Session.FirstName references parton. FirstName
* Session.MiddleName references parton. MiddleName
* patron\_ Infringements.Licence references patron.Licence
* raceinstructors.staffID references staff.staffID
* Hatchback.serialNumber references Hatchback.SerialNumber
* Sedan.serialNumber references Sedan.SerialNumber
* coupe.serialNumber references Hondacivic.SerialNumber
  1. A picture containing text

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**ENTER YOUR RELATIONAL SCHEMA AND FOREIGN KEYS HERE**

* tester [ID, Lastname, firstname]
* tester\_mail [ID, email]
* tester\_phone [ID, phone]
* Device [RetailValue, Description, ProductID]
* Laptop [ProductID, BatteryLife, keyboardStyle, GraphicsCard]
* Mobilephone [ScreenSize, CameraQuality HasHeadphoneJack, ProductID]
* part [ProductID, Name, Number, Warranty, TechnicalDescription, Weight]
* Connects [ProductId1, name1, number1, ConnectionType, ProductId2, name2, number2]
* MobilePhone.ProductID references Device.ProductID
* Laptop.ProductID references device.ProductID
* part.ProductID references device.ProductID
* Connects.ProductId1-> part.ProductId Connects.name1-> part.name, Connects.number1-> part.number (they determine a connector)
* Connects.ProductId2-> part.ProductId Connects.name2-> part.name, Connects.number2-> part.number (they determine a connected)