**Normalization**

**Instruction:**

In this assignment, you will be asked to identify Normal Forms and conduct the Normalization Process.

After you finish your answers, you can move forward to the solutions. You need to compare the solutions with your answers and summarize your learning experience. The **learning summary** will be peer-reviewed as your grade for Assignment 1. You can find detailed instructions for the learning summary later on.

**Question 1: Normal Forms**

1A: What normal form is the following relation in (key is underlined), and Why? Make sure you provide both Answer and Reasoning:

* STORE\_ITEM (SKU, EventID, Vendor, Style, Price, Warranty)
  + FD1: SKU, EventID → Vendor, Style, Price
  + FD2: SKU → Vendor, Style, Warranty
  + FD3: Vendor → Warranty

**Answer (1A):**

* **It is in 1NF since it is a relation. It is NOT in 2NF because it has a partial dependency**
  + **SKU 🡪 Vendor, Style, Warranty is in (SKU, EventID)**

1B: What normal form is the following relation in (key is underlined), and Why? Make sure you provide both Answer and Reasoning:

* SKU (SKU, Vendor, Style, Warranty)
  + FD1: SKU → Vendor, Style, Warranty
  + FD2: Vendor → Warranty

**Answer (1B):**

* **It is in 1NF since it is a relation. It is in 2NF as there are no partial dependencies.**
* **It is NOT in 3NF as there are transitive dependencies.**
  + **SKU 🡪 Vendor 🡪 Warranty**

1C: What normal form is the following relation in (key is underlined), and Why? Make sure you provide both Answer and Reasoning:

* SKU (SKU, Vendor, Style, Warranty)
  + FD1: SKU → Vendor, Style, Warranty
  + FD2: Vendor, Style → Warranty

**Answer (1C)**:

* **It is in 1NF since it is a relation. It is in 2NF as there are no partial dependencies.**
* **It is NOT in 3NF as there are transitive dependencies.**
  + **SKU 🡪 Vendor, Style 🡪 Warranty**

**Question 2: Normalization Process**

We have a relational model represented as a relational schema and its functional dependencies  given as below:

* TRANSCRIPT (ID, fName, lName, major, majorDescription, courseID, courseDescription, courseGrade)
  + FD1: ID, courseID -> fName, lName, major, majorDescription, courseDescription, courseGrade
  + FD2: ID -> fName, lName, major, majorDescription
  + FD3: courseID - > courseDescription
  + FD4: major -> majorDescription

2A: Normalize it to 2NF

2B: Check all the relations you got from 2A. Are they in 3NF? If not, normalize them to 3NF.

**Answer (2A):**

* **Transcript (ID (fk), courseID (fk), courseGrade)**
  + **FD1: ID, courseID 🡪 courseGrade**
* **Course (courseID, courseDescription)**
  + **FD1: courseID 🡪 courseDescription**
* **Student (ID, fName, lName, major, majorDescription)**
  + **FD2: ID 🡪 fName, lName, major, majorDescription**
  + **FD4: major 🡪 majorDescription**

**Answer (2B):**

* **Transcript(ID (fk), courseID (fk), courseGrade)**
  + **FD1: ID, courseID 🡪 fName, lName, major, majorDescription, courseDescription, courseGrade**
* **Student (ID, fName, lName, major (fk))**
  + **ID 🡪 fName, lName, major, majorDescription**
* **Course (courseID, courseDescription)**
  + **courseID 🡪 courseDescription**
* **Major (major, majorDescription)**
  + **Major 🡪 majorDescription**

**Question 3: Normalization Process**

You are given the following Relational Model represented as a relational schema and its functional dependencies.

Exam1(A, B, C, D, E, F, G, H, I)

fd1: A, B, C -> D, E, F, G, H, I

fd2: B -> E

fd3: C -> F, G, H, I

fd4: F, G -> H, I

3A: Normalize it to 2NF

3B: Check all the relations you got from 3A. Are they in 3NF? If not, normalize them to 3NF.

**Answer (3A)**:

* **Exam1 (A, B (fk), C (fk), D)**
  + **Fd1: A, B, C 🡪 D,**
* **Relation1 (B, E)**
  + **Fd2: B 🡪 E**
* **Relation2 (C, F, G, H, I)**
  + **Fd3: C 🡪 F, G, H, I**
  + **Fd4: F, G 🡪 H, I**

**Answer (3B):**

* **Exam1 (A, B(fk), C (fk), D)**
  + **Fd1: A, B, C 🡪 D**
* **Relation R2 (B, E)**
  + **B 🡪 E**
* **Relation R3 (C, F (fk), G (fk))**
  + **C 🡪 F, G**
* **Relation R4 (F, G, H, I)**
  + **F, G 🡪H, I**