**Homework 4: ERD and Normalization (Total Points: 100)**

Due: Saturday March 12, 11:59PM ET

**Note: Functional Dependencies and Normalization will be covered in Lecture 6**

**Problem 1: Design (Points: 30)**

A school tracks students in its database as follows:

| StudentId | FirstName | LastName | Last 4 of SSN | Email | Degree | Major |
| --- | --- | --- | --- | --- | --- | --- |
| 123456 | Mary | Smith | 1111 | smithm@school.edu | BS | Business |
| 123457 | Jamie | Jameson | 2222 | jameson@school.edu | BA | Criminal Justice |
| 123458 | John | Jones | 3333 | jones@school.edu | BS | Business |

a. Some students wish to pursue a minor. What changes would the school need to make to its database to keep track of students who pursue a major and a minor? You can enter a descriptive explanation with **conceptual** diagrams to support your proposal (15 points):

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b. Some students wish to pursue double majors. What changes would the school need to make to the database to keep track of students who pursue double majors? You can enter a descriptive explanation with **conceptual** diagrams to support your proposal (15 points):

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**Problem 2: Entity Relationship Diagram (Points: 30)**

Karen has been making fashion jewelry for a few years now. She’s been so successful that she wants to take her passion to the Web. With this in mind, she founded KewlJewels.

KewlJewels sells different types of jewelry pieces (e.g., bracelets, pendants). Each jewelry piece has a specific description (e.g., white pearl earrings). She wants to be able to produce sales reports that indicate how many pieces per type the company has sold. Potential customers may browse the online catalog without registering on the site.

While browsing the catalog, they may add jewelry pieces to a virtual shopping cart. Once they select to go to the checkout, they will need to provide personal information : name, phone number, address, email. Only credit card payments are accepted. The site collects the credit card type and number, and expiration date.

Customers may choose a shipping address different from the billing address, and the database needs to keep track of both addresses. Only complete orders are shipped, no partials are allowed. The database does not track inventory control, only sales information. You are asked to design the database to support the Web operations

a. Create some sample data which meets the requirements identified in the description above. Use a table format similar to slide 46 of lecture 5. (10 points)

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b) Create a **physical** ERD (identify entities, relationships, attributes, primary and foreign keys) using Crow’s foot notation. (20 points)

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**Problem 3: Database Keys (Points: 20)**

During the normalization process, you end up with the following candidate keys:

Key 1: InvoiceNo, InvoiceDate  
Key 2: InvoiceNo, SalespersonID  
Key 3: InvoiceNo, SalespersonEmail  
Key 4: InvoiceNo, SalespersonSSN

Assuming each invoice can be handled by more than one salesperson, which pair of the fields would you choose as the Primary Key? Explain the reasons for discarding the options as appropriate:

| Key 1:  Key 2:  Key 3:  Key 4: |
| --- |

**Problem 4: Functional Dependencies (Points: 20)**

Given the following four functional dependencies:

**FD-1:** **GuestID** --> FirstName, LastName, Email

**FD-2:** **GuestID, PhoneID** --> FirstName, LastName, Email, PhoneNo, PhoneType

**FD-3:** **EventID** --> EventDate, EventDescription

**FD-4:** **RSVPNo** --> GuestID, FirstName, LastName, Email, RSVPDate, NoOfGuests, EventID, EventDate, EventDescription

For each FD, indicate whether it is a FD or not. If any of the above are not, what changes would you need to make to turn them into full functional dependencies?

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**BONUS: BASIC NORMALIZATION PROCESS (10 points)**

The following is an inventory report from your new customer, a small plastic container reseller:

Pharmacy Inventory Report

Product Code: 01 Product Type: Medicine Manager: Darlene Snell

| **Item ID** | **Item Name** | **Category** | **Quantity on Hand** | **Last Physical Count** | **Re-order when inventory falls below** |
| --- | --- | --- | --- | --- | --- |
| 101  102  103 | Aspirin  Claritin  Ibuprofen | pain  allergy  pain | 120  400  300 | 1/30/2022  1/30/2022  2/15/2022 | 30  30  50 |

Product Code: 02 Product Type: Hygiene Manager: Wendy Byrde

| **Item ID** | **Item Name** | **Category** | **Quantity on Hand** | **Last Physical Count** | **Re-order when inventory falls below** |
| --- | --- | --- | --- | --- | --- |
| 101  102  200 | Hand Soap  Shampoo  Facial Tissue | Bath  Bath  Body Care | 100  100  500 | 1/30/2022  1/30/2022  2/20/2022 | 20  20  100 |

1. Normalize the data in First Normal Form. Identify Functional Dependencies, Candidate Keys and Primary Keys.
2. Normalize the data into Second Normal Form.
3. Normalize the data into Third Normal Form.