**General directions:**

* You may use drawings, tables, and figures as a part of your answers
* You may use bulleted phrases or complete paragraphs in your answers
* Make sure you answer the question
* Your work should be done using MySQL Workbench, MS Word, and a drawing tool such as Visio…nothing that is handwritten or drawn by hand will be graded
* You will need to use the my\_guitar\_shop ERD.mwb for many of the problems on this exam
* You will need to submit this document to Canvas when you are finished

1. In the my\_guitar\_shop.warehouses table, how many attributes *do not* have the Not Null constraint?

4 attribute does not have the not null constraint and they are wh\_addr\_line\_2, supplier\_addr\_line\_2, line2, and ship\_date

1. Allocating the storage for a database fits within which level of the three-schema architecture?

**Internal level**

1. Write the relational notation for the current instance of my\_guitar\_shop.products table.

Schema

PRODUCTS(PRODUCT\_ID, *CATEGORY\_ID*, PRODUCT\_NAME, DESCRIPTION, LIST\_PRICE, *SUPPLIER\_ID*)

Instance

products(product\_id, *category\_id*, product\_name, description, list\_price, *supplier\_id*)

1. The table for truck drivers in a transportation company’s database has the following attributes:

|  |  |
| --- | --- |
| **Attribute** | **Description** |
| EmpID | Employee Identification Number |
| DL# | Driver’s License Number |
| SSAN | Social Security Number |
| Fname | First Name |
| Lname | Last Name |

* 1. Identify any possible candidate keys

EmpID, DL#, SSAN

* 1. Identify a primary key

EmpID

* 1. Based on your selection in b), list the alternate key(s).

DL#, SSAN

1. Given the following data from the my\_guitar\_shop.customers and my\_guitar\_shop.orders tables, what constraint would be violated if Gary Hernandez’s tuple were deleted from the my\_guitar\_shop.customers table? Explain your reasoning.

customers

Graphical user interface, text, application

Description automatically generated

orders

Table

Description automatically generated

If garys tuple were to be deleted then the referential integrity constraint would be violated because customer\_id is a foreign key in orders, and since a deletion can only violate the referential integrity constraint that is the only constraint violated

1. Normalize the 1NF relation to 3NF showing the resulting 2NF and 3NF relations. Show your work in relational notation.

| **1NF Relation** | **2NF relation** | **3NF relation** |
| --- | --- | --- |
| R(A,B,C,D,E,F,G,H,I,J,K,L)  FD1 G -> F,H  FD2 I->G  FD3 (A,B)-> E  FD4 (A,B,C)->D,K,L  FD5 C->I,J | R1(A,B,E)  R2(A,B,C,D,K,L)  R3(C,F,G,H,I,J) | R1(A,B,E)  R2(A,B,C,D,K,L)  R3a(F,G,H)  R3b(G,I)  R3c(C,I,J) |

1. Consider the following relations for a database that keeps track of business trips of salespersons in a sales office:

salesperson (ssn, name, start\_year, dept\_no)

trip (ssn, from\_city, to\_city, departure\_date, return\_date, trip\_id)

expense (trip\_id, account#, amount)

One of the relationships is between salesperson and trip; the other is between trip and expense.

Specify the attributes that would be foreign keys in these relations.

* Do not assume any attributes are foreign keys to relations that are not listed above.
* Show your answer as relation(*attributeName*) for as many foreign keys as are necessary.

trip (*ssn*)

expense (*trip\_id*)

1. Identify the business rules for the ER diagram.



Business Rules for Student and Address

Business Rule 1: A Student can have zero to many Addresses

Business Rule 2: An Address has one and only one Student

Business Rules for Advisor and Student

Business Rule 1: An Advisor can have one to many Students

Business Rule 2: A Student has one and only one Advisor

1. Identify the foreign keys needed to implement the relationships shown in the previous question. Show your answer as relation(*attributeName*)for as many foreign keys as are necessary.

addresses(*studentid)*

student(*employeeid*)

1. Diagram

   Description automatically generated The ERD depicts the data needed to track which course and room are used by a class.

 For each entity:

* Indicate if the entity is strong, weak ID-dependent, or weak non-ID-dependent

 For each relationship:

* List the cardinality and participation of each entity in the relationship
* List the business rules for each relationship
* Indicate if the relationship is identifying or not

**Entities**

|  |  |
| --- | --- |
| users | strong weak ID-dependent weak non-ID-dependent |
| downloads | strong weak ID-dependent weak non-ID-dependent |
| products | strong weak ID-dependent weak non-ID-dependent |

**Relationships**

|  |  |  |  |
| --- | --- | --- | --- |
| Entity 1: users | PK: user\_id | Optional Mandatory | One Many |
| Entity 2: downloads | FK: user\_id | Optional Mandatory | One Many |
| Business Rule 1: | A user can download one to many downloads | | |
| Business Rule 2: | A downloads is downloaded by one and only one user | | |
| Identifying Non-identifying | | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Entity 1: products | PK: product\_id | Optional Mandatory | One Many |
| Entity 2: downloads | FK: product\_id | Optional Mandatory | One Many |
| Business Rule 1: | A product can download zero to many downloads | | |
| Business Rule 2: | A downloads is downloaded by one and only one product | | |
| Identifying Non-identifying | | | |

**My Guitar Shop ERD**

Timeline

Description automatically generated with medium confidence