CMP 320

Spring 2024

Database Systems

Project Submission

System Design Report

Names: Karim Rashad, Shady Abbas, Salma Alaleeli, Osama Hasayen, Asma Alkamali

IDs: b00079266, b00079760, g00092968, b00093643, g00084401

Professor: Dr. Muhammad Sheraz

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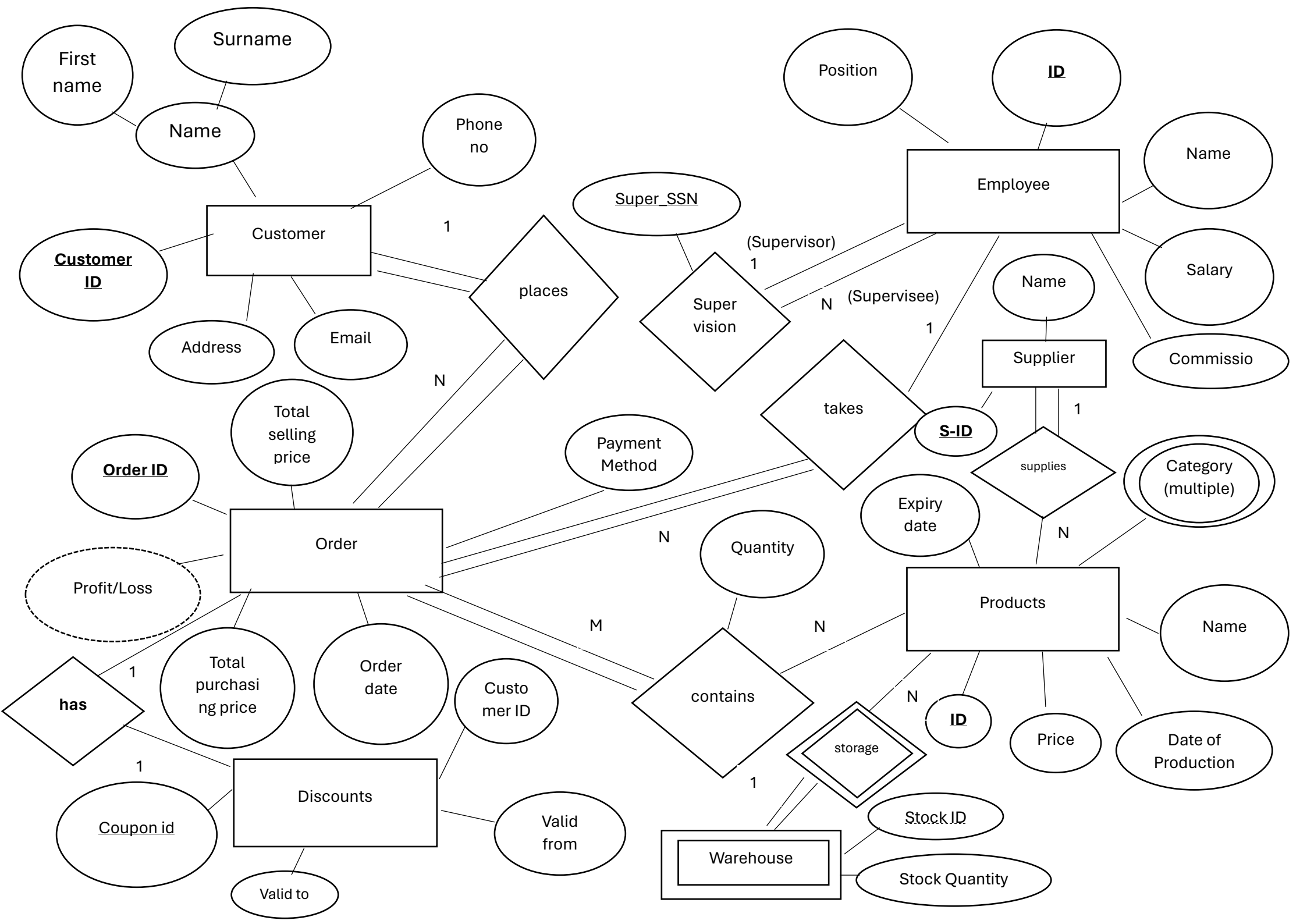
Project Title: *Grocery Store Management Database System*

Description: Our project involves designing a database system for efficiently managing a grocery store's operations. Key entities such as Customers, Products, Orders, Employees, Suppliers, Discounts and Storage will be defined, each with relevant attributes capturing essential information. Relationships between these entities will be established to ensure data integrity and facilitate efficient data retrieval. The goal is to create a flexible and scalable system that streamlines operations and enhances overall efficiency.

ER Diagram: Next page


First name
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takes
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Supplier
Name
1
supplies
N
Expiry date
Category (multiple)
Products
Name
N
ID
Price
Date of Production
storage
1
Warehouse
Stock ID
Stock Quantity

Relational Database Schema (Data Modeling using ER Diagram):

Entity Types:

1. Customer (First Name, Last Name, **ID**, Phone Number, Address, Email)

2. Products (Name, Expiry Date, Name, **P_ID**, Price, Supplier ID (References Supplier ID in Supplier), Date of Production, *Category,* Expiry date)

3. Employee (**E_ID**, Position, Name, Salary, Commission, Supervisor SSN/ID(References Employee ID)

4. Order (Total Selling Price, **Order ID**, Customer ID (references customer ID in Customer), Employee ID (References Employee ID in Employee), Order date, Total Purchasing Price, Total Selling Price)

5. Discounts (**Coupon ID,** Customer ID(references customer id in Customer), Order ID(references Order Id in Order),Valid from, Valid to

6. Supplier (**Supplier ID**, Supplier Name)

7. Warehouse (**Stock ID**, **Product ID**, Stock Quantity)

8. Contains (**Order ID(references order id in Order)**, **Product ID(References Product ID in Product)**, Specified Quantity)

9. Category (**CategoryName, Product/Category ID(References Product ID in Product)**

Relationships:

1. One to Many relationship between Employee and Order through “takes”: One employee can take many orders, but an order can be taken by one employee only. Each order must be taken, but not every employee has to be assigned (especially if number of orders is less than that of employees), hence why Employee entity has partial participation whereas Order has full participation.
2. One to Many relationship between Supplier and Products through “supplies”: One supplier can supply many products, but a product can be supplied by one supplier only. Each supplier must supply something, but not all products have to be supplied (especially if there is a shortage), hence why Supplier entity has full participation whereas Products has partial participation.
3. One to many relationship between supervisor and supervisee, A supervisor may supervise many other employees but an employee is managed by only one Supervisor
4. One to many relationship between Customer and Order. Each customer can place many orders, and each order can be placed by one customer only. A customer must place at least one order, and an order has to be placed by one customer only (hence why customer and order both have full participation.
5. Many to many relationship between order and products, one order can contain many products, and each products can be in multiple orders. Each order must have at least one product, but not every product has to be in an order (especially if its stock has finished)
6. One to one relationship between order and discount. Each order can have one discount only, and each coupon can be applied to only a single order. Not every order needs to have a coupon, and a coupon cannot be used if it is expired
7. Partial relationship between warehouse and product. Stock ID of warehouse needs to include the product ID as well entity in order to fully identify which order is still in stock and which is n0t (in the storage room)
8. Category is multivalued since a product can be part of multiple food types (For example, Olive Oil can be classified as both “Healthy Foods” and “Condiments”)

Keys and Constraints:

Domain integrity: Check constraints ensuring valid values for numerical attributes like price, quantity, salary, commission. Also enforcing constraints to make sure that dates (like expiry date, valid from ,valid to) are in valid formats.

Entity Integrity: Primary Key constraints (not NULL + Unique) on CustomerID, ProductID, OrderID, , EmployeeID, Supplier ID etc.

Referential Integrity(preventing certain actions such as deleting a record that is referenced by another table's
foreign key or inserting values into a foreign key column that do not exist in the referenced table.): Foreign Key constraints on EmployeeID and CustomerID in Order table, SupplierID in Product table, Super SSN in Employee table etc, Order ID and Product ID in contains table etc.)