Database Homework 1 (Fall 2024)

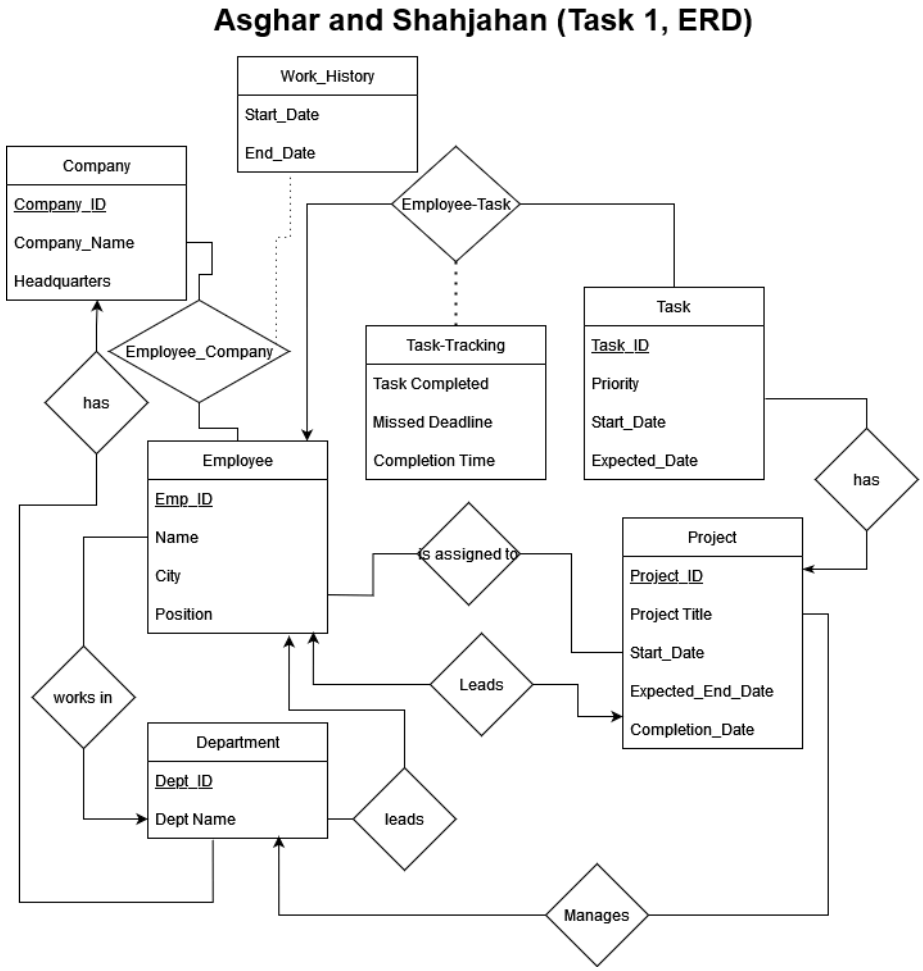
Shahjahan and Asghar

Question 1

Assumptions:

1. An employee can only work on one project at a time.
2. If End_Date of Employee_Project_History is null, the Project is still Ongoing
3. A task can only be assigned to one employee, however, an employee can have multiple tasks under their belt. Project Lead themselves can also assign themselves a task to do.
4. We can tell the "Progress" of the project by using the number of tasks completed, knowing whether there is a Null_Value at End_Date or not.
5. End-date in a Employee-Company table will be null to uniquely identify which company they are working at the moment.
6. End-date in a project table will be null to unique identify which project the employee is currently working at, and which project is still ongoing.

We first made Entity-Relationship Diagram (ERD) so that we can have an easier time creating Relational Schema



Then using this, we finally created the relevant **Relational Schema!**

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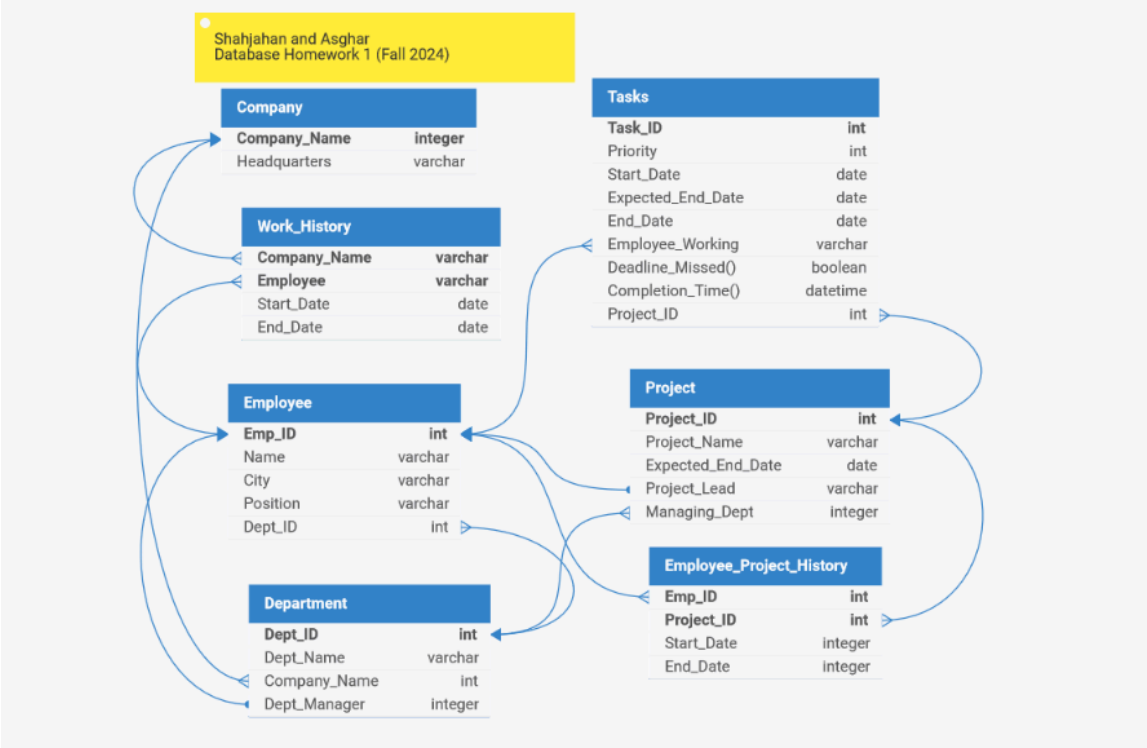

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Question 2

1NF:

SalesOrderID and PurchaseOrderID by itself as a primary key is insufficient to uniquely identify the ItemName, Quantity and UnitPrice. Thus, we will also make ItemID a primary key, so that those two together can identify the other stuff respectively.

{SalesOrderID, ItemID
SalesOrders (SalesOrderID, ItemID, ItemName, Quantity, Unit Price, CustomerID, CustomerName, CustomerPhone)

PurchaseOrders (PurchaseOrderID, ItemID, ItemName, Quantity, UnitPrice, SupplierID, SupplierName, SupplierPhone)

2NF:

Table 1 Functional dependencies:

FD1: {SalesOrderID} -> {customerID, CustomerName, CustomerPhone} **FD2:** {ItemID} -> {itemName}
customerID, CustomerName, CustomerPhone violate 2NF because of FD1. **itemName** violates 2NF because of FD2. Sales_Order_Details(SalesOrderID, ItemID, Quantity, UnitPrice) Customer_Details(SalesOrderID, customerID, CustomerName, CustomerPhone) Sales_Item_Identification(ItemID, itemName)

Table 2 Functional dependencies:

FD1: {ItemID} -> {ItemName, UnitPrice, SupplierID, SupplierName, SupplierPhone}
ItemName, UnitPrice, SupplierID, SupplierName, SupplierPhone violate 2NF because of FD1. Purchase(PurchaseOrderID, ItemID, Quantity) Purchase_Item_Description (ItemID, ItemName, UnitPrice, SupplierID, SupplierName, SupplierPhone)

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3NF:

Transitive Dependency Violations

In Customer_Details:

X->Z
{SalesOrderID} -> {CustomerID}
Z ->Y
{CustomerID} -> {CustomerName, CustomerPhone}

In Purchase_Item_Description:

X_1->Z_1
{ItemID} -> {SupplierID}
Z_1->Y_1
{SupplierID} -> {SupplierName, SupplierPhone}

X_2->Z_2
{ItemID} -> {ItemName}
Z_2 ->Y_2
{ItemName} -> {UnitPrice}

Making 3NF Tables:

Sales

Sales_Order_Details(SalesOrderID, ItemID, Quantity, UnitPrice)
Sales_Customer(SalesOrderID, customerID)
Customer_Details(customerID, CustomerName, CustomerPhone)
Sales_Item_Identification(ItemID, itemName)

Purchases

Purchase(PurchaseOrderID, ItemID, Quantity)
Item_Supplier(ItemID, ItemName, SupplierID)
Item_Name(ItemName, UnitPrice)
Supplier_Details(SupplierID, SupplierName, SupplierPhone)

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Question 3:

Assumptions:

1. Size won't change the price
2. There can be multiple sizes of the same Product_ID

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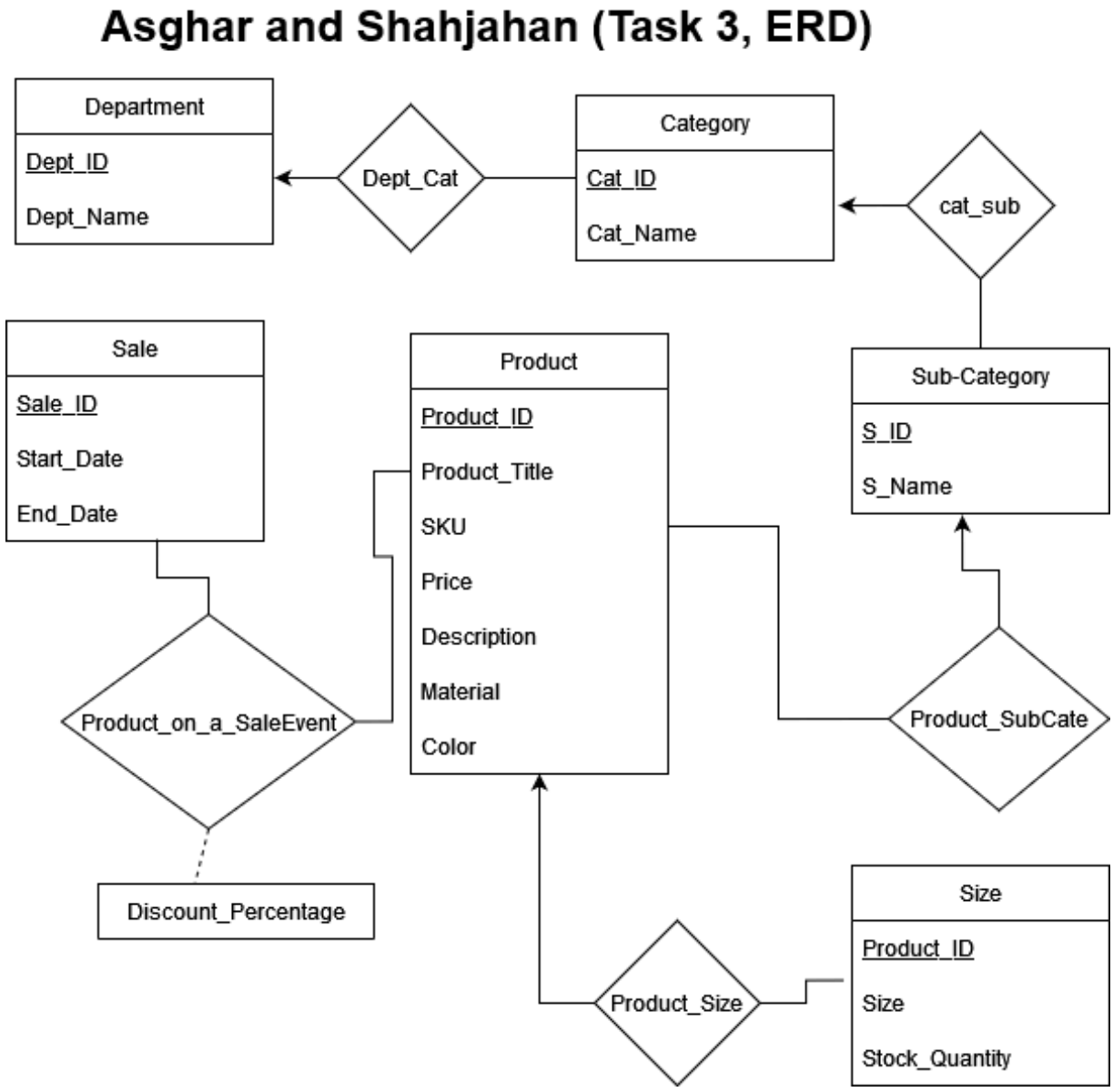

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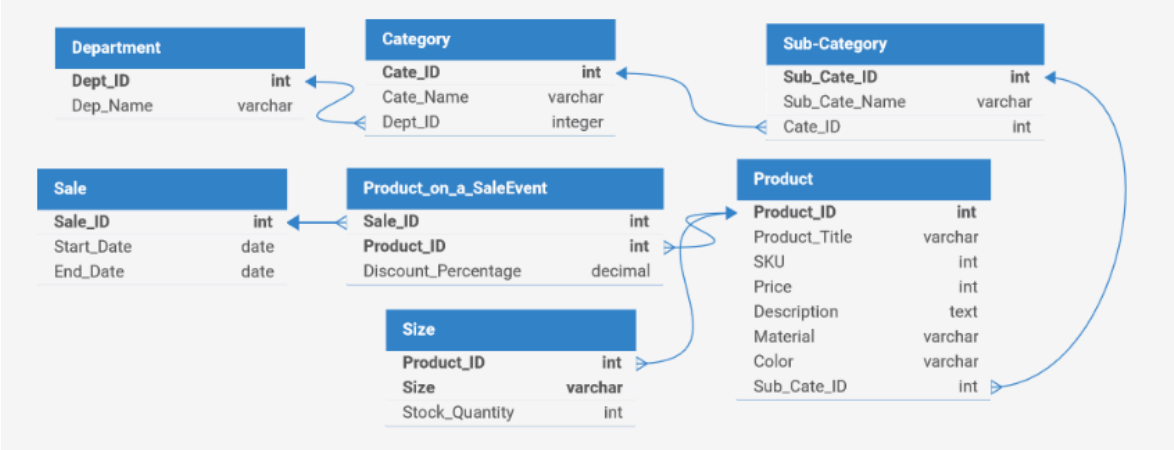
Then using this, we finally created the relevant **Relational Schema!**



Trying to see if there is any "transitive dependencies"

Department(Dept_ID, Dept_Name)
Category(Cate_ID, Cate_Name, Dept_ID(FK to Department))
Sub_Category(Sub_Cat_ID, Sub_Cate_Name, Cate_ID(FK to Category))
Product(Product_ID, Product_Title, SKU, Price, Description, Material, Color, Sub_Cate_ID(FK to Sub-Category))
Size(Product_ID, Size, Stock_Quantity)
Product_on_a_SaleEvent(Sale_ID(FK to Sale), Product_ID(Product), Discount_Percentage)

It is already in 3NF!