HO CHI MINH CITY UNIVERSITY OF TECHNOLOGY
INSTITUTE OF INTERNATIONAL EDUCATION

FINAL ASSIGNMENT REPORT

Major: **< Information Technology >**

Course code:**< COS101 >**

Course name: **< Advanced Database >**

Lecturer's name: TS.Nguyễn Thị Hải Bình

Student's name:

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Ho Chi Minh City

<2021>

SOCIALIST REPUBLIC OF VIETNAM

Independence – Freedom - Happiness

COMMENTS OF THE LECTURER

Student's full name:

(1)……Trần Hùng Cường …… **ID:** 1811062399

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Lecturer's comments:

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HCMC, ……. (date)

Please sign here

Lecturer's full name

I. Requirement summary

Fuctional requirement:

- Employee manager:
  - Employee: Employee ID, employee name, age, date of birth, address, phone number, email, position
  - Department: Department ID, department name, department head
  - Each employee will have to belong to a department
  - A department has many employees and has 1 room
- Materials management:
  - Materials: Material ID, material name, price of each piece, quantity in stock
  - Supply company: Company name, address, phone number, email
  - Materials are periodically imported by the supplier along with the supply record. Each supply record has information: Record ID, supply date, supply time, amount.
  - Each supply record comprises only one material and from a company.
- Production process:
  - Machine: Machine ID, machine name, import date, maintenance cycle
  - Workshop: Workshop ID, area
  - Product type: product type ID, product type name, original price, manufacture days and manufacture amount in that day
  - Place of distribution: Distributor ID, name, address, phone number of the place of distribution
  - Each type of finished product will be produced by the workshop in a certain quantity, with the date of production.
  - Each workshop will have one manager and each manager will manage only one workshop.
  - Each workshop manufactures many products type and each product only can be manufacture from one workshop.
  - Each machine will belong to a workshop
  - Each finished product is made from many machines and each machine produces only one type of finished product.
  - All kinds of finished products are delivered to the place of distribution on time with the specified quantity.

Non – Fuctional requirement

-Notice of materials running out of stock

-Notification of upcoming machine maintenance period

-Management of imported materials for 10 years

-Input data must be a positive integer

-Code of raw materials, machinery, and labor must be a clear, logical sequence, easy to recognize

-Bright friendly interface

-Features work smoothly

-Important features that are easy to interact with

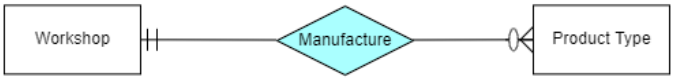
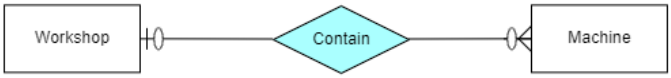
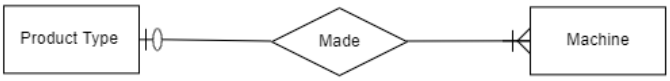
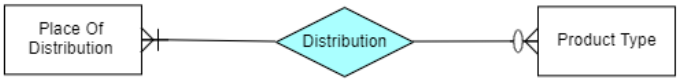
-Fast import and export data

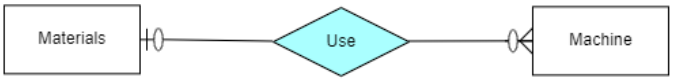
II. Conceptual data model

1. Identify entity sets

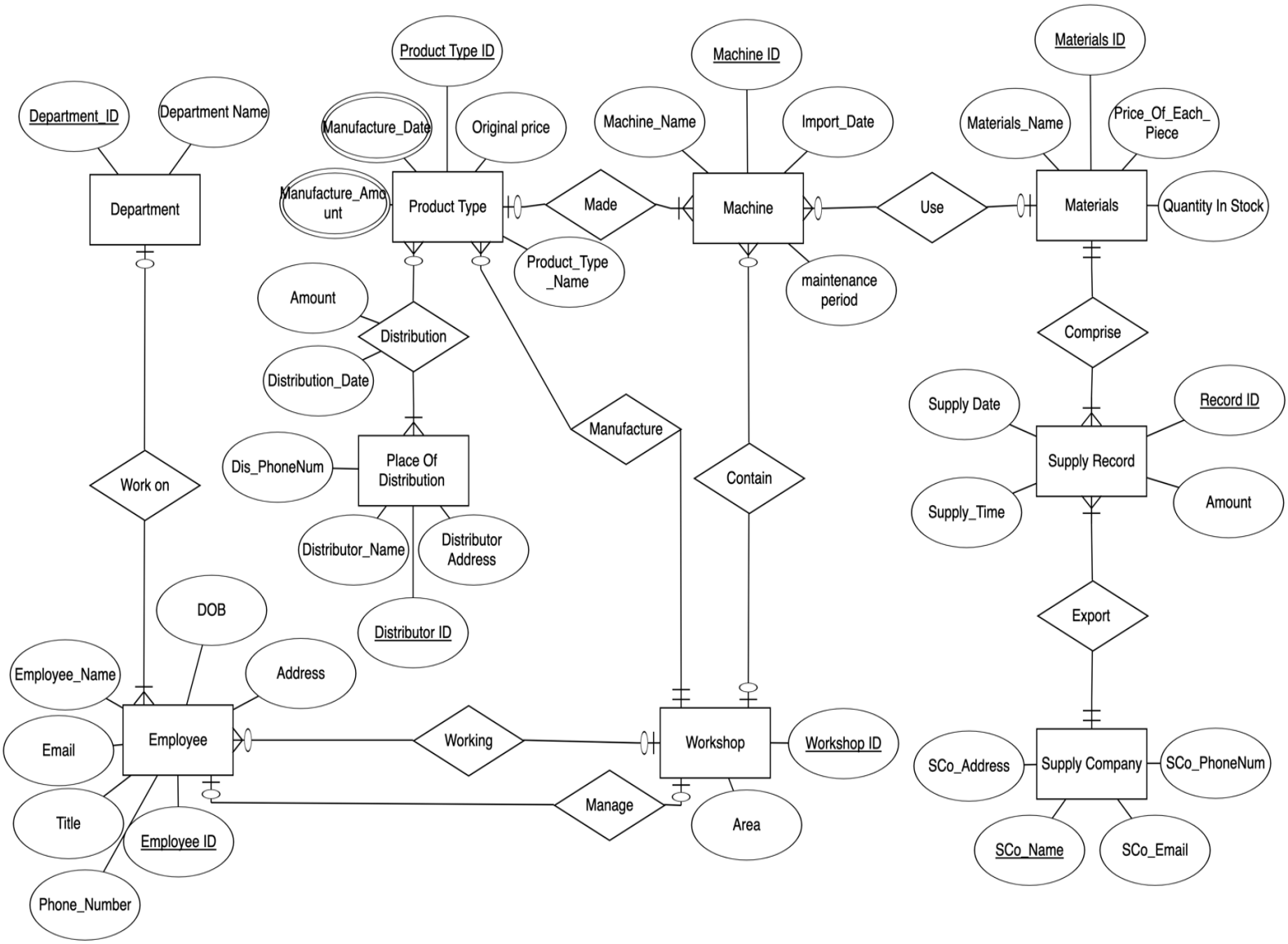
Entity set name	Attribute	Description
Department (strong entity set)	Department_ID (PK)	Department ID (unique)
	Department Name	Department name
Employee (strong entity set)	Employee_ID (PK)	Employee's ID (unique)
	Employee Name	Employee's name
	Title	Employee's title
	DOB	Employee's day of birth
	Email	Employee's email
	Address	Employee's address
	Phone_Number	Employee's phone number
Workshop (strong entity set)	Workshop_ID (PK)	Workshop ID (unique)
	Area	Workshop Area
Machine (strong entity set)	Machine_ID	Machine ID (unique)
	Machine_Name	Machine name
	Import_Date	Machine import date
Product Type (strong entity set)	Product Type_ID (PK)	Product Type ID (unique)
	Product_Type_Name	Product Type name
	Original price	Original price of the product
	Manufacture_Date	Manufacture date
	Manufacture_Amount	Manufacture amount
Place Of Distribution (strong entity set)	Maintenance Period	Machine maintenance period
	Distributor_Name	Distributor's name
	Distributor Address	Distributor's address
	Dis_PhoneNum	Distributor's phone number
Materials (strong entity set)	Materials_ID	Materials ID (unique)
	Materials_Name	Materials name
	Price_Of_Each_Piece	Price of each piece materials
	Quantity In Stock	Quantity materials in stock
Supply Company (strong entity set)	SCo_Name (PK)	Supply company name (unique)
	SCo_Email	Supply company email
	SCo_Address	Supply company address
	SCo_PhoneNum	Supply company phone number
Supply Record (strong entity set)	Record ID (PK)	Record ID (unique)
	Supply Date	Supply date
	Supply_Time	Supply time
	Amount	Amount

2. Identify relationship sets and cardinality constraints

Relationship set name	Attribute	Description	Cardinality constraint
Work on		Each employee will have to belong to a department. A department has many employees and has 1 room.	
Working		Employees will work in one workshop. One workshop can be work by many employees/	
Manage		Each workshop will have one manager and each manager will manage only one workshop.	
Manufacture		Each workshop manufactures many products type and each product only can be manufacture from one workshop.	
Contain		Each machine will belong to a workshop	
Made		Each finished product is made from many machines and each machine produces only one type of finished product.	
Distribution	Amount Distribution_Date	All kinds of finished products are delivered to the place of distribution on time with the specified quantity.	

Use		Machine use one type of materials. Materials be used by many machine	
Comprise		Each supply record comprises only one material and from a company.	
Export		Each supply company can export one or many supply record and each supply record can be export from one company	

3. Entity relationship diagram



III. Relational database design

1. ERD to relational schemas

• Convert entity sets

- Department (Department ID, Department Name)
  + Convert from entity set Department with Department ID is Primary Key
- Employee (Employee ID, Phone Number, Employee Name, Address, Email, Title, DOB)
  + Convert from entity set Employee with Employee ID is primary key
- Workshop (Workshop ID, Area)
  + Convert from entity set Workshop with Workshop ID is primary key
- Machine (Machine ID, Machine Name, maintenance period, Import Date)
  + Convert from entity set Machine with Machine ID is primary key
- Materials (Materials ID, Materials Name, Price Of Each Piece, Quantity In Stock)
  + Convert from entity set Materials with Materials ID is primary key
- Supply Company (SCo Name, Sco Address, SCo Phone Number, SCo Email)
  + Convert from entity set Supply Company with Sco_Name is primary key
- Product Type (Product Type ID, Product Type Name, Original price, Manufacture_Date, Manufacture_Amount)
  + Convert from entity set Product Type whit Product Type ID is primary key
- Place Of Distribution (Distributor ID, Distributor Name, Distributor Address, Dis_PhoneNum)
  + Convert from entity set Place Of Distribution with Distributor ID is primary key
- Supply Record (Record ID, Supply_Time, Supply Date, Amount)
  + Convert from entity set Supply Record with Record ID is primary key

• Convert relationship sets

- Convert Work on relationship set: Employee (Employee ID, Phone Number, Employee Name, Address, Email, Title, DOB, Department_ID(FK))
  + Relation ship set Work on is constraint many to one with one side is entity set Department and many side is entity set Employee. So we take primary key of one side (Department_ID) and add it to many side become foreign key of Employee table
- Convert Working relationship set: Employee (Employee ID, Phone Number, Employee Name, Address, Email, Title, DOB, Department_ID(FK), Workshop ID (FK))
  + Relation ship set Working is constraint many to one with one side is entity set Work shop and many side is entity set Employee. So we take primary key of one side (Workshop ID) and add it to many side become foreign key of Employee table

- Convert Manage relationship set: Workshop (Workshop ID, Area, Manager ID(FK))
  + Relation ship set Manage is constraint one to one. So we take primary key of a side and at it to another side, at here we choose (Employee ID) and add it to (Work shop) table become foreign key
- Convert Contain relationship set: Machine (Machine ID, Machine Name, maintenance period, Import Date, Workshop ID(FK))
  + Relation ship set Contain is constraint many to one with one side is entity set Work shop and many side is entity set Machine. So we take primary key of one side (Workshop ID) and add it to many side made it become foreign key of Machine table
- Convert Use relationship set: Machine (Machine ID, Machine Name, maintenance period, Import Date, Workshop ID(FK), Materials ID(FK))
  + Relation ship set Use is constraint many to one with one side is entity set Materials and many side is entity set Machine. So we take primary key of one side (Materials ID) and add it to many side made it become foreign key of Machine table
- Convert Comprise relationship set: Supply Record (Record ID, Supply_Time, Supply Date, Amount, Materials ID(FK))
  + Relation ship set Comprise is constraint many to one with one side is entity set Materials and many side is entity set Supply Record. So we take primary key of one side (Materials ID) and add it to many side made it become foreign key of Supply Record table
- Convert Export relationship set: Supply Record (Record ID, Supply_Time, Supply Date, Amount, Materials ID(FK), SCo_Name(FK))
  + Relation ship set Export is constraint many to one with one side is entity set Supply Company and many side is entity set Supply Record. So we take primary key of one side (SCo_Name) and add it to many side made it become foreign key of Supply Record table
- Convert Made relationship set: Machine (Machine ID, Machine Name, maintenance period, Import Date, Workshop ID(FK), Materials ID(FK), Product Type ID (FK))
  + Relationship set Made is constraint many to one with one side is entity set Product Type and many side is entity set Machine. So we take primary key of one side (Product Type ID) and add it to many side made it become foreign key of Machine table
- Convert Manufacture relationship set: Product type (Product Type ID, Product_Type_Name, Original Price, Manufacture_Date, Manufacture _amount, Workshop ID(FK))
  + Relationship set Manufacture is constraint many to one with one side is entity set Workshop and many side is entity set Product Type. So we take

primary key of one side (Workshop ID) and add it to many side made it become foreign key of Product Type table

- Convert Distribution relationship set: Pro_Distribution (Distributor ID, Product Type ID, Dis_Amount, Dis_Date)
  + Relationship set Distribution is constraint many to many so we split it to another table name (Pro_Distribution) in this table have primary key of two side table (Product Type ID, Distributor ID) and all attribute from relationship Distribution (Amount, Distribution_Date)

• Finally, we obtain the following relational schemas

- Employee (Employee ID, Phone Number, Employee Name, Address, Email, Title, DOB, Department_ID(FK), Workshop ID (FK))
- Department (Department ID, Department Name)
- Workshop (Workshop ID, Area, Manager ID)
- Machine (Machine ID, Machine Name, maintenance period, Import Date, Workshop ID(FK), Materials ID(FK), Product Type ID (FK))
- Materials (Materials ID, Materials Name, Price Of Each Piece, Quantity In Stock)
- Supply Record (Record ID, Supply_Time, Supply Date, Amount, Materials ID(FK), SCo_Name(FK))
- Supply Company (SCo Name, Sco Address, SCo Phone Number, SCo Email)
- Product type (Product Type ID, Product_Type_Name, Original Price, Manufacture_Date, Manufacture_amount, Workshop ID(Fk))
- Pro_Distribution (Distributor ID, Product Type ID, Dis_Amount, Dis_Date)
- Place Of Distribution (Distributor ID, Distributor Name, Distributor Address, Dis_PhoneNum)

2. Normalization

• Find all functional dependencies

- FD1: Employee ID → Phone Number, Employee Name, Address, Email, Title, DOB, Department_ID, Workshop ID
- FD2: Department ID → Department Name
- FD3: Workshop ID → Area, Manager ID
- FD4: Machine ID → Machine Name, maintenance period, Import Date, Workshop ID, Materials ID, Product Type ID
- FD5: Materials ID → Materials Name, Price Of Each Piece, Quantity In Stock
- FD6: Record ID → Supply_Time, Supply Date, Amount, Materials ID, SCo_Name
- FD7: SCo Name → Sco Address, SCo Phone Number, SCo Email
- FD8: Product Type ID → Product_Type_Name, Original Price, Manufacture_Date, Manufacture_amount, Workshop ID
- FD9: Distributor ID, Product Type ID → Dis_Amount, Dis_Date
- FD10: Distributor ID→ Distributor Name, Distributor Address, Dis_PhoneNum

• Check if the database is in 1NF, 2NF, 3NF

- Employee (Employee ID, Phone Number, Employee Name, Address, Email, Title, DOB, Department_ID(FK), Workshop ID (FK))
  + Because all fields from Employee table are single value. Table Employee is in 1NF
  + Consider with FD1: non-prime attribute is fully functionally dependent on the keys. Table Employee is in 2 NF
  + Consider with FD1: No non-prime attribute is transitively dependent on the keys. Table Employee is in 3 NF
- Department (Department ID, Department Name)
  + Because all fields from Department table are single value. Table Department is in 1NF
  + Consider with FD2: non-prime attribute is fully functionally dependent on the keys. Table Department is in 2 NF
  + Consider with FD2: No non-prime attribute is transitively dependent on the keys. Table Department is in 3 NF
- Workshop (Workshop ID, Area, Manager ID)
  + Because all fields from Workshop table are single value. Table Workshop is in 1NF
  + Consider with FD3: non-prime attribute is fully functionally dependent on the keys. Table Workshop is in 2 NF
  + Consider with FD3: No non-prime attribute is transitively dependent on the keys. Table Workshop is in 3 NF
- Machine (Machine ID, Machine Name, maintenance period, Import Date, Workshop ID(FK), Materials ID(FK), Product Type ID (FK))

+ Because all fields from Machine table are single value. Table Machine is in 1NF

+ Consider with FD4: non-prime attribute is fully functionally dependent on the keys. Table Machine is in 2 NF

+ Consider with FD4: No non-prime attribute is transitively dependent on the keys. Table Machine is in 3 NF

- Materials (Materials ID, Materials Name, Price Of Each Piece, Quantity In Stock)

+ Because all fields from Materials table are single value. Table Materials is in 1NF

+ Consider with FD5: non-prime attribute is fully functionally dependent on the keys. Table Materials is in 2 NF

+ Consider with FD5: No non-prime attribute is transitively dependent on the keys. Table Materials is in 3 NF

- Supply Record (Record ID, Supply_Time, Supply Date, Amount, Materials ID(FK), SCo_Name(FK))

+ Because all fields from Supply Record table are single value. Table Supply Record is in 1NF

+ Consider with FD6: non-prime attribute is fully functionally dependent on the keys. Table Supply Record is in 2 NF

+ Consider with FD6: No non-prime attribute is transitively dependent on the keys. Table Supply Record is in 3 NF

- Supply Company (SCo Name, Sco Address, SCo Phone Number, SCo Email)

+ Because all fields from Supply Company table are single value. Table Supply Company is in 1NF

+ Consider with FD7: non-prime attribute is fully functionally dependent on the keys. Table Supply Company is in 2 NF

+ Consider with FD7: No non-prime attribute is transitively dependent on the keys. Table Supply Company is in 3 NF

- Pro_Distribution (Distributor ID, Product Type ID, Dis_Amount, Dis_Date)

+ Because all fields from Pro_Distribution table are single value. Table Pro_Distribution is in 1NF

+ Consider with FD9: non-prime attribute is fully functionally dependent on the keys. Table Pro_Distribution is in 2 NF

+ Consider with FD9: No non-prime attribute is transitively dependent on the keys. Table Pro_Distribution is in 3 NF

- Product type (Product Type ID, Product_Type_Name, Original Price, Workshop ID, Manufacture_ Date, Manufacture_amount)

+ Because Manufacture_ Date field and Manufacture_amount field of Product type tables are multivalued. Table Product type isn't in 1 NF, so we split it become 2 (two) table:
  - Product type (Product Type ID, Product_Type_Name, Original Price, Workshop ID)
  - Manufacture_Record(Product Type ID, Manufacture_ Date, Manufacture_amount)

+ Consider with FD8: non-prime attribute is fully functionally dependent on the keys. Tables are in 2 NF

+ Consider with FD8: No non-prime attribute is transitively dependent on the keys. Tables are in 3 NF

- Place Of Distribution (Distributor ID, Distributor Name, Distributor Address, Dis_PhoneNum)

  + Because all fields from Place Of Distribution table are single value. Table Place Of Distribution is in 1NF

  + Consider with FD10: non-prime attribute is fully functionally dependent on the keys. Table Place Of Distribution is in 2 NF

  + Consider with FD10: No non-prime attribute is transitively dependent on the keys. Table Place Of Distribution is in 3 NF

3. Database diagram