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E-Commerce DBMS

Data and Applications

Project Phase – 1

1. Our System

In this modern era of online shopping no seller wants to be left behind, moreover due to its simplicity the shift from offline selling model to an online selling model is witnessing a rampant growth.This Project Phase presents our idea towards the E-Commerce DBMS.

Our mini-world, i.e. the **E-Commerce DBMS**, will facilitate :

Customers to enquire about the Products available on the basis of the Seller, Cost of item , Feedback on an item and also facilitate booking and cancellation of the orders, viewing delievery status , etc. Therefore, as an engineer our job is to ease the path of this transition for the seller. Amongst many things that an E-Commerce requires the most is a database system.

The database also helps the company to add and update the records of the employees working for the company (be it the Technician or the Security person or the Delivery Agent) . It also helps the company to keep the track of the Contracts and Stock details for the products to be sold .

2. Database Requirements

1. Eleven Entity Types
    a. Customer
    b. Employee
    c. Department
    d. Technician
    e. Security
    f. Product
    g. Supplier
    h. Order
    i. Tracking Detail
    j. Deliver Agent
    k. Feedback

* Entities with their Attributes and Data Type in Tabular Form

Entity Type	Attributes	Data Type	Domain
CUSTOMER	Customer_ID	INT	Any 7 Digit Number
	Name	VARCHAR	Atmax 30 letters
	First_Name	VARCHAR	Atmax 15 letters
	Last_Name	VARCHAR	Atmax 15 letters
	D.O.B	DATE	Any Valid Date
	Age(Derived from DOB)	INT	[8,150]
	Gender	VARCHAR	{Male,Female,Otheers}
	Email	VARCHAR	Any Valid Email
	Phone_Number	INT	Any 10 Digit Number
	Address	VARCHAR	Atmax 100 letters
	PIN	INT	Any 5 Digit Number
	State	VARCHAR	Any Valid State
	Country	VARCHAR	Any Valid Country
EMPLOYEE	Employee_ID	INT	Any 7 Digit Number
	Name	VARCHAR	Atmax 30 letters
	First_Name	VARCHAR	Atmax 15 letters
	Last_Name	VARCHAR	Atmax 15 letters
	D.O.B	DATE	Any Valid Date
	Age(Derived from DOB)	INT	[18,60]

	Gender	VARCHAR	{Male,Female,Others}
	Email	VARCHAR	Any Valid Email
	Phone_Number	INT	Any 10 Digit Number
	Address	VARCHAR	Atmax 100 letters
	PIN	INT	Any 5 Digit Number
	State	VARCHAR	Any Valid State
	Country	VARCHAR	Any Valid Country
	Salary	INT	Atmax 8 Digit Number
	Department_Name	VARCHAR	Atmax 100 letters
	Joining_Date	DATE	Any vaild Date
	Employment_Status	BOOLEAN	{0 (Inactive) ,1 (Active)}
	Supervisior	VARCHAR	Atmax 50 letters
DEPARTMENT	Department_Name	VARCHAR	Atmax 100 letters
	Number_Of_Employee	INT	Any 5 Digit Number
TECHNICIAN	Employee_ID	INT	Any 7 Digit Number
	Project_Name	VARCHAR	Atmax 100 letters
SECURITY	Employee_ID	INT	Any 7 Digit Number
	Years_Of_Experience	FLOAT	Atmax 2 Digit Number
	Security_Company	VARCHAR	Atmax 100 letters
PRODUCT	Product_Name	VARCHAR	Atmax 100 letters
	Product_ID	INT	Any 7 Digit Number
	Supplier_ID	INT	Any 7 Digit Number
	Price_Per_Item	FLOAT	(0,∞)
	Discount	FLOAT	[0,100]
	Final_Price	FLOAT	(0,∞)
	Current_Stock	INT	[0,∞)∩ INT
SUPPLIER	Supplier_ID	INT	Any 7 Digit Number
	Company_Name	VARCHAR	Atmax 100 letters
	Phone_Number	INT	Any 10 Digit Number
	Email	VARCHAR	Any valid Email
	Address	VARCHAR	Atmax 100 letters

	Contract_Date	DATE	Any Valid Date
ORDER	Order_ID	INT	Any 7 Digit Number
	Customer_ID	INT	Any 7 Digit Number
	Product_ID	INT	Any 7 Digit Number
	Ordered_Quantity	INT	Atmax 4 Digit Number
TRACKING DETAIL	ORDER_ID	INT	Any 7 Digit Number
	Shipped_From	VARCHAR	Atmax 100 letters
	Shipped_To	VARCHAR	Atmax 100 letters
	Estimated_Delivery (in Days)	INT	[0, 30] ∩ INT
	Agent_ID	INT	Any 7 Digit Number
DELIVERY AGENT	Agent_ID	INT	Any 7 Digit Number
	Agent_Name	VARCHAR	Atmax 30 letters
FEEDBACK	Customer_ID	INT	Any 7 Digit Number
	Product_ID	INT	Any 7 Digit Number
	Rating	FLOAT	[0,10]
	Comment	VARCHAR	Atmax 250 letters

* Here ∞ denotes maximum real world range the attribute could have

2. Three Entity Types with two-key attributes
    a. **Customer** has key attributes Customer_ID and Email
    b. **Employee** has key attributes Employee_ID and Email
    a. **Supplier** has key attributes Supplier_ID and Email

3. Two Weak-Entity Types
    a. **Feedback** is a weak entity whose **identifying entity** is **Customer**
    b. **Tracking Detail** is a weak entity whose **identifying entity** is **Order**

4. Five Relationship Types
    a. **SUPPLY** → Relationship between Customer, Delivery Agent, Order, and Supplier
    Cardinality Ratio → Customer : Delivery Agent : Order : Supplier :: 1 : 1 : N : 1

Participation Constraint → Customer (Partial), Delivery Agent (Partial), Order(Total), Supplier(Partial)

b. **SUPERVISION** → Recursive Relationship where an Employee can act as a Supervisor or Supervisee
   Cardinality Ratio → Supervisor : Supervisee :: 1 : N
   Participation Constraint → Supervisor (Partial), Supervisee (Partial)

c. **WORKS_FOR** → Relationship between Employee and Department
   Cardinality Ratio → Department : Employee :: 1 : N
   Participation Constraint → Department (Total), Employee (Total)

d. **MANAGES** → Relationship between Employee and Department
   Cardinality Ratio → Department : Employee :: 1 : 1
   Participation Constraint → Department (Total), Employee (Partial)

e. **REVIEW** → Relationship between Customer, Feedback
   Cardinality Ratio → Customer : Feedback :: 1 : N
   Participation Constraint → Customer (Partial), Feedback (Total)

5. One (n>3) 4 degree Realtionship

a. **SUPPLY** → Relationship between Customer, Delivery Agent, Order, and Supplier

6. Two Subclass

a. **Technician ⊂ Employee**
b. **Security ⊂ Employee**

7. i. Composite attributes:
   a. Address → State and Country
   b. Name → First_Name and Last_Name

   ii. Multi-valued attributes:
   a. Address
   b. Phone_Number
   c. Comment

   iii. Derived attributes:
   a. Age
   b. Order_Bill
   c. Final_Price

2.1 BONUS

1. SUPERVISION relationships between EMPLOYEE (in the role of supervisor) and EMPLOYEE (in the role of subordinate).

2. i) An Employee can manage atmost one department or no department .
   ii) A Customer can give minimum 0 reviews and maximum 1 review on a Product.

3. Functional Requirements

1. Retrieval

(a) Query functions for:

i. **Selection:** Retrieve purchase history of a CUSTOMER

ii. **Projection:** Display Product_Name of all the PRODUCTS whose Current_Stock is zero

iii. **Aggregate:** Average Rating given by a Customer

iv. **Search:** Search a PRODUCT (partial text match) by Product_Name

(b) Two analysis reports generated

i. Generating a status report of the PRODUCT and it's SUPPLIER which contains number of times that PRODUCT was purchased by CUSTOMERS.
This can be used to analyze which product is most trusted by CUSTOMERS.

ii. Generating a status report about the average number of days in which a PRODUCT was delivered to the respective CUSTOMER.
This will help users to know how quickly they can get a PRODUCT.

2. Modification

(a) Four Insert Operations (Following the constraints from the Domain column)

i. Hiring Technicians and Security and adding them to database.
ii. Registering a Customer and Employee.
iii. Giving a FEEDBACK on a product.
iv. Insert ORDER (The Ordered_Quantity must be less than Current_Stock of the PRODUCT Ordered)

(b) Four Update Operations

i. Updating Current_Stock of a product.
ii. Updating TRACKING DETAIL.
iii. Updating ORDER details.
iv. Updating Customer details and Employee details

(c) Two Delete Operations

i. Cancelling an order.
ii. Removing a SUPPLIER after cantract has expired.

3. Additional Functions required for Implementing DBMS.

(a) Final_Price_calculator : For calculating Final_Price of a product using Price_per_item and Discount.

(b) Order_Bill : Calculating total price of an order using Final_Price of the PRODUCT and Ordered_Quantity.

(c) Find_Age : Calculating Age of a CUSTOMER or EMPLOYEE using Current Date and Date_Of_Birth.

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THE END