Final Project
DATABASE DESIGN TERM PROJECT

Database Design Term Project

Student Name 1: Himanshu Patel **Student ID: C0735691**
Student Name 2: Shubham **Student ID: C0737342**
Student Name 3: Sujalkumar Patel **Student ID: C0735603**
Student Name4: Deepak Punia **Student ID: C0739472**

SUBMISSION:

- **Submit your project as pdf (without compression)**
- **PLEASE don't use winRaR.**

Note: This project must consist of your own work completed during this semester

Part I:

Requirements Analysis

Overview of Company and Product(s):

Provide a one page document entitles "Company Overview" that identifies:

a. Your name & student number
   - Himanshu Patel – C0735691
   - Shubham – C0737342
   - Sujalkumar Patel – C0735603
   - Deepak Punia - C0739472

b. Your company
   - Himansh Studios

c. Type of company (wholesaler or retailer)
   - Retailer

d. Short description of the company
   - Himansh Studios sells apple products to the consumers.
   - It has more than 4 branches all over Toronto.

e. Product

   - iPad
   - iPad Pro
   - iPad Mini
   - Apple Tv
   - iPod
   - iTunes Cards
   - iPhone

- MacBook
- iMac

i. Identify at least 6 characteristics (attributes), such as id or code, type, description, size, color, price, and so on
   - Branch_Id
   - Product_Id
   - Customer_Id
   - SALES_PERSON_Id
   - Invoice_Id

Final Project
DATABASE DESIGN TERM PROJECT

Customer Sales Invoice:

Modify the sample Customer Sales Invoice so that it reflects your company and the company's product. Although the company (and website) can advertise several products.

Customer Sales Invoice

Exclusive Electronics Store

Toronto, ONTARIO

Customer ID:C0735691
Customer FIRST Name: Himanshu
Customer LAST Name: Patel
Customer e-mail:micky.patel41@gmail.com
Customer Address: 121, Corinthian Blvd, Scarborough, ON, M1W1B7
Customer Phone Number:6472783248
Order ID: 178
Salesperson Name: Sujal
SalesPerson ID: 78
Sales Order Date: July23,2018

Product ID	Product Name	Description	Color	Quantity	Unit Price	Extended Price
1	iphone X	CPU Speed: 2.39 GHz	White	1	$224.59	$291
2	iPhone 7 Plus	CPU Speed: 2.34 GHz	Black	2	$238.93	$300.12
3	iPhone SE	CPU Speed: 1.85 GHz	Black	3	$299	$323.23
4	iPhone 8	CPU Speed: 2.39 GHz	White	4	$299	$323.23
					Invoice Total	$1237.58

Final Project
DATABASE DESIGN TERM PROJECT

Part 2:

Conceptual Design

1. Create an ER diagram based on the customer invoice. Only include the entities identified in the entity & attribute identification:
    a. Entities
        - BRANCH
        - PRODUCT
        - CUSTOMER
        - ORDER
        - EMPLOYEE
        - INVOICE

    b. Attributes

BRANCH
- Branch_Id
- Branch_Address
- Branch_Postalcode

PRODUCT
- Product_Id
- Product_Name
- Description
- Colour
- Unit_price

CUSTOMER
- Customer_Id
- Customer_First_name
- Customer_Last_name
- Customer_Email
- Customer_Address
- Customer_Postalcode
- Customer_Phone

Employee
- Employee_Id
- Employee_First_Name
- Employee_Last_Name
- Employee_Phone
- Employee_Address
- Employee_Postalcode
- Employee_email

INVOICE
- Invoice_Id
- Order_Id (fk)
- Invoice_Date

Final Project
DATABASE DESIGN TERM PROJECT

ORDER

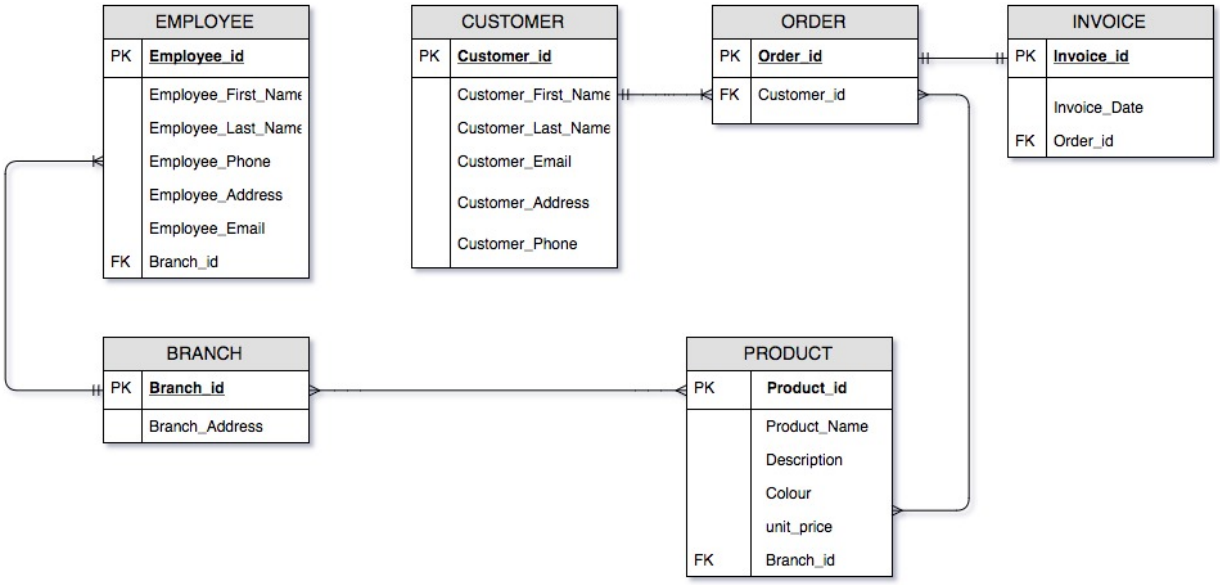
- Order_Id
- Customer_Id(fk)
- Order_date
- Quantity

c. Unique Identifiers
   - Branch_Id
   - Product_Id
   - Customer_Id
   - Employee_Id
   - Order_Id
   - Invoice_Id

d. Named Relationships

e. Optionality and Cardinality

f. Foreign Keys



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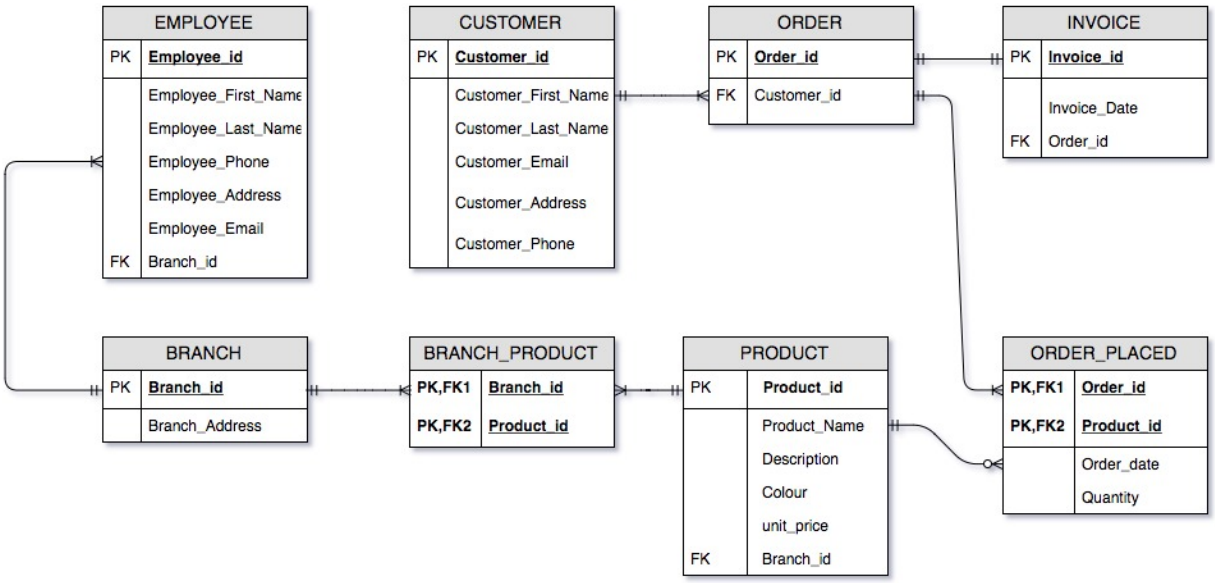
2. Create a second ER diagram that resolves many-to-many relationships



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Part 3:

Logical Model

Normalization & Relational Schema:

1. Create a document called "Database Normalization"
    a. Normalize your database to 3NF
    b. Modify the ER diagram if necessary
2. Include a relational schema for each entity

BRANCH (**Branch_Id**, *Branch_Address, Branch_Postalcode*)

Branch_Id	Branch_ Address	*Branch_Postalcode*
35	123 New Way Drive, Etobicoke, Ontario	M1G2V3
36	456 Park Wood Post, North york, Ontario	M2H3R4
37	789 Green Park, Toronto, Ontario	M3I4S5
38	741 Blackberry Street, Scarborough, Ontario	M4J5T6

Final Project

DATABASE DESIGN TERM PROJECT

CUSTOMER (**Customer_Id**, Customer_First_Name,Customer_Last_Name,Customer_Email, *Customer_Address, Customer_Postalcode, Customer_Phone*)

Customer_Id	Customer_ First_Name	Customer_Last_Name	Customer_Email	Customer_Address	*Customer_Postalcode*	*Customer_Phone*
735691	Himanshu	Patel	micky.patel41@gmail.com	123 New Way Drive, Etobicoke, Ontario	M1W1B7	+1 647-278-3248
737342	Shubham	NA	shubham.mourya301@gmail.com	456 Park Wood Post, North york, Ontario	M1W1B7	+1 647-777-6666
735603	Sujal	Patel	sujal.patel007@gmail.com	789 Green Park, Toronto, Ontario	M1K1J1	+1 241-777-5555
739472	Deepak	Punia	deepak.punia@gmail.com	741 Blackberry Street, Scarborough, Ontario	M1K1J1	+1 741-777-4444

Final Project

DATABASE DESIGN TERM PROJECT

Employee(**Employee_id,**Employee_First_Name,Employee_Last_Name,Employee_Phone ,Employee_Address, Employee_Postalcode, Employee_email)

Employee_id	Employee_First_Name	Employee_Last_Name	Employee_Phone	Employee_Address	*Employee_Postal code*	Employee_email
4510	Himanshu	Patel	+1 647-278-3248	123 New Way Drive, Etobicoke, Ontario	M1W1B7	micky.patel41@gmail.com
7890	Shubham	NA	+1 647-777-6666	456 Park Wood Post, North york, Ontario	M1W1B7	shubham.mourya301@gmail.com
9630	Sujal	Patel	+1 241-777-5555	789 Green Park, Toronto, Ontario	M1K1J1	sujal.patel007@gmail.com
7413	Deepak	Punia	+1 741-777-4444	741 Blackberry Street, Scarborough, Ontario	M1K1J1	deepak.punia@gmail.com

PRODUCT (**Product_Id**, Product_name, Description, Color, Unit_Price)

Product Id	Product_Name	Description	Color	Unite_price
098521	iPhone X	Phone	White	200
075315	MacBook	Laptop	Black	300
074136	iPad Pro	iPad	Black	400
098112	iPhone 8	Phone	White	500

Final Project
DATABASE DESIGN TERM PROJECT

INVOICE (*Invoice_Id,Branch_Id,Customer_Id, Order_Id,*Quantity, Unit_Price,Invoice_Date)

Invoice_Id	*Order_Id*	Invoice_Date
I_1745	O098521	28/11/2017
I_8541	O045123	28/11/2017
I_9845	O089463	28/11/2017
I_1651	O465436	28/11/2017

ORDER (*Order_Id, Customer_Id, Product_Id*)

Order_Id	*Customer_Id*	Product Id
O098521	C_895351	P098521
O045123	C_951354	P075315
O089463	C_165131	P074136
O465436	C_165132	P098112

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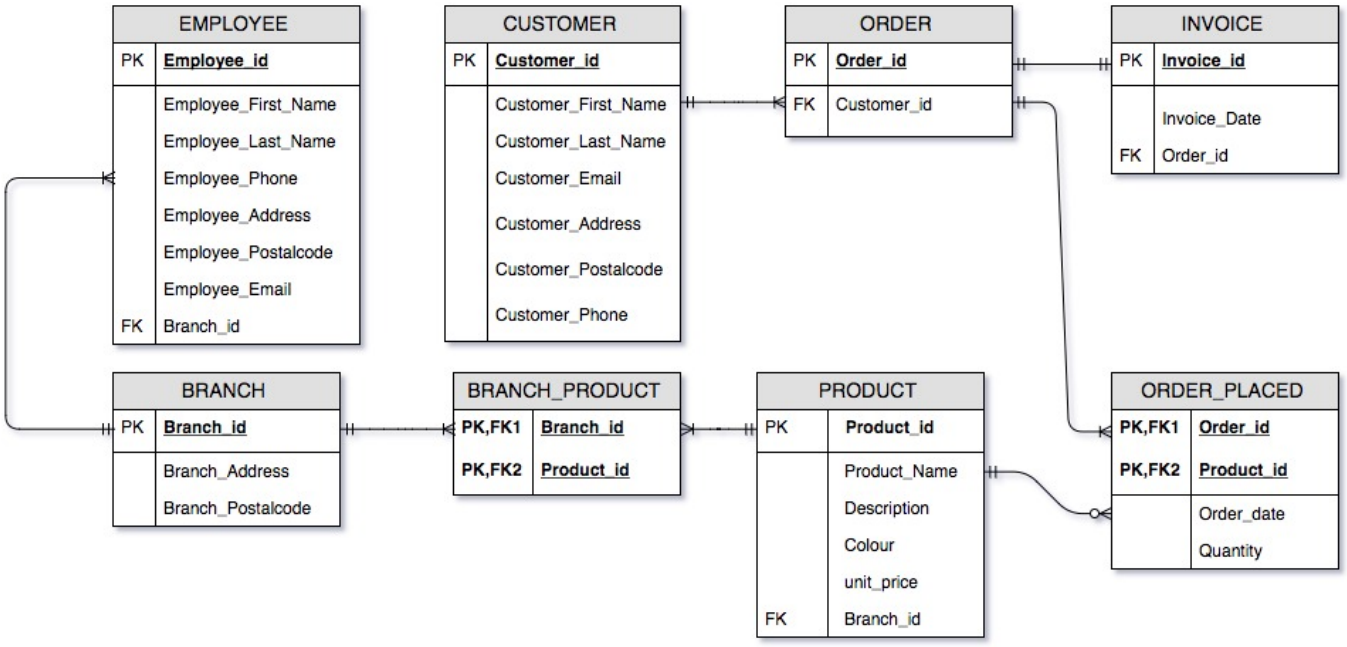
DATABASE DESIGN TERM PROJECT

ER-Diagram based on Normalized data



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Part 4:

Physical Model

Physical Table Representation:

1. Convert the logical model to a physical model using a table format (not implementation)
    a. Create a table for each physical database table

    Include key type, optionality, column name, data type, length

Physical Table Representation

BRANCH					
Column name	**Data Type**	**Length**	**Key Type**	**Optionality**	**Column Description**
Branch_id	Integer	20	PK	Not null	Branch Details
Branch_Address	Varchar	50		Not null	Address of branch
Branch_Postalcode	Varchar	06		Not null	Postal Code of Branch

CUSTOMER				
Column name	**Data Type**	**Length**	**Key Type**	**Optionality**
Customer_Id	integer	15	PK	Not null
Customer_First_name	char	20		Not null
Customer_Last_name	char	20		Not null
Customer_Email	Char	50		
Customer_Address	char	50		Not null
Customer_Postalcode	Char	06		Not null
Customer_phone	integer	12		Not null

Employee				
Column name	**Data Type**	**Length**	**Key Type**	**Optionality**
Employee_Id	integer	15	PK	Not null
Employee_First_name	char	20		Not null
Employee_Last_name	char	20		Not null
Employee_phone	integer	12		Not null
Employee_Address	char	50		Not null

Employee_Postalcode	char	06		Not null
Employee_Email	varchar	10		Not null
Branch_id	integer	20	FK	Not null

PRODUCT				
Column name	**Data Type**	**Length**	**Key Type**	**Optionality**
Product_Id	integer	15	PK	Not null
Product_name	varchar	20		Not null
Description	char	20		Not null
Color	char	10		Not null
Unit_price	integer	10		Not null
Branch_id	integer	20	FK	Not null

BRANCH_PRODUCT				
Column name	**Data Type**	**Length**	**Key Type**	**Optionality**
Branch_id	integer	20	PK	Not null
Product_Id	integer	15	PK	Not null

INVOICE				
Column name	**Data Type**	**Length**	**Key Type**	**Optionality**
Invoice_Id	integer	15	PK	Not null
Invoice_Date	date	15		Not null
Order_Id	integer	15	Fk	Not null

ORDER				
Column name	**Data Type**	**Length**	**Key Type**	**Optionality**
Order_Id	integer	15	Pk	Not null
Customer_Id	integer	15	Fk	Not null

ORDER_PLACED				
Column name	**Data Type**	**Length**	**Key Type**	**Optionality**
Order_Id	integer	15	Pk	Not null
Product_Id	integer	15	Pk	Not null
Order_date	Date	15		Not null
Quantity	Integer	15		Not null

Final Project
DATABASE DESIGN TERM PROJECT

Part 5:

Implementation of Physical Model

Create Database Tables:

1. Construct CREATE statements for each table
2. Include IDENTITY and SEQUENCE columns (optional)
3. Construct INSERT statements and populate each table with at least 10 rows

Identify Business Rules/Database Constraints:

1. Create a document called "Business Rules/Database Constraints"

a. List the physical database rules/constraints for:

- ✓ NOT NULL
- ✓ DEFAULT
- ✓ Primary keys
- ✓ Unique keys
- ✓ Foreign keys
- ✓ Check constraints

- **NOT NULL** - Ensures that a column cannot have a NULL value
- **DEFAULT** - Sets a default value for a column when no value is specified
- **PRIMARY KEY** - A combination of a NOT NULL and UNIQUE. Uniquely identifies each row in a table
- **UNIQUE** - Ensures that all values in a column are different
- **FOREIGN KEY** - Uniquely identifies a row/record in another table
- **CHECK** - Ensures that all values in a column satisfies a specific condition

b. List at least 3 business rules that must be programmed

- Each customer should have a unique Email Id to register
- Each Product should have specific description
- Each Sales Order should have date
- Each Customer should have name
- Only one branch should belong to specific location
- Multiple Customers can have same zip code

2. Implement the constraints into the database creation statements

- Email_ Id is Unique constraint for every customer
- Zip code which is primary key of branch_zip is foreign key for branch
- Zip code which is primary key of Customer_zip is foreign key for customer

Create Database tables and Insert Statements

Create Branch table:

CREATE TABLE BRANCH (Branch_Id int primary key, Branch_Address varchar(50) not null, Branch_Postalcode varchar(6) not null);

Insert statement for Branch table:

INSERT INTO branch values(35, '123 New Way Drive, Etobicoke, Ontario','M1G2V3');
INSERT INTO branch values(36, '456 Park Wood Post, North york, Ontario','M2H3R4');
INSERT INTO branch values(37, '789 Green Park, Toronto, Ontario','M3I4S5');
INSERT INTO branch values(38, '741 Blackberry Street, Scarborough, Ontario','M4J5T6');

INSERT INTO branch values(39, '123 New Way Drive, Etobicoke, Ontario','M1G2V3');
INSERT INTO branch values(40, '456 Park Wood Post, North york, Ontario','M2H3R4');
INSERT INTO branch values(41, '789 Green Park, Toronto, Ontario','M3I4S5');
INSERT INTO branch values(42, '741 Blackberry Street, Scarborough, Ontario','M4J5T6');

INSERT INTO branch values(39, '123 New Way Drive, Etobicoke, Ontario','M1G2V3');
INSERT INTO branch values(40, '456 Park Wood Post, North york, Ontario','M2H3R4');

Create table Customer:

CREATE TABLE CUSTOMER (customer_id int primary key, customer_first_name varchar(50) not null, customer_last_name varchar(50) not null, customer_email varchar(50) not null, customer_Address varchar(50) not null, customer_Postalcode varchar(6) not null, customer_phone_no int not null);

Insert statements for Customer table:

INSERT INTO customer('0735691', 'Himanshu', 'Patel', 'micky.patel41@gmail.com', '123 New Way Drive, Etobicoke, Ontario' ,'M1W1B7', '6472783248');

INSERT INTO customer('0735603', 'Sujalkumarl', 'Patel', 'sujal.patel007@gmail.com', '456 Park Wood Post, North york, Ontario', 'M1J1K1', '6477776666');

INSERT INTO customer('0737342', 'Shubham', 'NA', 'shubham.mourya301@gmail.com', '789 Green Park, Toronto, Ontario', 'M1W1B7', '2417775555');

INSERT INTO customer('0739472', 'Deepak', 'Punia', 'deepak.punia@gmail.com', '741 Blackberry Street, Scarborough, Ontario', 'M1K1J1', '7417774444');

INSERT INTO customer('0735691', 'Himanshu', 'Patel', 'micky.patel41@gmail.com', '123 New Way Drive, Etobicoke, Ontario' ,'M1W1B7', '6472783248');

INSERT INTO customer('0735603', 'Sujalkumarl', 'Patel', 'sujal.patel007@gmail.com', '456 Park Wood Post, North york, Ontario', 'M1J1K1', '6477776666');

INSERT INTO customer('0737342', 'Shubham', 'NA', 'shubham.mourya301@gmail.com', '789 Green Park, Toronto, Ontario', 'M1W1B7', '2417775555');

INSERT INTO customer('0739472', 'Deepak', 'Punia', 'deepak.punia@gmail.com', '741 Blackberry Street, Scarborough, Ontario', 'M1K1J1', '7417774444');

INSERT INTO customer('0735691', 'Himanshu', 'Patel', 'micky.patel41@gmail.com', '123 New Way Drive, Etobicoke, Ontario' ,'M1W1B7', '6472783248');

INSERT INTO customer('0735603', 'Sujalkumarl', 'Patel', 'sujal.patel007@gmail.com', '456 Park Wood Post, North york, Ontario', 'M1J1K1', '6477776666');

Create Invoice table:

CREATE TABLE INVOICE(invoice_id int primary key ,order_id int UNIQUE not null ,invoice_date date not null, order_id int FOREIGN KEY REFERENCES order(order_id)););

Insert statements for Invoice table:

INSERT INTO Invoice(1745, 7815, '28/06/2018');
INSERT INTO Invoice(8541, 8652, '29/06/2018');
INSERT INTO Invoice(9845, 6181, '30/06/2018');
INSERT INTO Invoice(1651, 1561, '1/07/2018');
INSERT INTO Invoice(1745, 7815, '28/06/2018');
INSERT INTO Invoice(8541, 8652, '29/06/2018');
INSERT INTO Invoice(9845, 6181, '30/06/2018');
INSERT INTO Invoice(1651, 1561, '1/07/2018');
INSERT INTO Invoice(1745, 7815, '28/06/2018');
INSERT INTO Invoice(8541, 8652, '29/06/2018');

Create Order table:

CREATE TABLE ORDER(order_id int primary key , customert_id int FOREIGN KEY REFERENCES customer(customer_id)););

Insert statements for Invoice table:

INSERT INTO order(1745, B_7815, 895351);
INSERT INTO order(8541, B_8652, 951354);
INSERT INTO order(9845, B_6181, 165131);
INSERT INTO order(1651, B_1561, 165132);
INSERT INTO order(1745, B_7815, 895351);

INSERT INTO order(8541, B_8652, 951354);
INSERT INTO order(9845, B_6181, 165131);
INSERT INTO order(1651, B_1561, 165132);
NSERT INTO order(1745, B_7815, 895351);
INSERT INTO order(8541, B_8652, 951354);

Create Order_Placed table:

CREATE TABLE ORDER_Placed(order_id int Not null , product_id int not null, order_date date not null, quantity int not null, primary_key(order_id, product_id), order_id
int FOREIGN KEY REFERENCES order(order_id), product_id
int FOREIGN KEY REFERENCES product(product_id));

Insert statements for Invoice table:

INSERT INTO order_placed(1745, 111, 23/7/18, 2);
INSERT INTO order_placed(1746, 112, 24/7/18, 3);
INSERT INTO order_placed(1747, 113, 25/7/18, 4);
INSERT INTO order_placed(1748, 114, 26/7/18, 5);
INSERT INTO order_placed(1745, 111, 23/7/18, 6);
INSERT INTO order_placed(1746, 112, 24/7/18, 7);
INSERT INTO order_placed(1747, 113, 25/7/18, 8);
INSERT INTO order_placed(1748, 114, 26/7/18, 9);
INSERT INTO order_placed(1745, 111, 23/7/18, 3);
INSERT INTO order_placed(1746, 112, 24/7/18, 4);

Create table Product:

CREATE TABLE PRODUCT(product_id int primary key, product_name varchar(20) not null , description varchar(50) not null, color varchar(15) not null, unite_price integer(15) not null, branch_id int FOREIGN KEY REFERENCES Branch(branch_id)););

Insert statements for product table:

INSERT INTO product values(111, ‘iphone6’, ’phone’, ‘white’, 200);
INSERT INTO product values(112, ‘iphone7’, ’phone’, ‘white’, 300);
INSERT INTO product values(113, ‘iphone8’, ’phone’, ‘white’, 400);
INSERT INTO product values(114, ‘iphonex’, ’iphone’, ‘white’, 500);
INSERT INTO product values(111, ‘iphone6’, ’phone’, ‘white’, 200);
INSERT INTO product values(112, ‘iphone7’, ’phone’, ‘white’, 300);
INSERT INTO product values(113, ‘iphone8’, ’phone’, ‘white’, 400);
INSERT INTO product values(114, ‘iphonex’, ’iphone’, ‘white’, 500);
INSERT INTO product values(111, ‘iphone6’, ’phone’, ‘white’, 200);
INSERT INTO product values(112, ‘iphone7’, ’phone’, ‘white’, 300);

Final Project
DATABASE DESIGN TERM PROJECT

Create table Employee:

CREATE TABLE EMPLOYEE (employee_id int primary key, employee_first_name varchar(50) not null, employee_last_name varchar(50) not null, 'employee_phone_no int not null', customer_Address varchar(50) not null, customer_Postalcode varchar(6) not null, employee_email varchar(50) not null, branch_id
int FOREIGN KEY REFERENCES branch(branch_id)););

Insert statements for Employee table:

INSERT INTO employee(735691, 'Himanshu', 'Patel', '6472783248', '123 New Way Drive, Etobicoke, Ontario' , 'M1W1B7', 'micky.patel41@gmail.com');

INSERT INTO employee(73735603, 'Sujalkumar', 'Patel', '6477776666', '456 Park Wood Post, North york, Ontario', 'M1J1K1', 'sujal.patel007@gmail.com');

INSERT INTO employee(C0737342, 'Shubham', 'NA', '2417775555', '789 Green Park, Toronto, Ontario', 'M1W1B7', 'shubham.mourya301@gmail.com');

INSERT INTO employee(C0739472, 'Deepak', 'Punia','7417774444', '741 Blackberry Street, Scarborough, Ontario', 'deepak.punia@gmail.com');

INSERT INTO employee(735691, 'Himanshu', 'Patel', '6472783248', '123 New Way Drive, Etobicoke, Ontario' , 'M1W1B7', 'micky.patel41@gmail.com');

INSERT INTO employee(73735603, 'Sujalkumar', 'Patel', '6477776666', '456 Park Wood Post, North york, Ontario', 'M1J1K1', 'sujal.patel007@gmail.com');

INSERT INTO employee(C0737342, 'Shubham', 'NA', '2417775555', '789 Green Park, Toronto, Ontario', 'M1W1B7', 'shubham.mourya301@gmail.com');

INSERT INTO employee(C0739472, 'Deepak', 'Punia','7417774444', '741 Blackberry Street, Scarborough, Ontario', 'deepak.punia@gmail.com');

INSERT INTO employee(735691, 'Himanshu', 'Patel', '6472783248', '123 New Way Drive, Etobicoke, Ontario' , 'M1W1B7', 'micky.patel41@gmail.com');

INSERT INTO employee(73735603, 'Sujalkumar', 'Patel', '6477776666', '456 Park Wood Post, North york, Ontario', 'M1J1K1', 'sujal.patel007@gmail.com');

Constraint Testing:

- INSERT INTO employee(C0735691, ‘Himanshu’, ‘Patel’, ‘micky.patel41@gmail.com’, ‘M1S2P5’,64715826954);

```
Violation of PRIMARY KEY constraint. Cannot insert duplicate key
in object 'dbo.employee'. The duplicate key value is (C0735691).
```

- INSERT INTO customer_zip values(‘F5D563’, ’234 Brimortan drive’, ‘45’, ‘Ontario’);

```
Error converting data type numeric to varchar.
```

- INSERT INTO Invoice(I_1698, B_2935, C_789635, P036362, 1, ‘hello, ‘28/11/2017’);

```
Error converting data type varchar to numeric.
```

- INSERT INTO customer(‘C0735691’, ‘Himanshu’, ‘Patel’, ‘micky.patel41@gmail.com’, ‘M1W1B7’);

```
Violation of PRIMARY KEY constraint. Cannot insert duplicate key
in object 'dbo.customers'. The duplicate key value is (C0735691).
```

- INSERT INTO product values(111, ‘iphone6’, ‘white’,’iphone’);

```
Violation of PRIMARY KEY constraint. Cannot insert duplicate key
in object 'dbo.vproduct'. The duplicate key value is (111).
```

SUBMISSION:

Submit your project as pdf (without compression)
PLEASE don’t use winRaR.