

《数据库系统原理》实验报告 ()					
题目：实验一					
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实验环境： docker oceanbase					
实验步骤及结果截图：					
<p>一、建立相关数据表</p> <p>1.Customer 表</p> <pre>obclient(root@sys)[oceanbase]> CREATE TABLE Customers (-> CustomerID INT AUTO_INCREMENT NOT NULL, -> Name VARCHAR(50) NOT NULL, -> Email VARCHAR(100) NOT NULL UNIQUE, -> Phone VARCHAR(20), -> RegistrationDate DATETIME NOT NULL, -> CONSTRAINT chk_Email CHECK (Email LIKE '%_@___.__%'), -> PRIMARY KEY (CustomerID) ->);</pre> <p>2、Products 表</p> <pre>obclient(root@sys)[oceanbase]> CREATE TABLE Products (-> ProductID INT AUTO_INCREMENT NOT NULL, -> ProductName VARCHAR(100) NOT NULL, -> Price DECIMAL(10,2) NOT NULL , -> StockQuantity INT NOT NULL , -> CategoryID INT NOT NULL , -> CONSTRAINT chk_Price CHECK (Price > 0), -> CONSTRAINT chk_StockQuantity CHECK (StockQuantity > 0), -> PRIMARY KEY (ProductID), -> FOREIGN KEY (CategoryID) REFERENCES Categories(CategoryID) ->);</pre> <p>Query OK, 0 rows affected (0.084 sec)</p> <p>3、建立 Categories 表</p> <pre>obclient(root@sys)[oceanbase]> CREATE TABLE Categories -> (-> CategoryID INT AUTO_INCREMENT NOT NULL, -> CategoryName VARCHAR(50) NOT NULL UNIQUE, -> PRIMARY KEY (CategoryID) ->); Query OK, 0 rows affected (0.115 sec)</pre> <p>4、建立 Orders 表</p> <pre>obclient(root@sys)[oceanbase]> CREATE TABLE Orders (-> OrderID INT AUTO_INCREMENT NOT NULL, -> CustomerID INT NOT NULL, -> OrderDate DATETIME NOT NULL , -> TotalAmount DECIMAL(10,2) NOT NULL , -> CONSTRAINT chk_TotalAmount CHECK (TotalAmount > 0), -> PRIMARY KEY (OrderID), -> FOREIGN KEY (CustomerID) REFERENCES Customers(CustomerID) ->); Query OK, 0 rows affected (0.068 sec)</pre>					

5、建立 OrderItems 表

```
obclient(root@sys)[oceanbase]> CREATE TABLE OrderItems(
->     OrderItemID INT AUTO_INCREMENT NOT NULL,
->     OrderID INT NOT NULL,
->     ProductID INT NOT NULL,
->     Quantity INT NOT NULL ,
->     Subtotal DECIMAL(10,2) NOT NULL ,
->     CONSTRAINT chk_Quantity CHECK (Quantity > 0),
->     PRIMARY KEY (OrderItemID),
->     FOREIGN KEY (OrderID) REFERENCES Orders(OrderID),
->     FOREIGN KEY (ProductID) REFERENCES Products(ProductID)
-> );
Query OK. 0 rows affected (0.087 sec)
```

6、建立触发器，令 subtotal = prices * Quantity

```
obclient(root@sys)[oceanbase]> CREATE TRIGGER CalculateSubtotalBeforeInsert
-> BEFORE INSERT ON OrderItems
-> FOR EACH ROW
-> SET NEW.Subtotal = (SELECT Price FROM Products WHERE ProductID = NEW.ProductID) * NEW.Quantity;
Query OK, 0 rows affected (0.103 sec)

obclient(root@sys)[oceanbase]> CREATE TRIGGER CalculateSubtotalBeforeUpdate
-> BEFORE UPDATE ON OrderItems
-> FOR EACH ROW
-> SET NEW.Subtotal =
->     (SELECT Price FROM Products WHERE ProductID = NEW.ProductID
-> ) * NEW.Quantity;
Query OK, 0 rows affected (0.066 sec)
```

二、进行查询

```
obclient(root@sys)[oceanbase]> DESC Customers;
```

Field	Type	Null	Key	Default	Extra
CustomerID	int(11)	NO	PRI	NULL	auto_increment
Name	varchar(50)	NO		NULL	
Email	varchar(100)	NO	UNI	NULL	
Phone	varchar(20)	YES		NULL	
RegistrationDate	datetime	NO		NULL	

5 rows in set (0.013 sec)

```
obclient(root@sys)[oceanbase]> DESC Products;
```

Field	Type	Null	Key	Default	Extra
ProductID	int(11)	NO	PRI	NULL	auto_increment
ProductName	varchar(100)	NO		NULL	
Price	decimal(10,2)	NO		NULL	
StockQuantity	int(11)	NO		NULL	
CategoryID	int(11)	NO		NULL	

5 rows in set (0.004 sec)

```
obclient(root@sys)[oceanbase]> DESC Categories;
+-----+-----+-----+-----+-----+
| Field      | Type       | Null | Key  | Default | Extra        |
+-----+-----+-----+-----+-----+
| CategoryID | int(11)    | NO   | PRI   | NULL    | auto_increment |
| CategoryName| varchar(50) | NO   | UNI   | NULL    |               |
+-----+-----+-----+-----+-----+
2 rows in set (0.006 sec)

obclient(root@sys)[oceanbase]> DESC Orders;
+-----+-----+-----+-----+-----+
| Field      | Type       | Null | Key  | Default | Extra        |
+-----+-----+-----+-----+-----+
| OrderID     | int(11)    | NO   | PRI   | NULL    | auto_increment |
| CustomerID  | int(11)    | NO   |       | NULL    |               |
| OrderDate    | datetime   | NO   |       | NULL    |               |
| TotalAmount  | decimal(10,2)| NO   |       | NULL    |               |
+-----+-----+-----+-----+-----+
4 rows in set (0.003 sec)

obclient(root@sys)[oceanbase]> DESC OrderItems;
+-----+-----+-----+-----+-----+
| Field      | Type       | Null | Key  | Default | Extra        |
+-----+-----+-----+-----+-----+
| OrderItemID | int(11)    | NO   | PRI   | NULL    | auto_increment |
| OrderID     | int(11)    | NO   |       | NULL    |               |
| ProductID   | int(11)    | NO   |       | NULL    |               |
| Quantity     | int(11)    | NO   |       | NULL    |               |
| Subtotal     | decimal(10,2)| NO   |       | NULL    |               |
+-----+-----+-----+-----+-----+
5 rows in set (0.002 sec)
```

三、使用以下语句查询建立的约束

```
obclient(root@sys)[mydb]> SELECT table_name, constraint_name, constraint_type
-> FROM information_schema.TABLE_CONSTRAINTS
-> WHERE table_name IN ('Customers', 'Products', 'Categories', 'Orders', 'OrderItems');
+-----+-----+-----+
| table_name | constraint_name | constraint_type |
+-----+-----+-----+
| Categories | PRIMARY      | PRIMARY KEY   |
| Customers  | PRIMARY      | PRIMARY KEY   |
| OrderItems | PRIMARY      | PRIMARY KEY   |
| Orders     | PRIMARY      | PRIMARY KEY   |
| Products   | PRIMARY      | PRIMARY KEY   |
| Customers  | Email        | UNIQUE        |
| Categories | CategoryName | UNIQUE        |
| Customers  | chk_Email    | CHECK          |
| Products   | chk_Price    | CHECK          |
| Products   | chk_StockQuantity | CHECK          |
| Orders     | chk_TotalAmount | CHECK          |
| OrderItems | chk_Quantity  | CHECK          |
| OrderItems | OrderItems_OBFK_1744126047291444 | FOREIGN KEY   |
| OrderItems | OrderItems_OBFK_1744126047280381 | FOREIGN KEY   |
| Orders     | Orders_OBFK_1744126041619039 | FOREIGN KEY   |
| Products   | Products_OBFK_1744126036012166 | FOREIGN KEY   |
+-----+-----+-----+
16 rows in set (0.113 sec)
```

四、表结构修改与操作

- 1、在 **Customers** 表中添加一个新字段 **EditDate**, 类型为 **DATETIME**, 当客户每次登录时, 该字段更新为某个值(可自行设置, 某个固定值即可)。需创建触发器实现此功能。

```
obclient(root@sys)[mydb]> ALTER TABLE Customers ADD EditDate DATETIME;
Query OK, 0 rows affected (0.161 sec)
```

```
obclient(root@sys)[mydb]> DESC Customers
-> ;
+-----+-----+-----+-----+-----+
| Field      | Type       | Null | Key | Default | Extra      |
+-----+-----+-----+-----+-----+
| CustomerID | int(11)    | NO  | PRI | NULL    | auto_increment |
| Name        | varchar(50) | NO  |     | NULL    |             |
| Email       | varchar(100) | NO  | UNI | NULL    |             |
| Phone       | varchar(20)  | YES |     | NULL    |             |
| RegistrationDate | datetime | NO  |     | NULL    |             |
| EditDate    | datetime    | YES |     | NULL    |             |
+-----+-----+-----+-----+-----+
6 rows in set (0.010 sec)
```

```
obclient(root@sys)[mydb]> CREATE TRIGGER UpdateEditDateBeforeUpdate
-> BEFORE UPDATE ON Customers
-> FOR EACH ROW
-> SET NEW.EditDate = CURRENT_TIMESTAMP;
Query OK, 0 rows affected (0.097 sec)
```

- 2、将 **Customers** 中的 **name** 由 **varchar** 改为 **char(15)**。

```
obclient(root@sys)[mydb]> ALTER TABLE Customers MODIFY Name char(15);
Query OK, 0 rows affected (1.039 sec)
```

```
obclient(root@sys)[mydb]> desc Customers
-> ;
+-----+-----+-----+-----+-----+
| Field | Type | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+
| CustomerID | int(11) | NO | PRI | NULL | auto_increment |
| Name | char(15) | YES | | NULL | |
| Email | varchar(100) | NO | UNI | NULL | |
| Phone | varchar(20) | YES | | NULL | |
| RegistrationDate | datetime | NO | | NULL | |
| EditDate | datetime | YES | | NULL | |
+-----+-----+-----+-----+-----+
6 rows in set (0.017 sec)
```

3、修改 Products 表，添加一个 IsFeatured 字段，类型为 BOOLEAN，默认值为 FALSE。同时，创建一个索引，用于快速查询特色商品（IsFeatured 为 TRUE 的商品）

```
obclient(root@sys)[mydb]> ALTER TABLE Products ADD IsFeatured BOOLEAN DEFAULT FALSE;
Query OK, 0 rows affected (0.053 sec)
```

```
obclient(root@sys)[mydb]> desc Products
-> ;
+-----+-----+-----+-----+-----+
| Field | Type | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+
| ProductID | int(11) | NO | PRI | NULL | auto_increment |
| ProductName | varchar(100) | NO | | NULL | |
| Price | decimal(10,2) | NO | | NULL | |
| StockQuantity | int(11) | NO | | NULL | |
| CategoryID | int(11) | NO | | NULL | |
| IsFeatured | tinyint(1) | YES | | 0 | |
+-----+-----+-----+-----+-----+
6 rows in set (0.004 sec)
```

```
obclient(root@sys)[mydb]> CREATE INDEX idx_IsFeatured ON Products (IsFeatured);
Query OK, 0 rows affected (0.287 sec)
```

```
obclient(root@sys)[mydb]> SHOW INDEX FROM Products;
+-----+-----+-----+-----+-----+
| Table | Non_unique | Key_name | Seq_in_index | Column_name | Collation | Cardinality | Sub_part |
+-----+-----+-----+-----+-----+
| Products | 0 | PRIMARY | 1 | ProductID | A | NULL | NULL |
| Products | 1 | idx_IsFeatured | 1 | IsFeatured | A | NULL | NULL |
+-----+-----+-----+-----+-----+
2 rows in set (0.032 sec)
```

出现的问题：

1. Products 表不能建立提示不存在表

```
obclient(root@sys)[oceanbase]> CREATE TABLE Products (
->     ProductID INT AUTO_INCREMENT NOT NULL,
->     ProductName VARCHAR(100) NOT NULL,
->     Price DECIMAL(10,2) NOT NULL ,
->     StockQuantity INT NOT NULL ,
->     CategoryID INT NOT NULL ,
->     CONSTRAINT chk_Price CHECK (Price > 0),
->     CONSTRAINT chk_StockQuantity CHECK (StockQuantity > 0),
->     PRIMARY KEY (ProductID),
->     FOREIGN KEY (CategoryID) REFERENCES Categories(CategoryID)
-> );
ERROR 1146 (42S02): Table doesn't exist
```

2. 查询表出错

```
obclient(root@sys)[oceanbase]> DESC <Customers>;
ERROR 1064 (42000): You have an error in your SQL syntax; check the manual that corresponds to your OceanBase version for the right syntax to use near '<Customers>' at line 1
[172.17.0.2:2882] [2025-04-08 15:05:21.652941] [YB42AC110002-0000632456C70FF94-0-0]
```

3、查找约束出错

```
obclient(root@sys)[oceanbase]> SELECT table_name, constraint_name, constraint_type
-> FROM information_schema.TABLE_CONSTRAINTS
-> WHERE table_name=<Customers/Products/Categories/Orders/OrderItems>;
ERROR 1064 (42000): You have an error in your SQL syntax; check the manual that corresponds to your OceanBase version for the right syntax to use near '<Customers/Products/Categories/Orders/OrderItems>' at line 3
```

解决方案:

1. 在建立 Product 表之前先建立 Categories 表
2. 在进行查询时不能有<>
3. 另重新创建一个数据库，重新在新的数据库中建立表