Database Implementation Report - Stock Trading System

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Problem Summary

The Stock Trading System is an automated system for trading stocks of publicly traded companies and it has the following data requirements:

A company is uniquely determined by its name, while also having a headquarters address and an established date. Address is a composite attribute, with components street number, apartment number, city, street and zip Code. Some companies have publicly traded common stocks, and are named public companies. Each public company has only one such stock. Each stock has a unique stock code and specified number of shares. Every stock trades on one or more exchanges, but the number of trading exchanges cannot exceed 9. An exchange is uniquely determined by its name. There is a stock symbol associated with a stock, which is used to track trades on an exchange. The same stock may have different symbols on different exchanges. The last trading price and current daily volume for every symbol should be recorded.

Stocks are owned and traded by traders. A trader has a name and a trader id. The trader id uniquely determines the trader. Traders do not trade directly, but via brokers. A broker is uniquely determined by its name and state. Each broker deals with one or more exchanges and pays a fixed yearly fee to every exchange it deals with. The fee could be different for every broker/exchange pair. A trader owns at least one account with at least one broker. She/he may hold more than one account with the same broker and deal with more than one broker. An account is uniquely determined by the broker and account number. A broker may have no accounts. Each account has exactly one owner. Accounts hold securities and cash. Note that a stock bought on one exchange could be sold on another, so it is stocks, not symbols, which are held.

Traders place trading orders via their brokerages. Every transaction contains the following information: number of shares, price, commissions paid by the buyer and the seller to their brokerages and the timestamp. Exchange and transaction number uniquely determine the transaction. Note that an order could be filled by several transactions. The stocks are traded if their orders are fulfilled by some transactions.

Business Rules

- Each public company has only one such stock, each stock has a unique stock code and specified number of shares.
- Every stock trades on one or more exchanges, but the number of trading exchanges cannot exceed 9.
- A trader owns at least one account with at least one brokerage.
- Each account has exactly one owner.
- The stocks are traded if their orders are fulfilled by some transactions.

Entities and Attributes

1. **Account_info**	
a. account_no	Unique id of each account
b. trader_id	Contains Trader id
c. broker_id	Contains Broker id
d. cash	Contains cash
e. Security	Contains security
2. **Exchange**	
a. Exchange_id	Unique id of each Exchange
b. Exchange_name	Name of exchange
3. **Company_info**	
a. Company_id	Unique id of each company
b. Company_name	Name of Company
c. Street_no	Street number of the company
d. City	City in which company resides
e. Zipcode	Zipcode of the company's location
f. State	State in which company lies
g. Est_date	Date of establishment
4. **Broker_Info**	
a. Broker_id	Unique id of each broker
b. Broker_name	Name of broker
c. Broker_address	Broker's address
d. Contact_no	Broker's contact number
5. **BrokerExchangeDeals**	
a. ID	Unique id of each deal completed
b. Broker_id	Unique id of each broker
c. Exchange_id	Unique id of each exchange
d. Fees_given	Value of brokerage
6. **Stock_info**	
a. Stock_id	Unique id of each stock
b. Stock_name	Name of each stock
c. Shares_no	Number of shares
d. S_price	Price of a unit stock
e. Stock_symbol	Tracks trades on an Exchange
f. Company_id	Unique id of each company
g. Trader_exchange_id	Same as exchange_id in
h. Stock_launch_date	Date the stock was launched in the IPO
7. **Trader_details**	

a. Trader_id	Unique id of each trader
b. Trader_broker_id	
c. Account_no	Unique id of each account
8. Transaction_details	
a. Order_id	Unique id of each order
b. Stock_id	Unique id of each stock
c. Broker_id	Unique id of each broker
d. Trader_id	Unique id of each trader
e. Exchange_id	Unique id of each exchange
f. No_of_shares	Number of Shares
g. T_Price	Total amount of stocks purchased/sold
h. Brokeragepaidby_seller	Brokerage paid by seller
i. Brokeragepaidby_buyer	Brokerage paid by buyer

ERD
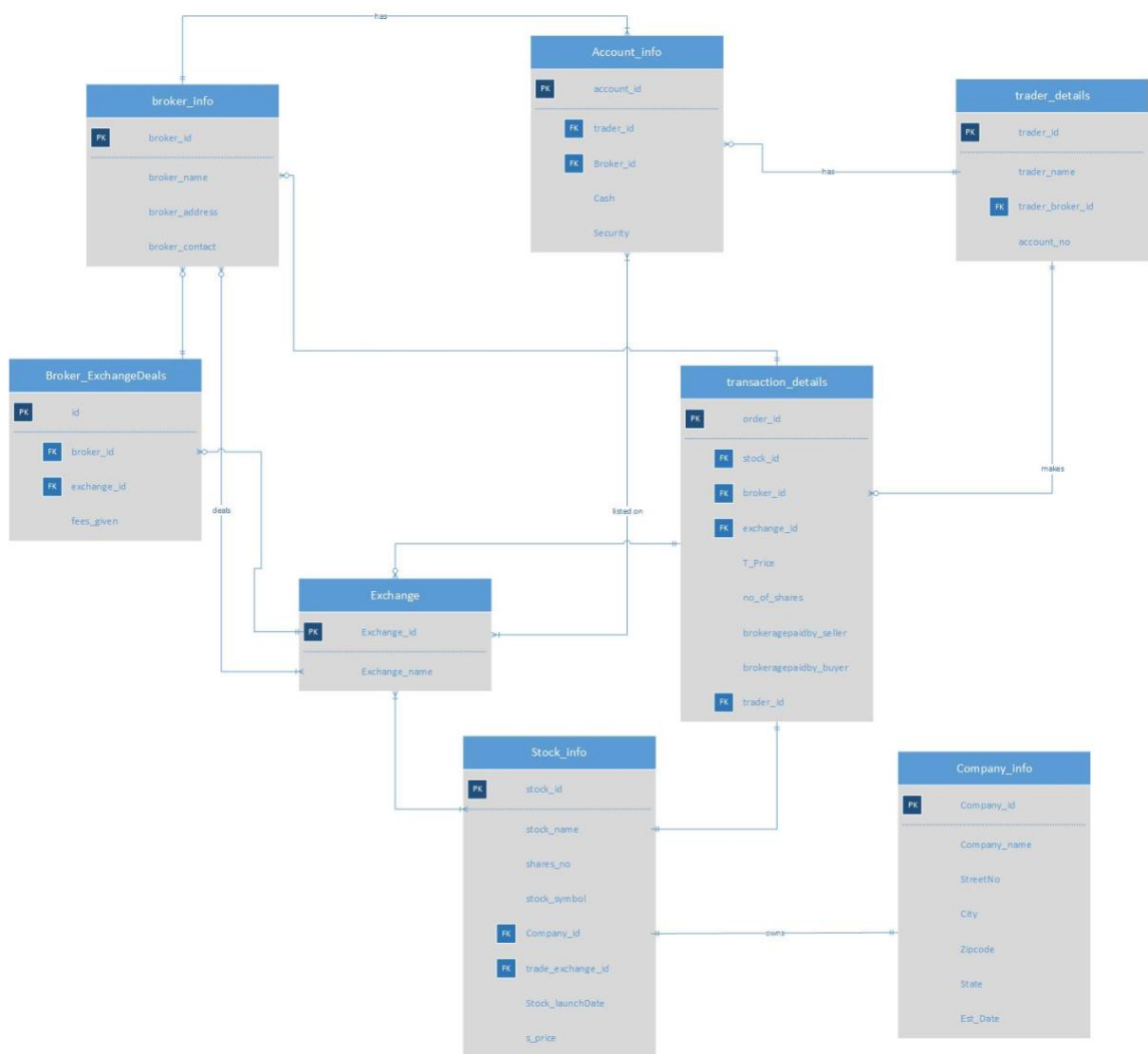
Creation of Tables

create table company_info
(
company_id char(10) primary key,
company_name VARCHAR(30) NOT NULL,
streetNo VARCHAR(30) NOT NULL,
city VARCHAR (50) NOT NULL,
c_state VARCHAR (50) NOT NULL,
zipcode NUMERIC (10) NOT NULL,
established_date DATETIME NOT NULL
);
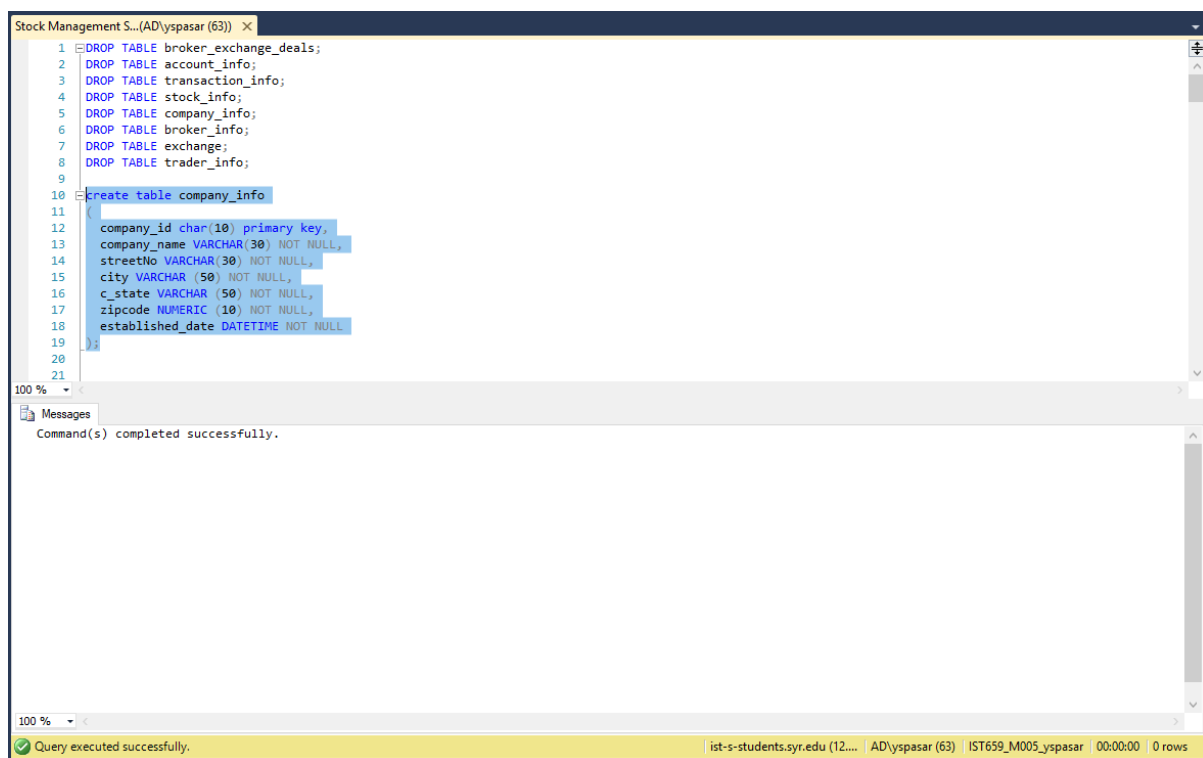
create table exchange
(
exchange_id char(10) primary key,
exchange_name varchar(10) NOT NULL
);

```
CREATE TABLE broker_info(
broker_id char(10) primary key,
broker_fname varchar(30) NOT NULL,
broker_lname varchar(30) NOT NULL,
broker_contact varchar(12) NOT NULL,
broker_streetno numeric(10) NOT NULL,
broker_streetname varchar(50) NOT NULL,
broker_city varchar(30) NOT NULL,
broker_state varchar(30) NOT NULL,
broker_zip numeric(10) NOT NULL
);
```

6

```
Stock Management S...(AD\yspasar (63))  ×
22  create table exchange
23  (
24  exchange_id char(10) primary key,
25  exchange_name varchar(10) NOT NULL
26  );
27
28
29  CREATE TABLE broker_info(
30  broker_id char(10) primary key,
31  broker_fname varchar(30) NOT NULL,
32  broker_lname varchar(30) NOT NULL,
33  broker_contact varchar(12) NOT NULL,
34  broker_streetno numeric(10) NOT NULL,
35  broker_streetname varchar(50) NOT NULL,
36  broker_city varchar(30) NOT NULL,
37  broker_state varchar(30) NOT NULL,
38  broker_zip numeric(10) NOT NULL
39  );
40
41
42  CREATE TABLE trader_info(
100 %

Messages
    Command(s) completed successfully.

100 %
Query executed successfully.          ist-s-students.syr.edu (12...  | AD\yspasar (63)  | IST659_M005_yspasar | 00:00:00 | 0 rows
```
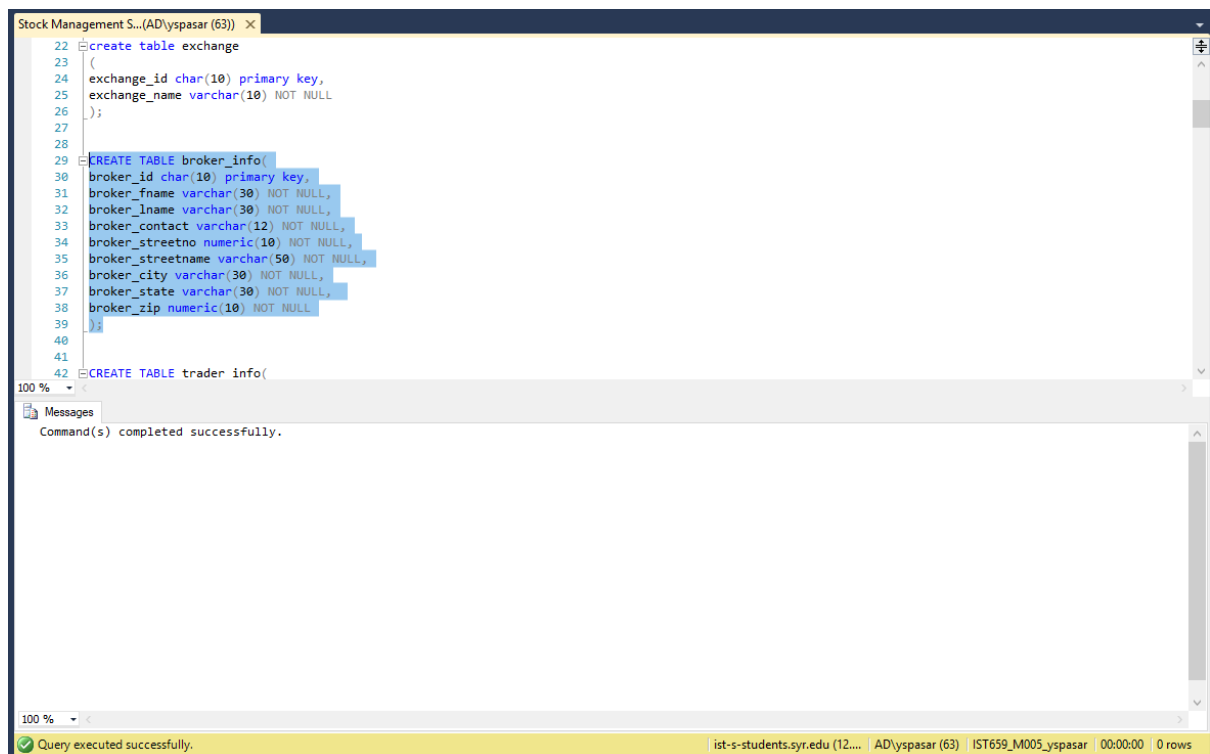
CREATE TABLE trader_info(
trader_id char(10) primary key NOT NULL,
trader_fname varchar(30) NOT NULL,
trader_lname varchar(30) NOT NULL,
account_no numeric(9) NOT NULL,
trader_contact varchar(12) NOT NULL,
trader_streetno numeric(10) NOT NULL,
trader_streetname varchar(50) NOT NULL,
trader_city varchar(30) NOT NULL,
trader_state varchar(30) NOT NULL,
trader_zip numeric(10) NOT NULL
);

7

```
37   broker_state varchar(30) NOT NULL,
38   broker_zip numeric(10) NOT NULL
39   );
40
41
42 ☐CREATE TABLE trader_info(
43   trader_id char(10) primary key NOT NULL,
44   trader_fname varchar(30) NOT NULL,
45   trader_lname varchar(30) NOT NULL,
46   account_no numeric(9) NOT NULL,
47   trader_contact varchar(12) NOT NULL,
48   trader_streetno numeric(10) NOT NULL,
49   trader_streetname varchar(50) NOT NULL,
50   trader_city varchar(30) NOT NULL,
51   trader_state varchar(30) NOT NULL,
52   trader_zip numeric(10) NOT NULL
53   );
54
55
56 ☐CREATE TABLE Account_info(
57   account id char(10) primary key NOT NULL,
```

Messages

Command(s) completed successfully.

Query executed successfully.

CREATE TABLE Account_info(
account_id char(10) primary key NOT NULL,
cash numeric(10) NOT NULL,
security numeric(10) NOT NULL,
trader_id char(10) FOREIGN KEY (trader_id) REFERENCES trader_info(trader_id),
broker_id char(10) FOREIGN KEY (broker_id) REFERENCES broker_info(broker_id)
);


```
46   account_no numeric(9) NOT NULL,
47   trader_contact varchar(12) NOT NULL,
48   trader_streetno numeric(10) NOT NULL,
49   trader_streetname varchar(50) NOT NULL,
50   trader_city varchar(30) NOT NULL,
51   trader_state varchar(30) NOT NULL,
52   trader_zip numeric(10) NOT NULL
53   );
54
55   |
56 ☐CREATE TABLE Account_info(
57   account_id char(10) primary key NOT NULL,
58   cash numeric(10) NOT NULL,
59   security numeric(10) NOT NULL,
60   trader_id char(10) FOREIGN KEY (trader_id) REFERENCES trader_info(trader_id),
61   broker_id char(10) FOREIGN KEY (broker_id) REFERENCES broker_info(broker_id)
62   );
63
64
65 ☐CREATE TABLE broker_exchange_deals(
66   id char(10) primary key,
```

Messages

Command(s) completed successfully.

Query executed successfully.

```
CREATE TABLE broker_exchange_deals(
id char(10) primary key,
fees_given char(5),
broker_id char(10) FOREIGN KEY (broker_id) REFERENCES broker_info(broker_id),
exchange_id char(10) FOREIGN KEY (exchange_id) REFERENCES exchange(exchange_id)
);
```



```
create table stock_info
(
stock_id char(10) primary key,
stock_name VARCHAR(20) NOT NULL,
shares_no NUMERIC(10) NOT NULL,
stock_symbol varchar(30) NOT NULL,
stock_launchDate DATETIME NOT NULL,
s_price NUMERIC(10) NOT NULL,
company_id char(10) FOREIGN KEY (company_id) REFERENCES company_info(company_id),
trade_exchange_id   char(10)   FOREIGN   KEY   (trade_exchange_id)   REFERENCES
exchange(exchange_id)
);
```

```
64
65  CREATE TABLE broker_exchange_deals(
66  id char(10) primary key,
67  fees_given char(5),
68  broker_id char(10) FOREIGN KEY (broker_id) REFERENCES broker_info(broker_id),
69  exchange_id char(10) FOREIGN KEY (exchange_id) REFERENCES exchange(exchange_id)
70  );
71
72  create table stock_info
73  (
74      stock_id char(10) primary key,
75      stock_name VARCHAR(20) NOT NULL,
76      shares_no NUMERIC(10) NOT NULL,
77      stock_symbol varchar(30) NOT NULL,
78      stock_launchDate DATETIME NOT NULL,
79      s_price NUMERIC(10) NOT NULL,
80      company_id char(10) FOREIGN KEY (company_id) REFERENCES company_info(company_id),
81      trade_exchange_id char(10) FOREIGN KEY (trade_exchange_id) REFERENCES exchange(exchange_id)
82  );
83
84
```

Messages
  Command(s) completed successfully.

Query executed successfully.   ist-s-students.syr.edu (12.... AD\yspasar (63) IST659_M005_yspasar 00:00:00 0 rows

create table transaction_info
(
order_id char(10) primary key,
T_Price NUMERIC(10) NOT NULL,
No_Of_Shares NUMERIC(10) NOT NULL,
brokeragepaidby_seller NUMERIC(10) NOT NULL,
brokeragepaidby_buyer NUMERIC(10) NOT NULL,
id char(10) FOREIGN KEY (id) REFERENCES broker_exchange_deals(id),
stock_id char(10) FOREIGN KEY (stock_id) REFERENCES Stock_info(stock_id),
broker_id char(10) FOREIGN KEY (broker_id) REFERENCES broker_info(broker_id),
exchange_id char(10) FOREIGN KEY (exchange_id) REFERENCES exchange(exchange_id),
trader_id char(10) FOREIGN KEY (trader_id) REFERENCES trader_info(trader_id)
);

ALTER TABLE transaction_info
ADD   account_id   char(10)   FOREIGN   KEY   (ACCOUNT_ID)   REFERENCES
Account_info(account_id);

Insertion of Tables

insert into company_info values(1, 'Apple', '1', 'Cupertino', 'California', '95014', '1976-04-01');
insert into company_info values(2, 'Google', '1600', 'Menlo Park', 'California', '94043', '1998-09-04');
insert into company_info values(3, 'Amazon', '410', 'Seattle', 'Washington', '98109', '1994-07-05');

insert into broker_info values(1, 'Johnny', 'Walker', '315-555-5555', '45', 'Tiemann Place', 'Manhattan', 'New York', '10027');
insert into broker_info values(2, 'Paul', 'Smith', '315-545-6655', '7906', '5th Avenue', 'Brooklyn', 'New York', '11209');
insert into broker_info values(3, 'Marc', 'New York', '315-343-5566', '4322', 'Queens Street', 'Long Island City', 'New York', '11101');
insert into broker_info values(4, 'John', 'Hopkins', '315-343-7666', '4322', 'Queens Street', 'Long Island City', 'New York', '11101');

insert into exchange values(1, 'NYSE');
insert into exchange values(2, 'NASDAQ');
insert into exchange values(3, 'CSE');
insert into exchange values(4, 'ASE');

```
140  insert into stock_info values(8,'Amazon.com Inc.', '900', 'AMZN', '1997-11-11', '1861.69', '3', '2' );
141  insert into stock_info values(9,'Amazon.com Inc.', '900', 'AMZN', '1997-11-11', '1861.69', '3', '3' );
142  insert into stock_info values(10,'Amazon.com Inc.', '900', 'AMZN', '1997-11-11', '1861.69', '3', '4' );
143
144  insert into transaction_info values(1,20400,100,12,30,1,1,1,1,1 );
145  insert into transaction_info values(2,10200,50,6,15,2,2,2,2,2 );
146  insert into transaction_info values(3,16728,82,42,30,1,3,2,1,3 );
147  insert into transaction_info values(4,16728,82,42,30,1,3,2,1,3 );
148  insert into transaction_info values(5,11120,55,42,30,1,3,2,1,3 );
149  insert into transaction_info values(6,1320,51,42,30,1,3,2,1,3 );
150
151  SELECT * FROM company_info;
152  SELECT * FROM broker_info;
153  SELECT * FROM exchange;
154  SELECT * FROM trader_info;
155  SELECT * FROM account_info;
156  SELECT * FROM broker_exchange_deals;
157  SELECT * FROM stock_info;
158  SELECT * FROM transaction_info;
159
160  /* 1. For each public company list the number of exchanges which its stock trades on */
```

	exchange_id	exchange_name
1	1	NYSE
2	2	NASDAQ
3	3	CSE
4	4	ASE

Query executed successfully.   ist-s-students.syr.edu (12.... | AD\yspasar (63) | IST659_M005_yspasar | 00:00:00 | 4 rows

insert into trader_info values(1, 'Yash', 'Pasar', '987651819', '315-450-1430', '212', 'Westcott Street', 'Syracuse', 'New York', '13210');

insert into trader_info values(2, 'Amit', 'Jadhav', '984321819', '315-395-7948', '141', 'Avondale Place', 'Syracuse', 'New York', '13210');

insert into trader_info values(3, 'Devansh', 'Khakkar', '787673219', '315-378-9014', '716', 'South Beech Street', 'Syracuse', 'New York', '13210');

insert into trader_info values(4, 'Manan', 'Dedhia', '654651819', '315-395-7788', '400', 'Westcott Street', 'Syracuse', 'New York', '13210');

13

```
insert into account_info values(1, '1800', '1500', '1', '3');
insert into account_info values(2, '2800', '1000', '1', '2');
insert into account_info values(3, '800', '3500', '2', '1');
insert into account_info values(4, '400', '2500', '2', '2');
insert into account_info values(5, '900', '1500', '2', '3');
insert into account_info values(6, '800', '1500', '3', '1');
insert into account_info values(7, '800', '500', '4', '2');
```

insert into broker_exchange_deals values(1, '0.15', '1', '1');
insert into broker_exchange_deals values(2, '0.25', '1', '2');
insert into broker_exchange_deals values(3, '0.10', '1', '3');
insert into broker_exchange_deals values(4, '0.15', '2', '1');
insert into broker_exchange_deals values(5, '0.25', '2', '2');
insert into broker_exchange_deals values(6, '0.10', '3', '3');

insert into stock_info values(1,'Apple Inc.', '1300', 'AAPL', '1980-12-12', '203.86', '1', '1');
insert into stock_info values(2,'Apple Inc.', '1300', 'AAPL', '1980-12-12', '203.86', '1', '2');
insert into stock_info values(3,'Apple Inc.', '1300', 'AAPL', '1980-12-12', '203.86', '1', '3');
insert into stock_info values(4,'Alphabet Inc.', '1267', 'GOOGL', '1998-09-04', '1241.47', '2', '1');
insert into stock_info values(5,'Alphabet Inc.', '1267', 'GOOGL', '1998-09-04', '1241.47', '2', '2');
insert into stock_info values(6,'Alphabet Inc.', '1267', 'GOOGL', '1998-09-04', '1241.47', '2', '3');
insert into stock_info values(7,'Amazon.com Inc.', '900', 'AMZN', '1997-11-11', '1861.69', '3', '1');
insert into stock_info values(8,'Amazon.com Inc.', '900', 'AMZN', '1997-11-11', '1861.69', '3', '2');
insert into stock_info values(9,'Amazon.com Inc.', '900', 'AMZN', '1997-11-11', '1861.69', '3', '3');
insert into stock_info values(10,'Amazon.com Inc.', '900', 'AMZN', '1997-11-11', '1861.69', '3', '4');

insert into transaction_info values(1,20400,100,12,30,1,1,1,1,1,1);
insert into transaction_info values(2,10200,50,6,15,2,2,2,2,2,4);
insert into transaction_info values(3,16728,82,42,30,1,3,2,1,3,6);
insert into transaction_info values(4,16728,82,42,30,1,3,2,1,3,6);
insert into transaction_info values(5,11120,55,42,30,1,3,2,1,3,6);
insert into transaction_info values(17,1320,5,42,30,1,3,2,1,3,6);

SELECT * FROM company_info;

SELECT * FROM broker_info;

SELECT * FROM exchange;

SELECT * FROM trader_info;

SELECT * FROM account_info;

SELECT * FROM broker_exchange_deals;

SELECT * FROM stock_info;

SELECT * FROM transaction_info;

Trigger

drop trigger S_Quantity
create trigger S_Quantity

```
ON transaction_info
AFTER INSERT
AS
DECLARE @No_Of_Shares AS INT
DECLARE @T_Price AS INT
SET @No_Of_Shares = (SELECT TOP 1 inserted.No_Of_Shares FROM inserted)
SET @T_Price = (SELECT TOP 1 inserted.T_Price FROM inserted)
IF @No_Of_Shares<50
BEGIN
 RAISERROR  ('Number of shares should be greater than or equal to 50',15,1);
  ROLLBACK
END
if @T_Price < 10000
BEGIN
 RAISERROR  ('Total transaction value has to be greater than or equal to 10000',15,1);
  ROLLBACK
```


Major Data Questions

/* 1. For each public company list the number of exchanges which its stock trades on */

```
select s.stock_name, count(s.trade_exchange_id) as No_of_exchanges
from stock_info s
group by s.stock_name
ORDER BY No_of_exchanges;
```

	stock_name	No_of_exchanges
1	Alphabet Inc.	3
2	Apple Inc.	3
3	Amazon.com Inc.	4

/* 2. List all Exchanges who have stock from the public company established before "Jan01,1982" */

```
select e.exchange_name
from exchange e
inner join stock_info s on s.trade_exchange_id = e.exchange_id
inner join company_info c on c.company_id = s.company_id
where c.established_date < '1982-01-01';
```


	exchange_name
1	NYSE
2	NASDAQ
3	CSE

/* 3. Find each Trader who has exactly one account */

```
select a.trader_id
from account_info a
group by a.trader_id
having count(a.account_id) = 1;
```


	trader_id
1	3
2	4

/* 4. Find all Brokerages who do not have any accounts */

```
select b.broker_fname,b.broker_lname, b.broker_id
from broker_info b
left join account_info as a
on b.broker_id = a.broker_id
where b.broker_id
not in (select distinct(broker_id) from account_info);
```

	broker_fname	broker_lname	broker_id
1	John	Hopkins	4

/* 5. List all stocks belonging to each Exchange */

Select stock_name, exchange_name
from stock_info as s
join exchange as e on s.trade_exchange_id = e.exchange_id
order by s.stock_name

	stock_name	exchange_name
1	Alphabet Inc.	NYSE
2	Alphabet Inc.	NASDAQ
3	Alphabet Inc.	CSE
4	Amazon.com Inc.	NYSE
5	Amazon.com Inc.	NASDAQ
6	Amazon.com Inc.	CSE
7	Amazon.com Inc.	ASE
8	Apple Inc.	NASDAQ
9	Apple Inc.	CSE
10	Apple Inc.	NYSE

login Page

1. Admin Login

Stock Management System

User Name [   ]

Password [   ]

AdminLogin

Trader Login

2. Trader Login

Login Screen

Stock Management System

Last Name

Phone Number

Login

3. Interface once logged in

Stock Management System

Open Report

Broker

Company

Trader

Stock

Forms

1. Broker Form

Broker Form

Broker ID	7
First Name	Amit
Last Name	Jadhav
Contact Number	3153957948
Street Number	141
Street Name	Avondale
City	San Fransico
State	California
Zip Code	13210

[Add Broker]　　　[Delete Broker]

2. Company Form

Company

company_id	4
company_name	Microsoft
streetNo	10
city	Washs
c_state	Xst
zipcode	55555
established_date	4/24/2019

Add Company

3. Stock Form

Stock

Stock Id	11
Stock Name	Apple Inc.
Shares Number	1200
Stock Symbol	AAD
Launch Date	12/12/1980
Stock Price	206
Company ID	1
Exchange Id	1

[Add Stock] [Delete Stock]

4. Trader

Trader

trader_id	5
trader_fname	Advaith
trader_lname	Kamath
account_no	145254789
trader_contact	315-395-8965
trader_streetno	12
trader_streetname	Westcott
trader_city	Syracuse
trader_state	New York
trader_zip	13210

Add Trader   Delete Trader

5. Purchases

Purchases

Order Id	12
Total Price	10201
Number Of Shares	100
Brokerage (Seller)	10
Brokerage (Buyer)	30
ID	1025
Stock Id	22
Broker Id	5415
Trader ID	1125
Account ID	102
Exchange	ASE
	CSE
	NASDAQ
	NYSE

Add Purchase

Report

1. Admin Report

Overall Stock Report

trader_id	T_Price	account_i	exchange	No_Of_Shares	stock_id	broker_i
1		10201 1	1		100 1	1
2		10200 4	2		50 2	2
2		15014 4	1		62 2	1
2		20201 4	3		50 2	1
2		20145 4	1		61 2	2
3		16728 6	1		82 3	2
3		16728 6	1		82 3	2
3		11120 6	1		55 3	2
3		10320 6	1		51 3	2

2. Individual Trader Report

TraderReport

order_i	T_Price	No_Of_Shares	stock_i	accou	trader	trader_fname	trader_lname
3	16728		82 3	6	3	Devansh	Khakkar
4	16728		82 3	6	3	Devansh	Khakkar
5	11120		55 3	6	3	Devansh	Khakkar
7	10320		51 3	6	3	Devansh	Khakkar