Individual Project

A DATABASE SYSTEM FOR FUTURE, INC.

Course: Database Management Systems (CS 4513)
Semester: Fall-2018
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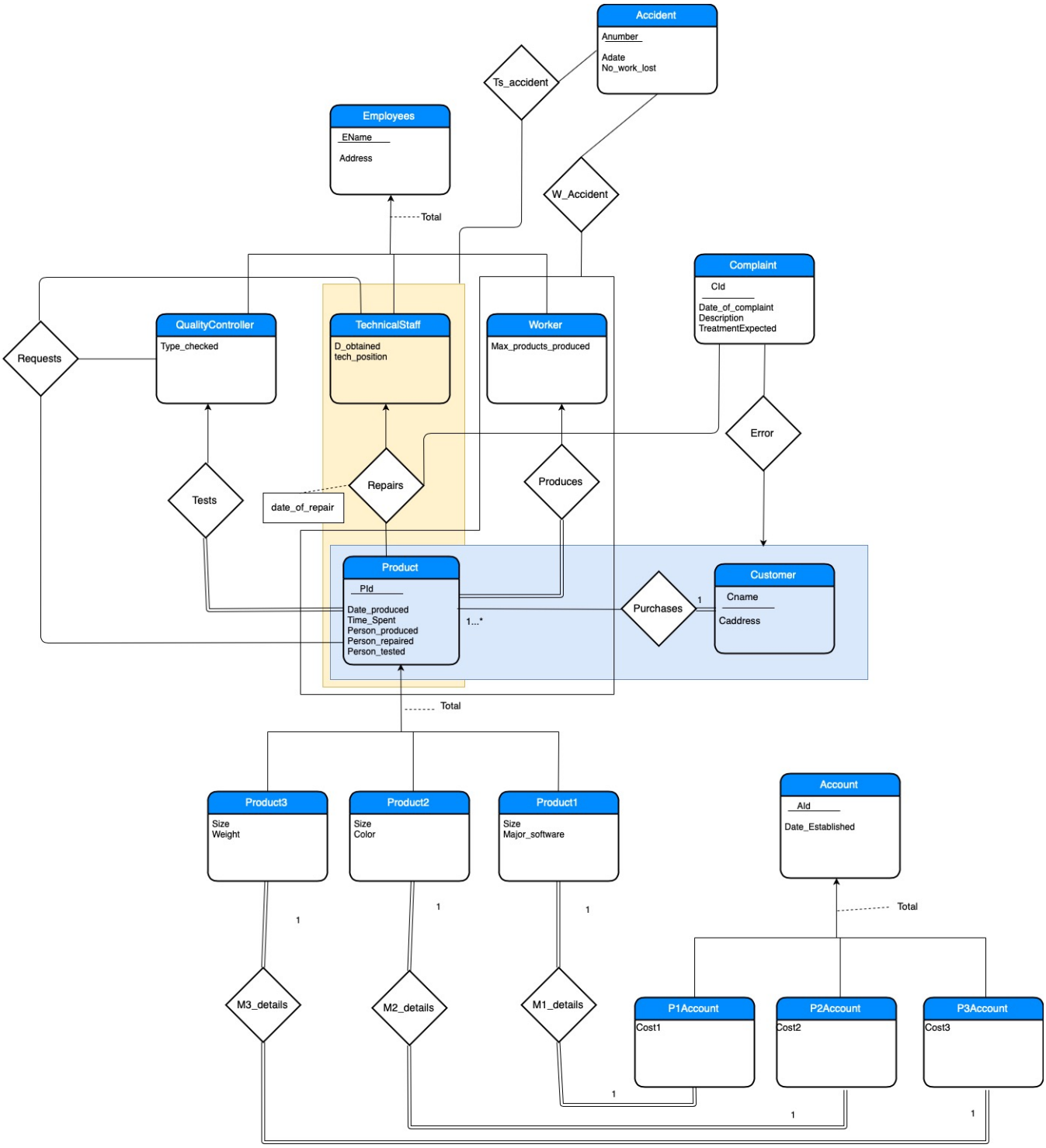
1.1 E-R-Diagram

A DATABASE SYSTEM FOR FUTURE, INC.



1.2 Relational Schema

Relational Schema for tables/relations:

Employee(Ename, Address)
TechnicalStaff(Ename ,D_obtained, tech_position)
QualityController(Ename, Type_checked)
Worker (Ename,Max_products_produced)
Product(Pid,Date_produced,Time_spent,Person_produced,Person_tested,Person_repaired)
Account(Aid,Date_established)
M1_details(Pid,Size,Major_software, Aid,cost)
M2_details(Pid,Size,Color, Aid,Cost)
M3_details(Pid,Size,Weight, Aid,Cost)
Customer(Cname,Caddress,Pid)
Complaint(Cid,Date_of_complaint,Description,TreatmentExpected)
Accident:(Anumber,A_date,no_work_lost)

Relations:
Error(Cid,Cname,Pid)
Ts_Accident(Anumber,Ename,Pid)
W_Accident(Anumber,Ename,Pid)
Repairs(Pid,Cid,Ename, Date_of_repair,degree,Types)
Requests(Qname,Tname,pid)

Task 2: Data Dictionary

Table Name	Attribute Name	Type	Size	Constraints
Employee	ename	varchar	40	Primary Key
Employee	address	varchar	40	

Table Name	Attribute Name	Type	Size	Constraints
TechnicalStaff	ename	varchar	40	Primary Key, Foreign Key
TechnicalStaff	D_obtained	Varchar	20	Values in BS, MS, PHD
TechnicalStaff	Tech_position	Varchar	10	

Table Name	Attribute Name	Type	Size	Constraints
QualityController	ename	Varchar	40	Primary Key, Foreign Key
Qualitycontroller	Type_checked	Varchar	20	Values in Product1, Product2, Product3

Table Name	Attribute Name	Type	Size	Constraints
Worker	ename	Varchar	40	Primary Key, Foreign Key
Worker	Max_products_produced	int	Default	

Table Name	Attribute Name	Type	Size	Constraints
Product	Pid	int	Default	Primary Key
Product	Date_produced	date		YYYY-MM-DD
Product	Time_spent	int	Default	
Product	Person_produced	varchar	40	Not NULL, Foreign Key
Product	Person_tested	varchar	40	Not NULL, Foreign Key
Product	Person_repaired	varchar	40	Foreign Key

Table Name	Attribute Name	Type	Size	Constraints
Account	Aid	Int	Default	Primary Key
Account	Date_established	date		YYYY-MM-DD

Table Name	Attribute Name	Type	Size	Constraints
Customers	Cname	varchar	40	Primary Key
Customers	Caddress	Varchar	40	
Customers	Pid	Int	Default	Foreign Key

Table Name	Attribute Name	Type	Size	Constraints
M1_details	Pid	Int	Default	Primary Key
M1_details	Size	Char	10	Value in Small, Medium, Large
M1_details	Major_Software	Varchar	20	
M1_details	Aid	Int	Default	Foreign Key
M1_details	Cost	Int	Default	

Table Name	Attribute Name	Type	Size	Constraints
M2_details	Pid	Int	Default	Primary Key
M2_details	Size	Char	10	Value in Small, Medium, Large
M2_details	color	Varchar	20	
M2_details	Aid	Int	Default	Foreign Key
M2_details	Cost	Int	Default	

Table Name	Attribute Name	Type	Size	Constraints
M3_details	Pid	Int	Default	Primary Key
M3_details	Size	Char	10	Value in Small, Medium, Large
M3_details	weight	int	Default	
M3_details	Aid	Int	Default	Foreign Key
M3_details	Cost	Int	Default	

Table Name	Attribute Name	Type	Size	Constraints
Complaint	Cid	Int	Default	Primary Key
Complaint	Date_of_complaint	Date		YYYY-MM-DD
Complaint	Description	Varchar	50	
Complaint	Treatment Expected	Varchar	20	Values in Moneyback, AnotherProduct

Table Name	Attribute Name	Type	Size	Constraints
Accident	Anumber	int	Default	Primary Key
Accident	A_date	date		YYYY-MM-DD
Accident	No_work_lost	int	Default	

Table Name	Attribute Name	Type	Size	Constraints
Ts_Accident	Anumber	int	Default	Primary Key, Foreign Key
Ts_Accident	Ename	varchar	40	Primary Key, Foreign Key
Ts_Accident	Pid	int	Default	Primary Key, Foreign Key

Table Name	Attribute Name	Type	Size	Constraints
W_Accident	Anumber	int	Default	Primary Key, Foreign Key
W_Accident	Ename	varchar	40	Primary Key, Foreign KEY
W_Accident	Pid	Int	Default	Primary Key, Foreign Key

Table Name	Attribute Name	Type	Size	Constraints
Requests	Qname	Varchar	40	Primary Key, Foreign Key
Requests	Tname	Varchar	40	Primary Key, Foreign KEY
Requests	Pid	Int	Default	Primary Key, Foreign Key

Table Name	Attribute Name	Type	Size	Constraints
Repairs	Pid	int	Default	Primary Key, Foreign Key
Repairs	Cid	Int	Default	Primary Key, Foreign Key
Repairs	ename	Var Char	40	Primary Key, Foreign Key
Repairs	Date_of_Repair	date		YYYY-MM-DD
Repairs	Degree	Varchar	20	Values in MS,BS,Phd
Repairs	Types	Varchar	20	Values in Product1, Product2, Product3

Task 3

Task 3.1:

Indexing-Storage Structure:

Table Name	Type Of Queries	Search Key	Frequency	File Organisation
Employee	1. Insertion		2/Month	Dynamic Extendable Hashing
TechnicalStaff	14.Random Search 16.Update 1.Insertion	Ename Ename	5/Day 1/3 Months 2/Month	Index Sequential File
QualityController	14.Random Search 16.Update 1.Insertion	Ename Ename	5/Day 1/3 Months 2/Month	Index Sequential File
Worker	13.Random Search 14.Random Search 1.Insertion	Ename Ename	10/Month 5/Day 2/Month	Index Sequential File
Product	2.Insertion 7.Random Search 8.Random Search 9.Random Search 10.Random Search	 Pid Pid Pid Pid	400/Day 100/Day 2000/Day 400/Day 40/Day	Dynamic Extendable Hashing

Account	4.Insertion 15.Range Search	 Date	50/Day 5/Day	Dynamic Hashing
M1_Details	4.Insertion 15.Range Search	 Date	40/Day 5/Day	Dynamic Hashing
M2_Details	4.Insertion 11.Random Search 15.Range Search	 Pid Date	40/Day 5/Month 5/Day	Dynamic Hashing
M3_Details	4.Insertion 10.Random Search 15. Range Search	 Pid Date	40/Day 40/Day 5/Day	Dynamic Hashing
Customers	3. Insertion 11. Random Search 13. Random Search 14.Random Search	 Cname Cname Cname	50/Day 5/Month 10/Month 5/Day	Dynamic Hashing
Complaint	5.Insertion		30/Day	Dynamic Hashing
Error	5.Insertion 9.Error	 Pid	30/Day 400/day	Dynamic Hashing
Accident	6.Insertion 12.Random Search 12.Random Search 17.Delete	 Anumber No_work_lost A_Date	1/Week 1/Month 1/Month 1/Day	Sequential Storage

Ts_Accident	6.Insertion 12.Random Search 12.Random Search	 Pid Anumber	1/Week 1/Month 1/Month	Sequential Storage
W_accident	6.Insertion		1/Week	Sequential Storage
Requests	10.Random Search	Pid	40/Day	Index- sequential
Repairs	12.Random Search	Pid	1/Month	Heap

3.2. Discussion of storage structures for tables (Aruze SQL Database)

We know that the SQL server automatically creates the primary index basing on the Primary Key of the tables. We create secondary indices on a table for faster access of the queries where they occur more frequently. Whenever a table is created by the user, the best optimum storage structure is chosen and implemented by the Azure according to the table information and constraints on it.

In **SQL Server**, **indexes** are organized as **B-trees**. Each page in an **index B-tree** is called an **index** node.

A **B+ tree** can be viewed as a B-**tree** in which each node contains only keys (not key–value pairs), and to which an additional level is added at the bottom with linked leaves. The primary value of a **B+ tree** is in storing data for efficient retrieval in a block-oriented storage context.

In our database we perform all the tasks based on the primary index so since the sql automatically creates primary index based on the primary key.

Secondary Index:

```
Create Index index2 on m2_details(color)
Create INDEX yak on accident(a_date);
```

We create this index so that we decrease the time taken by the range Query.

Task 4

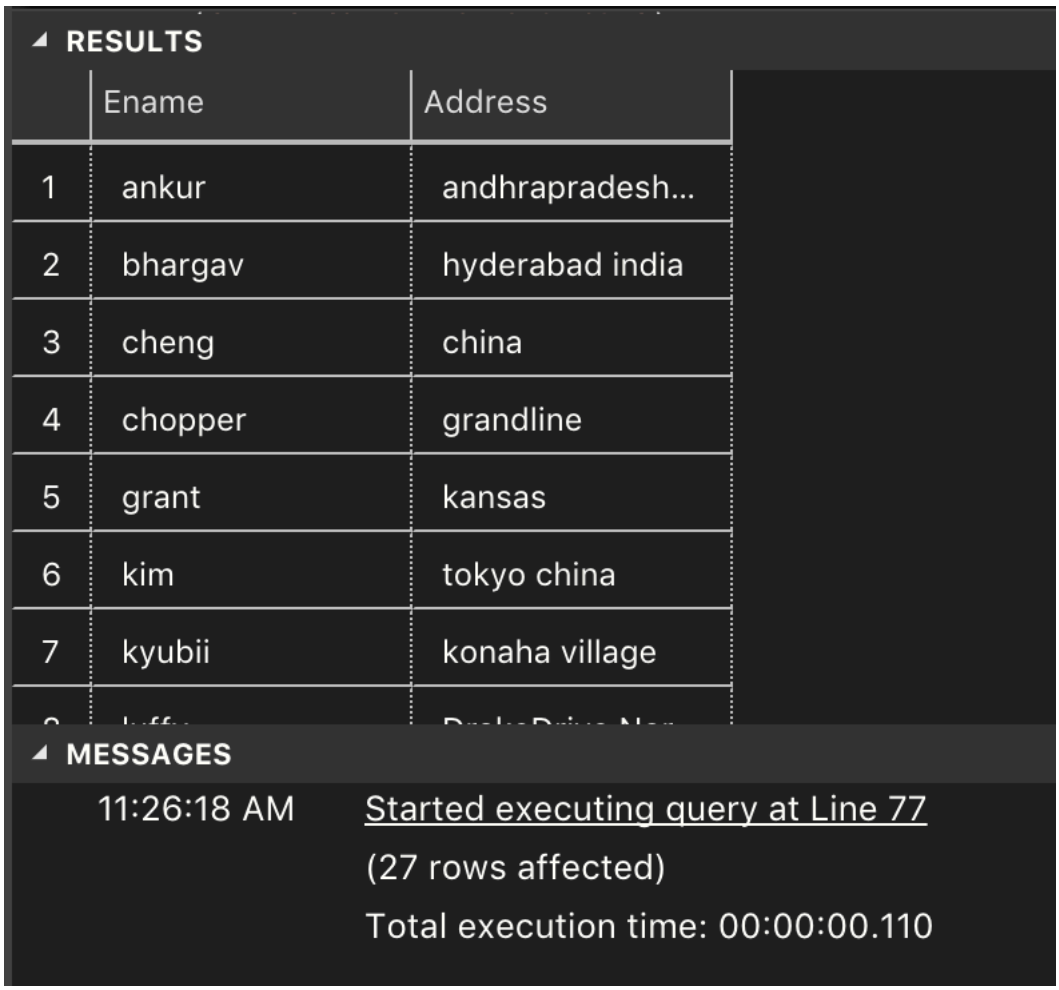
SQL and text files showing the creation of tables in Aruze SQL Database

Creating Table for Employee

```
Create TABLE Employee(Ename varchar(40) primary key,Address varchar(40))
```

Inserting into Employee Values:

```
insert into employee values('luffy','DrakeDrive Norman'),
('Zoro','swordsman Norman'),
('sanji','12th avenue tulsa'),
('nami','brooks st oklahoma'),
('ussop','cleaveland edmond'),
('surya','andhrapradesh india'),
('bhargav','hyderabad india'),
('ramya','banglore united states'),
('navya','visakhapatnam madhyapradesh'),
('madhu','delhi utterpradesh'),
('swetha','tokyo china'),
('ankur','andhrapradesh india'),
('ram','hyderabad india'),
('cheng','banglore united states'),
('sita','visakhapatnam madhyapradesh'),
('sasuke','london portland'),
('naruto','paris englang'),
('kyubii','konaha village')
```

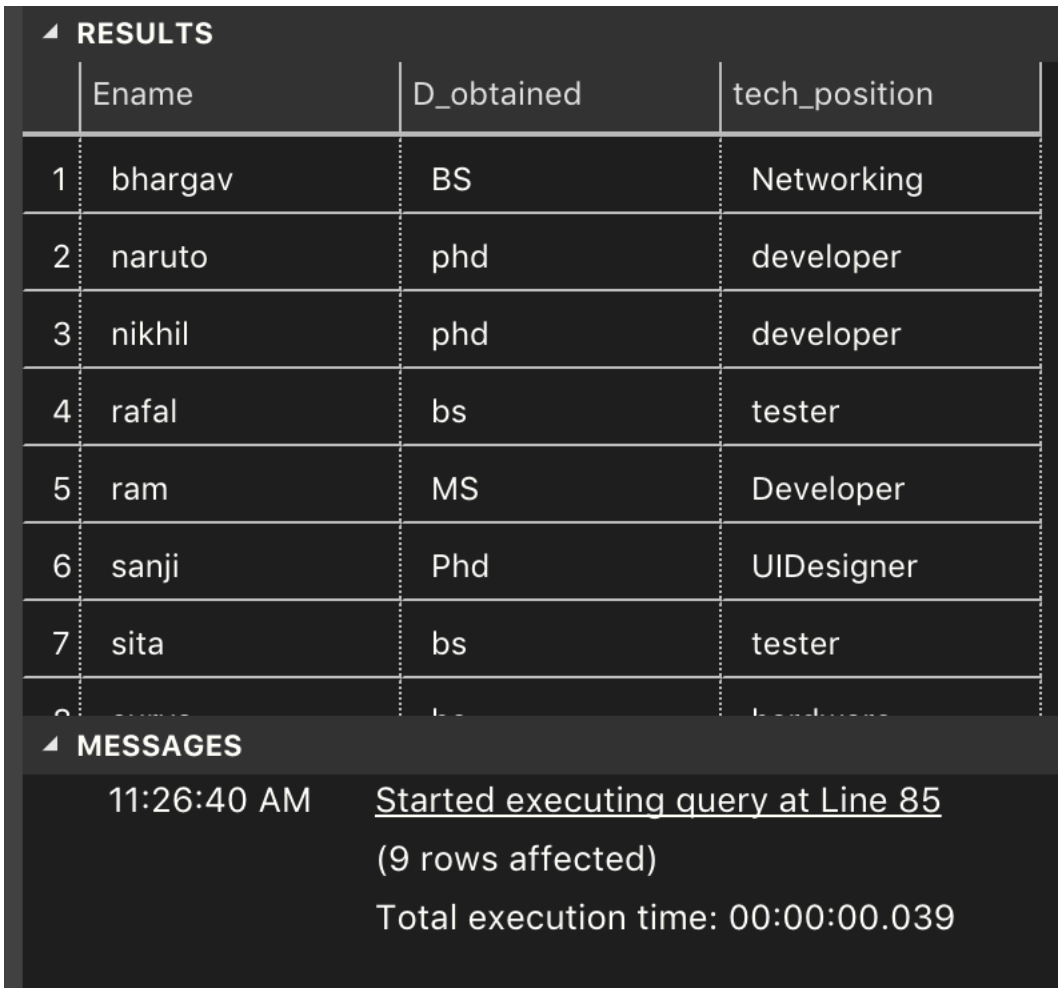


Creating Table For Technical Staff

Create table Technicalstaff(Ename varchar(40) Primary key,D_obtained varchar(20),tech_position varchar(10),foreign key(Ename)references employee(Ename) on delete CASCADE)

ALTER table Technicalstaff ADD CONSTRAINT CHK_Technical_staff CHECK (D_obtained IN ('BS', 'MS', 'Phd'))

```
/*inserting into Technical Staff */
insert into Technicalstaff
values('Zoro','MS','Developer'),('sanji','Phd','UIDesigner'),('bhargav','BS','Networki
ng')
insert into Technicalstaff values('surya','bs','hardware'),('ram','ms','Developer')
```



RESULTS

	Ename	D_obtained	tech_position
1	bhargav	BS	Networking
2	naruto	phd	developer
3	nikhil	phd	developer
4	rafal	bs	tester
5	ram	MS	Developer
6	sanji	Phd	UIDesigner
7	sita	bs	tester

MESSAGES

11:26:40 AM Started executing query at Line 85

(9 rows affected)

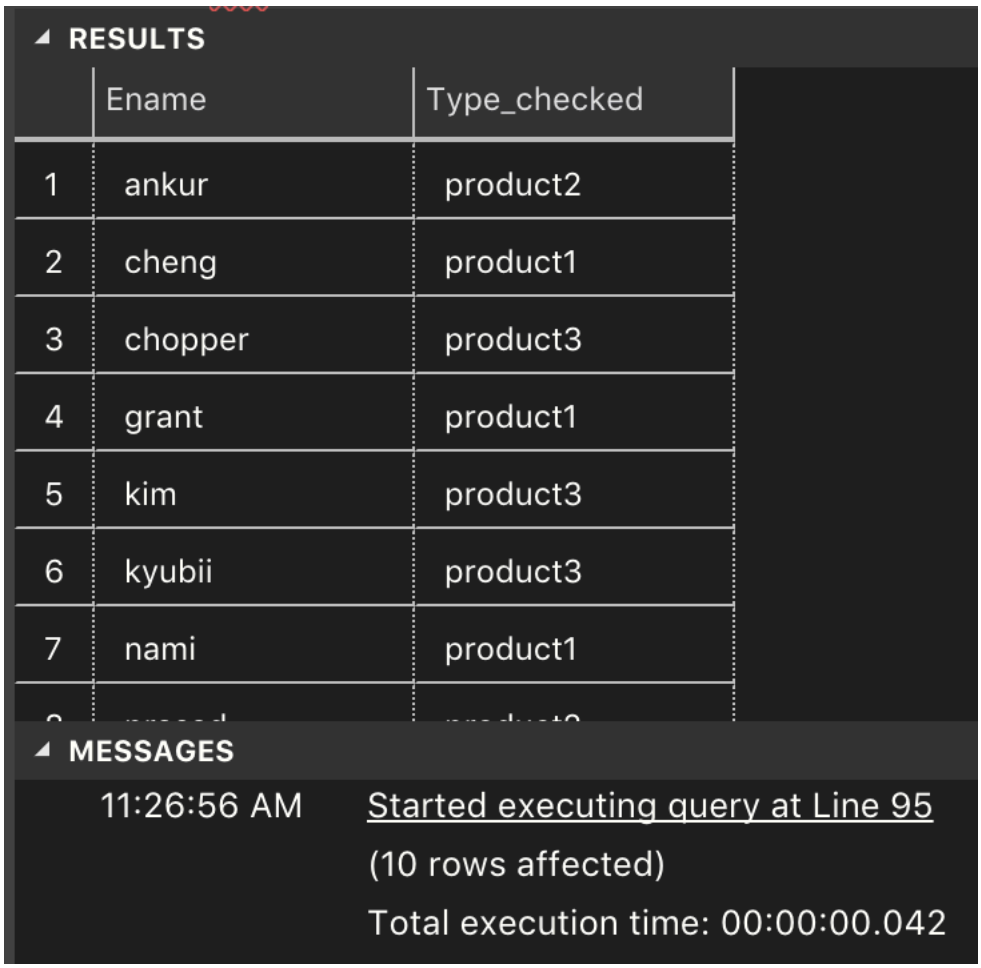
Total execution time: 00:00:00.039

Creating Table For Quality Controller

Create table Qualitycontroller(Ename varchar(40) Primary key,Type_checked varchar(20),foreign key(Ename)references employee(Ename) on delete CASCADE)

ALTER table QualityController ADD CONSTRAINT CHK_Type_checked CHECK (Type_checked IN ('PRODUCT1', 'PRODUCT2', 'PRODUCT3'))

```
/*inserting into QualityController*/
insert into Qualitycontroller values('nami','product1'),
('ussop','product2'),
('kim','product3'),
('kyubii','product3'),
('ankur','product2')
```



RESULTS

	Ename	Type_checked
1	ankur	product2
2	cheng	product1
3	chopper	product3
4	grant	product1
5	kim	product3
6	kyubii	product3
7	nami	product1

MESSAGES

11:26:56 AM Started executing query at Line 95

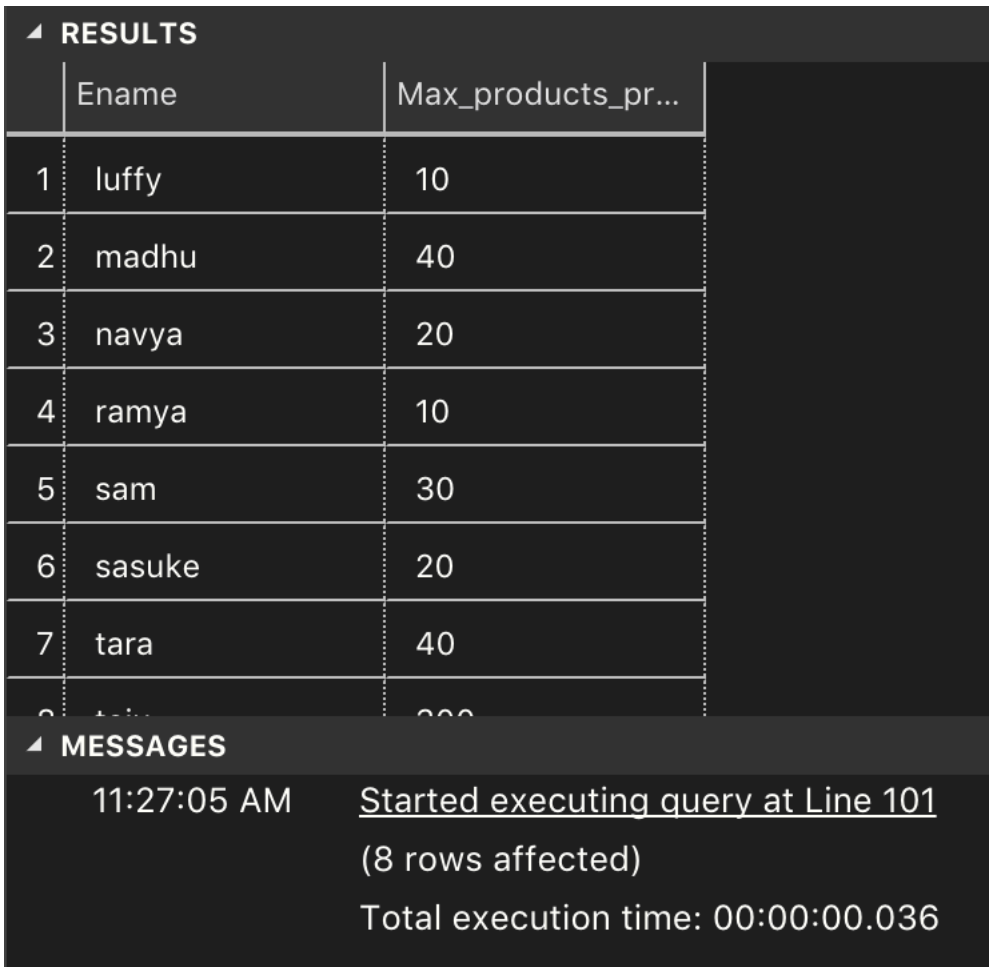
(10 rows affected)

Total execution time: 00:00:00.042

Creating Table For Worker

Create table Worker(Ename varchar(40) Primary key,Max_products_produces int,foreign key(Ename)references employee(Ename) on delete CASCADE)

```
/* insreting into Worker */
insert into Worker values('luffy',10),
('navya',20),('ramya',10),('madhu',40),('sasuke',20)
```



RESULTS

	Ename	Max_products_pr...
1	luffy	10
2	madhu	40
3	navya	20
4	ramya	10
5	sam	30
6	sasuke	20
7	tara	40

MESSAGES

11:27:05 AM Started executing query at Line 101

(8 rows affected)

Total execution time: 00:00:00.036

Creating Table For Product:

create table product(Pid int primary key,date_produced date,time_spent int,person_produced varchar(40) not null foreign key references worker(ename), person_tested varchar(40) not null foreign key references qualitycontroller(ename), person_repaired varchar(40) foreign key references technicalStaff(ename))

```
/*inserting into Product */
insert into product values(100,'2018-05-12',20,'luffy','nami',NULL)
(101,'2018-09-22',20,'navya','kim','sanji'),
(102,'2018-10-01',400,'madhu','kim','bhargav'),
(103,'2018-01-15',900,'ramya','kyubii',null),
(104,'2018-02-18',800,'luffy','ussop','ram'),
(105,'2018-03-06',100,'sasuke','kyubii','surya'),
(106,'2018-04-30',300,'ramya','ankur',NULL),
(107,'2018-06-30',500,'navya','ankur',NULL),
(108,'2018-07-19',230,'luffy','ussop',NULL),
(109,'2018-08-03',250,'madhu','nami',NULL)
```

RESULTS

	Pid	date_produced	time_spent	person_produced	person_tested	person_repaired
1	1	2018-10-10	10	Ramya	nami	naruto
2	2	2018-09-15	20	navya	swetha	ram
3	3	2018-08-23	40	ramya	kyubii	sita
4	4	2018-06-13	1	sasuke	chopper	ram
5	5	2018-06-19	50	madhu	grant	surya
6	6	2018-05-15	30	sam	swetha	bhargav
7	7	2018-04-15	30	tara	ussop	bhargav

MESSAGES

11:27:19 AM Started executing query at Line 115
(26 rows affected)
Total execution time: 00:00:00.055

Creating Table For Account:

create table account(Aid int Primary key, date_established date)

```
/*inserting into account */
insert into account values (1,'2018-05-12'),
(2,'2018-09-22'),
(3,'2018-10-01'),
(4,'2018-01-15'),
(5,'2018-02-18'),
(6,'2018-03-06'),
(7,'2018-04-30'),
(8,'2018-06-30'),
(9,'2018-07-19'),
(10,'2018-08-03')
```

RESULTS

	Aid	date_established
1	1	2018-05-12
2	2	2018-09-22
3	3	2018-10-01
4	4	2018-01-15
5	5	2018-02-18
6	6	2018-03-06
7	7	2018-04-30
8	8	2018-06-30

MESSAGES

5:24:20 PM Started executing query at Line 118

(12 rows affected)

Total execution time: 00:00:00.033

Creating Table For M1_Accounts by combining the tables of P1Account and Product1

create table m1_details(pid int ,Size char(10), major_software varchar(20),foreign key(pid) references product(pid) on DELETE CASCADE,aid int,cost int, foreign key(aid) references account(aid) on delete cascade, PRIMARY KEY (aid,pid))

ALTER table m1_details ADD CONSTRAINT CHK_size CHECK (Size IN ('small', 'Medium', 'large'))

```
INSERT into m1_details values(100,'small','mac',1,3000),(105,'medium','java',2,2990)
```

RESULTS

	pid	Size	major_software	aid	cost
1	105	medium	java	2	2990
2	1	small	java	11	300
3	201	small	java	211	400
4	204	large	c#	214	4000
5	101	large	csharp	217	600
6	5	small	python	1005	500
7	9	medium	java	1009	3000

MESSAGES

11:27:33 AM Started executing query at Line 120

(7 rows affected)

Total execution time: 00:00:00.030

Creating Table For M2_Accounts by combining the tables of P2Account and Product2

create table m2_details(pid int, Size char(10) CONSTRAINT CHK_s2 CHECK (Size IN ('small', 'Medium', 'large')), color varchar(20),foreign key(pid) references product(pid) on DELETE CASCADE,aid int,cost int, foreign key(aid) references account(aid) on delete cascade, PRIMARY KEY (aid,pid))

```
INSERT into M2_details VALUES(102,'Large','red',3,4000),(103,'medium','Yellow',4,3400)
```

RESULTS

	pid	Size	color	aid	cost
1	102	Large	red	3	4000
2	103	medium	Yellow	4	3400
3	202	small	white	212	500
4	205	medium	black	215	850
5	107	medium	grey	218	200
6	2	small	red	1002	600
7	6	Large	pink	1006	3000

MESSAGES

11:27:49 AM Started executing query at Line 124

(9 rows affected)

Total execution time: 00:00:00.040

Creating Table For M3_Accounts by combining the tables of P3Account and Product3

create table m3_details(pid int, Size char(10) CONSTRAINT CHK_s3 CHECK (Size IN ('small', 'Medium', 'large')), weight int,foreign key(pid) references product(pid) on DELETE CASCADE,aid int,cost int, foreign key(aid) references account(aid) on delete cascade, PRIMARY KEY (aid,pid))

```
INSERT into M3_details VALUES(104,'Large',30,3,4000),(106,'medium',100,4,3400)
```

RESULTS

	pid	Size	weight	aid	cost
1	104	Large	30	3	4000
2	106	medium	100	4	3400
3	203	small	40	213	400
4	206	large	400	216	670
5	108	medium	500	219	800
6	109	medium	450	220	500
7	3	large	400	1003	200

MESSAGES

11:28:03 AM Started executing query at Line 128

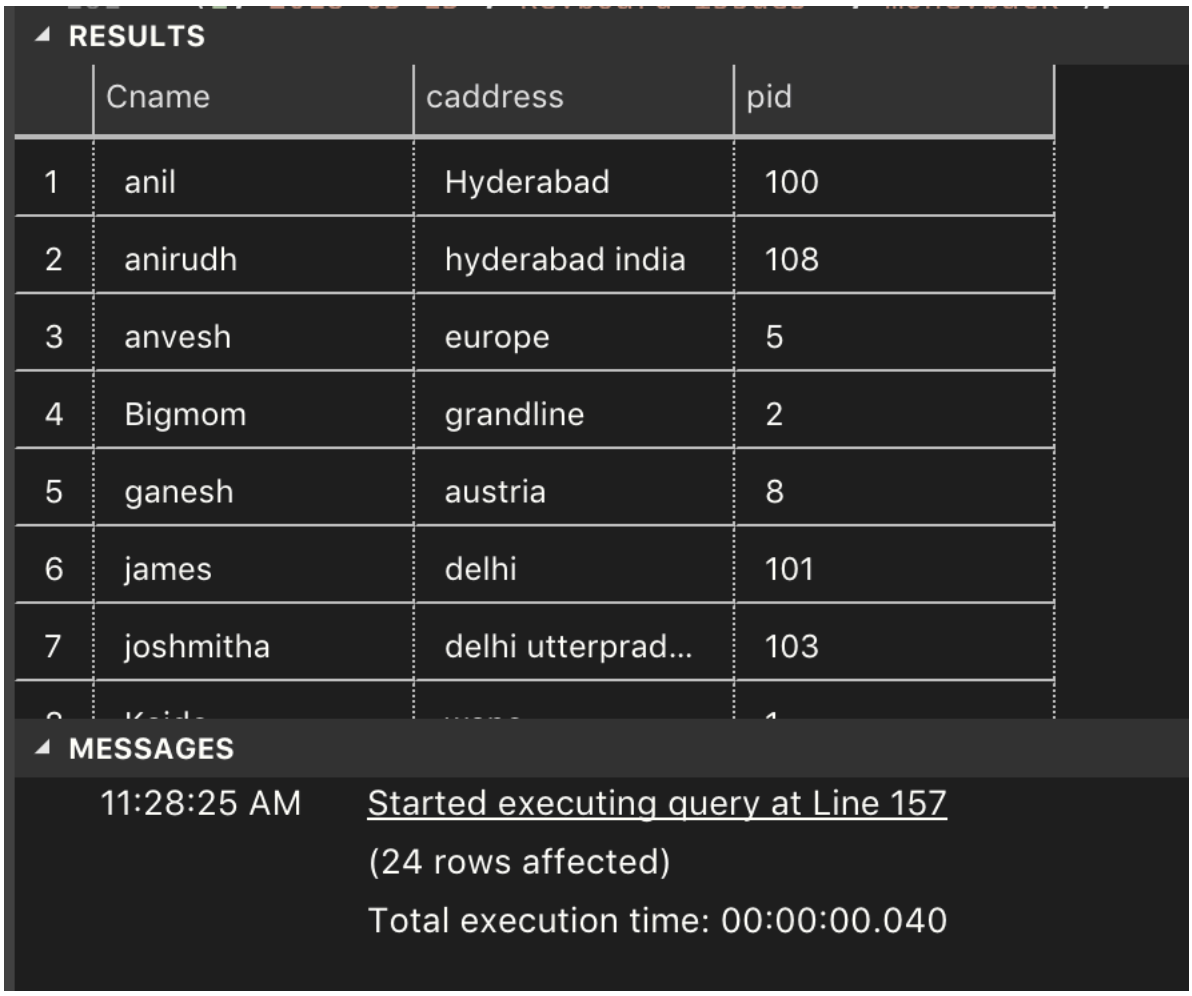
(9 rows affected)

Total execution time: 00:00:00.034

Creating Table For Customers

create table customers(Cname varchar(40) PRIMARY KEY,caddress varchar(40),pid int foreign key references product(pid))

```
insert into customers values('Luffy','drakedrive oklahoma',100)
insert into customers values('surya','andhrapradesh india',101),
('krishna','hyderabad india',102),
('ramya','banglore united states',107),
('navya','visakhapatnam madhyapradesh',109),
('joshmitha','delhi utterpradesh',103),
('swetha','tokyo china',100),
('raj','andhrapradesh india',106),
('anirudh','hyderabad india',108),
('sandeep','banglore united states',107)
```



RESULTS

	Cname	caddress	pid
1	anil	Hyderabad	100
2	anirudh	hyderabad india	108
3	anvesh	europe	5
4	Bigmom	grandline	2
5	ganesh	austria	8
6	james	delhi	101
7	joshmitha	delhi utterprad...	103

MESSAGES

11:28:25 AM Started executing query at Line 157

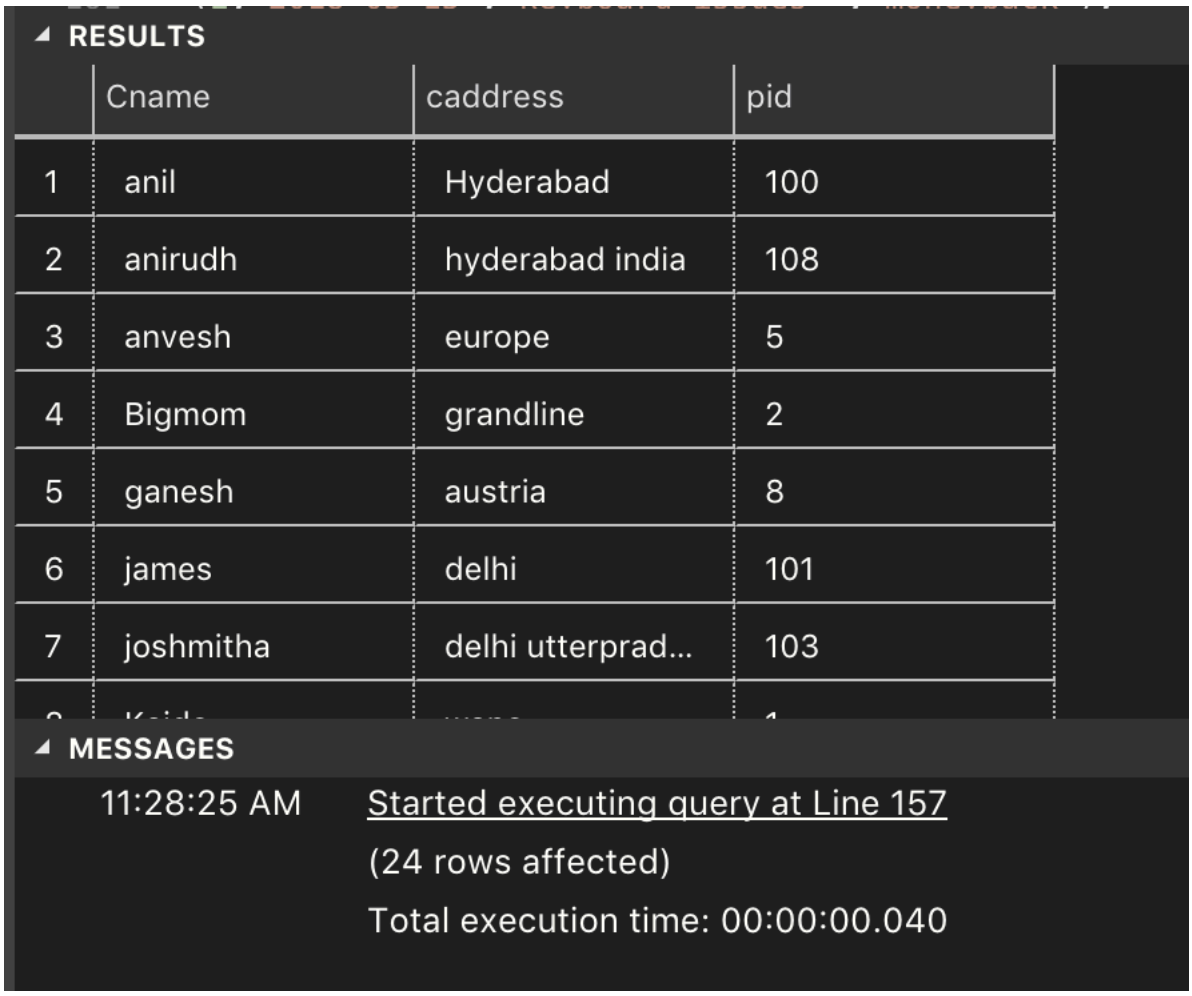
(24 rows affected)

Total execution time: 00:00:00.040

Creating Table For Complaint:

create table Complaint(Cid int primary Key, Date_of_complaint date, Description varchar(50), TreatmentExpected varchar(20),CONSTRAINT CHK_treatment_value CHECK (TreatmentExpected IN ('moneyback', 'anotherproduct')))

```
/*inserting into complaints*/
insert into complaint values (1,'2018-10-01','doesnt turn on ','anotherproduct'),
(2,'2018-05-15','keyboard issues ','moneyback'),
(3,'2018-06-28','colour faded ','anotherproduct'),
(4,'2019-01-01','incorrect size ','anotherproduct'),
(5,'2018-11-11','hardware problem ','moneyback'),
(6,'2018-12-12','excess weight','moneyback')
```



RESULTS

	Cname	caddress	pid
1	anil	Hyderabad	100
2	anirudh	hyderabad india	108
3	anvesh	europe	5
4	Bigmom	grandline	2
5	ganesh	austria	8
6	james	delhi	101
7	joshmitha	delhi utterprad...	103

MESSAGES

11:28:25 AM Started executing query at Line 157

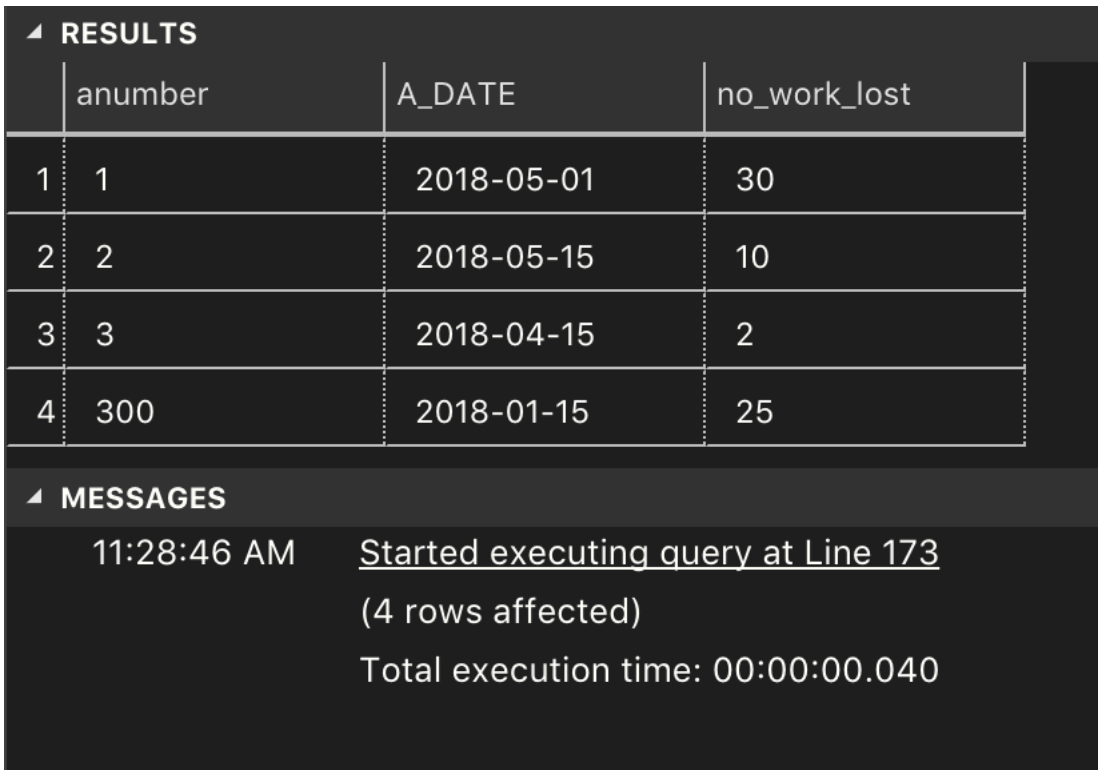
(24 rows affected)

Total execution time: 00:00:00.040

Creating Table For Accident:

create table accident(anumber int primary key,A_DATE date,no_work_lost int)

```
/*inserting into accident */
insert into accident values(100,'2018-10-11',10)
```



RESULTS

	anumber	A_DATE	no_work_lost
1	1	2018-05-01	30
2	2	2018-05-15	10
3	3	2018-04-15	2
4	300	2018-01-15	25

MESSAGES

11:28:46 AM Started executing query at Line 173

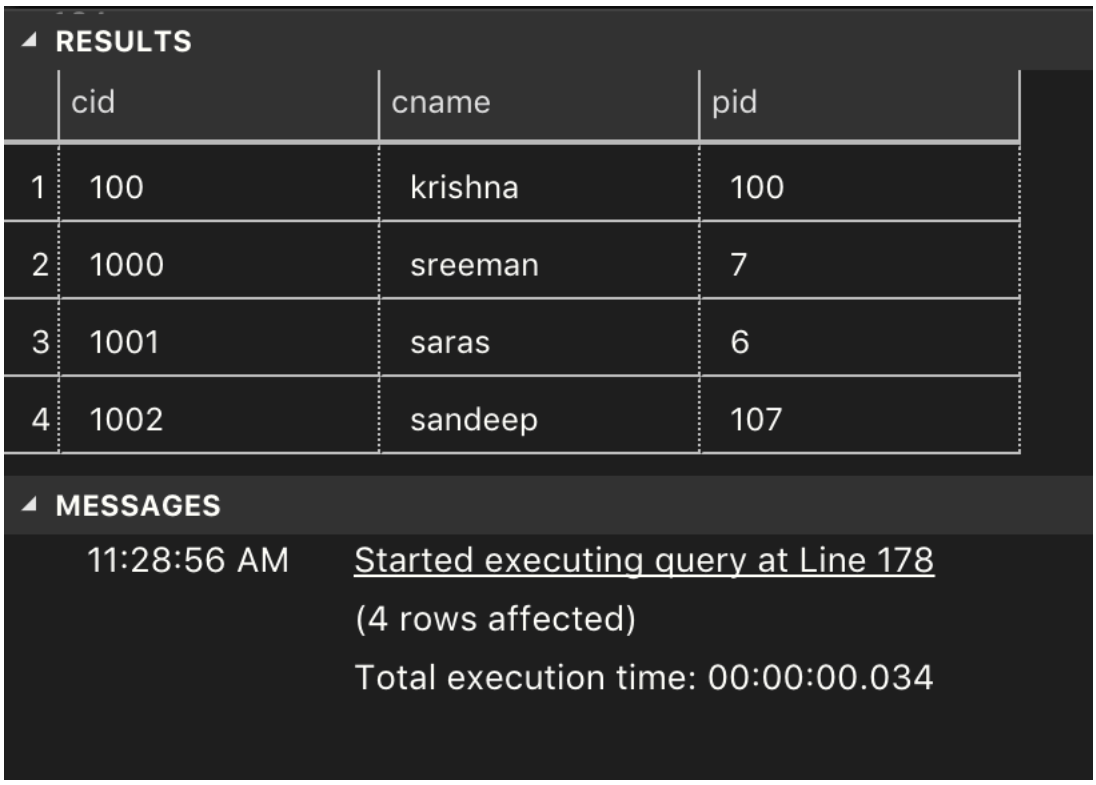
(4 rows affected)

Total execution time: 00:00:00.040

Creating Table For Error:

create table Error(cid int foreign key references complaint(cid) ON DELETE CASCADE, cname varchar(40) foreign key references customers(cname) ON DELETE CASCADE, pid int Foreign Key references product(pid) ON DELETE CASCADE,PRIMARY KEY (cid,cname,pid))

```
/*inserting into error*/
insert into error values(100,'krishna',100)
```



RESULTS

	cid	cname	pid
1	100	krishna	100
2	1000	sreeman	7
3	1001	saras	6
4	1002	sandeep	107

MESSAGES

11:28:56 AM Started executing query at Line 178

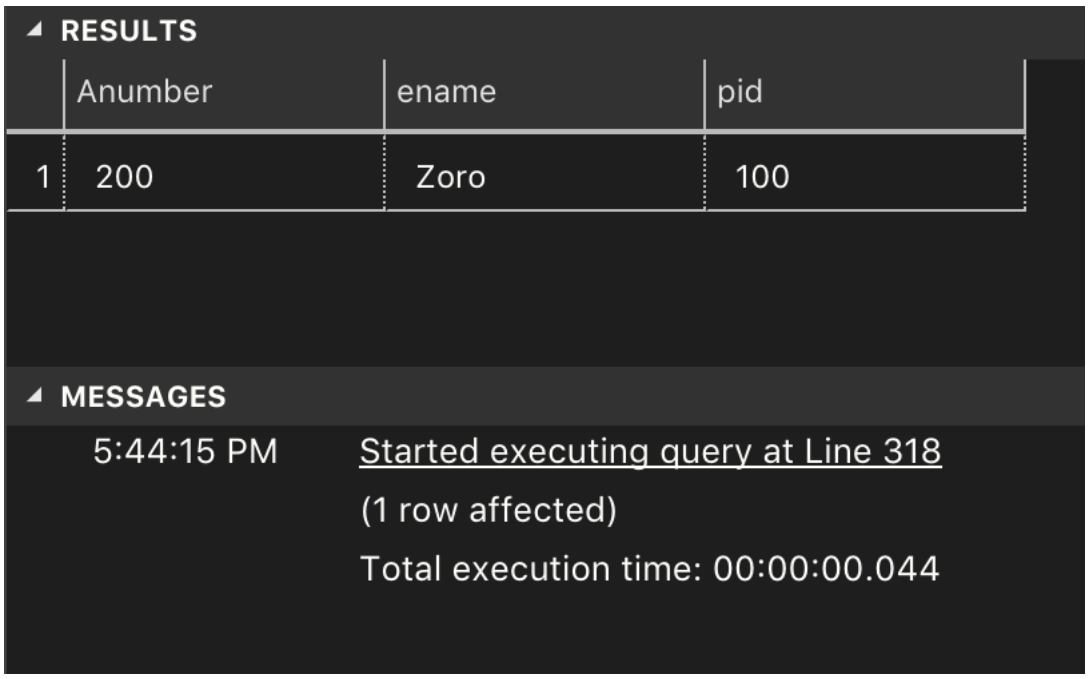
(4 rows affected)

Total execution time: 00:00:00.034

Creating Table For Accidents:

create table TS_Accident(Anumber int FOREIGN Key references accident(anumber) on Delete CASCADE,ename varchar(40) foreign key references TechnicalStaff(ename)on Delete CASCADE,pid int foreign key references product(pid)on Delete CASCADE, PRIMARY KEY (pid,ename,anumber))

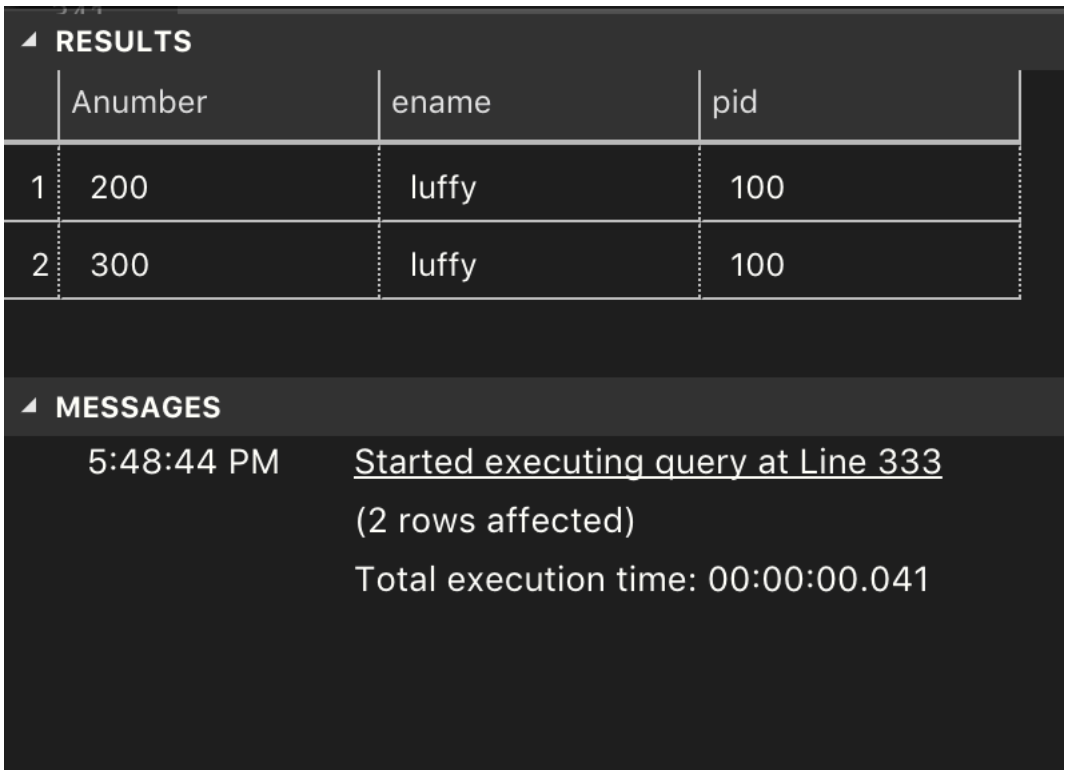
```
/* inserting into TS_Accident*/
insert into TS_Accident values(200,'Zoro',100)
```



Creating Table For W_Accidents:

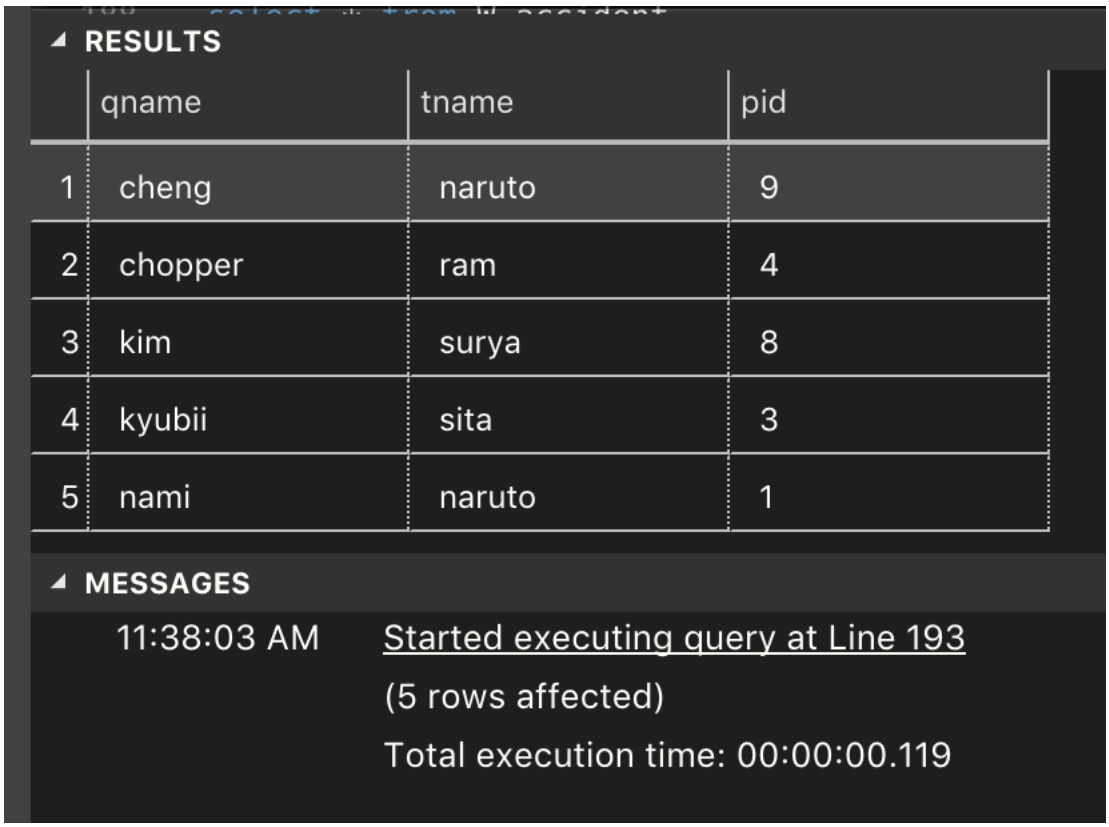
create table W_accident(Anumber int FOREIGN Key (anumber) references accident(anumber) ON DELETE CASCADE ,ename varchar(40) foreign key references worker(ename) ON DELETE CASCADE,pid int foreign key references product(pid) ON DELETE CASCADE, PRIMARY KEY (pid,ename,anumber))

```
/*inserting into W_Accident*/
INSERT into W_accident values(300,'luffy',100)
```



Creating Table For Requests:

create table requests(qname varchar(40) FOREIGN KEY references qualitycontroller(ename), tname varchar (40) FOREIGN KEY references technicalStaff(ename),pid int FOREIGN KEY references product(pid),PRIMARY KEY(qname,tname,pid))



RESULTS

	qname	tname	pid
1	cheng	naruto	9
2	chopper	ram	4
3	kim	surya	8
4	kyubii	sita	3
5	nami	naruto	1

MESSAGES

11:38:03 AM Started executing query at Line 193

(5 rows affected)

Total execution time: 00:00:00.119

Creating Table For Repairs:

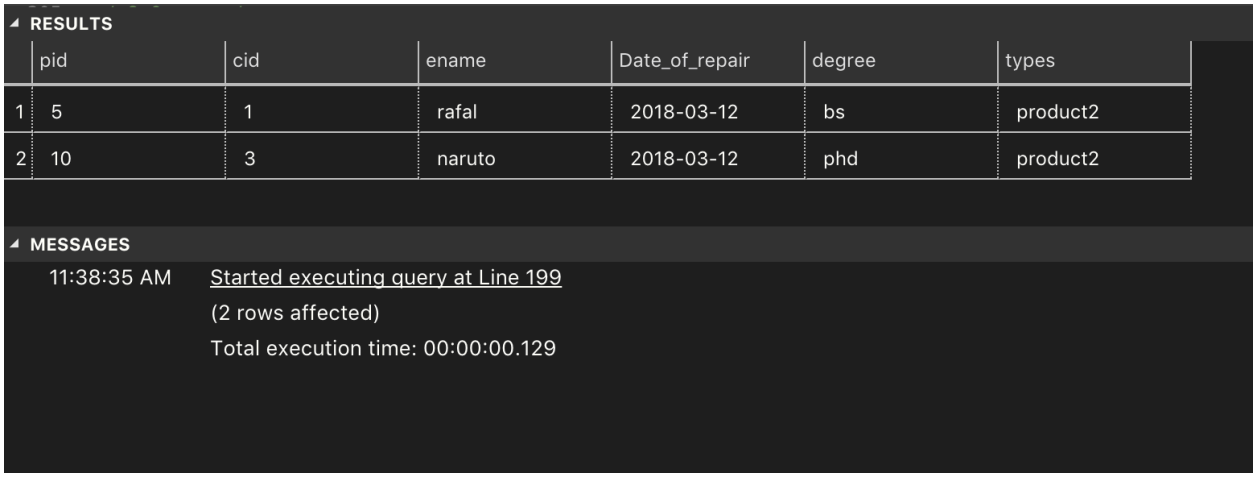
create table Repairs(pid int foreign key references product(pid) ON DELETE CASCADE, cid int foreign key references complaint(cid) ON DELETE CASCADE, ename varchar(40) foreign key references Technicalstaff(ename) ON DELETE CASCADE,Date_of_repair date,PRIMARY KEY(pid,cid,ename),)

```
ALTER TABLE Repairs ADD degree VARCHAR(20) CONSTRAINT deg CHECK (degree in
('BS','MS','Phd'));
ALTER TABLE Repairs ADD types VARCHAR(20) CONSTRAINT typ CHECK (types in
('Product1','Product2','Product3'));
ALTER TABLE Repairs ADD CONSTRAINT chk_degree CHECK (dbo.CEDUCATION(degree, types) =
1)


CREATE FUNCTION dbo.CEDUCATION(@D_g VARCHAR(20), @ty_p VARCHAR(20))
    RETURNS INT
AS
    BEGIN
        IF @ty_p in ('Product1') and @D_g not in ('MS','Phd')
            RETURN 0
        RETURN 1
    END
```

```
GO
```

This Function is is used to check the constraint that If a product1 has any problem, only a technical staff who has graduate education can repair it.



RESULTS

	pid	cid	ename	Date_of_repair	degree	types
1	5	1	rafal	2018-03-12	bs	product2
2	10	3	naruto	2018-03-12	phd	product2

MESSAGES

11:38:35 AM Started executing query at Line 199

(2 rows affected)

Total execution time: 00:00:00.129