Databases Individual Project

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Database Management Systems

CS4513-001 Fall 2021

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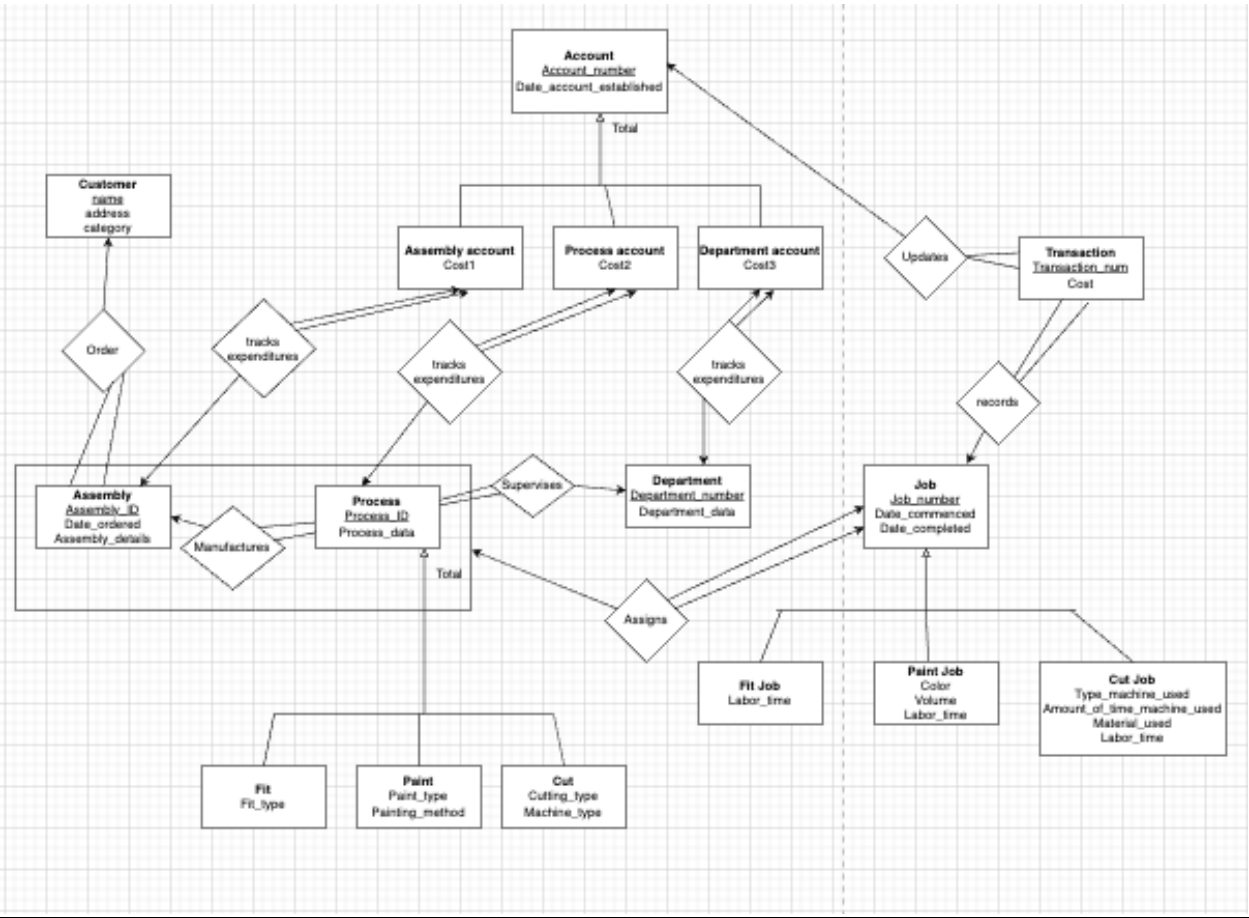
Tasks Performed **Page Number**

ER Diagram



Relational Database Schema

Customer(name, address, category)
Assembly1(assembly_id, date_ordered, assembly_details, name)
Process(process_id, process_data, assembly_id, department_number)
Fit_Process(process_id, process_data, assembly_id, department_number, fit_type)
Paint_Process(process_id, process_data, assembly_id, department_number, paint_type, painting method)
Cut_Process(process_id, process_data, assembly_id, department_number, cutting_type, machine_type)
Department(deparment_number, department_data)
Job(job_number, date_commenced, date_completed, assembly_id, process_id)
Fit_Job(job_number, labor_time)
Paint_Job(job_number, labor_time, color, volume)

Cut_Job(job_number, labor_time, type_machine_used, amount_of_time_machine_used, material_used)
Transaction(transanction_num, cost, job_number, account_number)
Account(account_number, date_account_established)
Assembly_Account(account_number, date_account_established, cost1, assembly_id)
Process_Account(account_number, date_account_established, cost2, process_id)
Department_Account(account_number, date_account_established, cost3, department_number)

Data Dictionary

Customer			
Variable	**Type**	**Size (bytes)**	**Constraints**
Name	varchar(64)	66	• Primary Key
Address	varchar(128)	130	• Not Null
Category	int	4	• Not Null • Check if integer from 1-10 inclusive

Assembly			
Variable	**Type**	**Size**	**Constraints**
Assembly_id	Int	4	• Primary Key
Date_ordered	Date	3	• Not Null
Assembly_details	Varchar(256)	258	• Not Null
Name	varchar(64)	66	• Not Null • Foreign Key REFERENCES customer

Process			
Variable	**Type**	**Size**	**Constraints**
Process_ID	Int	4	• Primary Key
Process_data	Varchar(128)	130	• Not Null
Assembly_id	Int	4	• Foreign Key REFERENCES Assembly
Department_number	Int	4	• Not Null • Foreign Key REFERENCES Department

Fit_Process			
Variable	**Type**	**Size**	**Constraints**
Process_ID	Int	4	• Primary Key
Process_data	Varchar(128)	130	• Not Null
Assembly_id	Int	4	• Foreign Key REFERENCES Assembly
Department_number	Int	4	• Not Null • Foreign Key REFERENCES Department
Fit_type	Varchar(64)	66	• Not Null

Paint_Process			
Variable	**Type**	**Size**	**Constraints**
Process_ID	Int	4	• Primary Key
Process_data	Varchar(128)	130	• Not Null
Assembly_id	Int	4	• Foreign Key REFERENCES Assembly
Department_number	Int	4	• Not Null • Foreign Key REFERENCES Department
Paint_type	Varchar(64)	66	• Not Null
Painting_method	Varchar(64)	66	• Not Null

Cut_Process			
Variable	**Type**	**Size**	**Constraints**
Process_ID	Int	4	• Primary Key
Process_data	Varchar(128)	130	• Not Null
Assembly_id	Int	4	• Not Null • Foreign Key REFERENCES Assembly
Department_number	Int	4	• Not Null • Foreign Key REFERENCES Department
Cutting_type	Varchar(64)	66	• Not Null
Machine_type	Varchar(64)	66	• Not Null

Department			
Variable	**Type**	**Size**	**Constraints**
Department_number	Int	4	• Primary Key
Department_data	Varchar(128)	130	• Not Null

Job			
Variable	**Type**	**Size**	**Constraints**
Job_number	Int	4	• Primary Key
Date_commenced	Date	3	• Not Null
Data_completed	Date	3	
Process_ID	Int	4	• Not Null • Foreign Key REFERENCES Process
Assembly_id	Int	4	• Not Null • Foreign Key REFERENCES Assembly

Fit_Job			
Variable	**Type**	**Size**	**Constraints**
Job_number	Int	4	• Primary Key
Labor_time	Time	5	• Not Null

Paint_Job			
Variable	**Type**	**Size**	**Constraints**
Job_number	Int	4	• Primary Key
Labor_time	Time	5	• Not Null
Color	Varchar(64)	66	• Not Null
Volume	Int	4	• Not Null

Cut_Job			
Variable	**Type**	**Size**	**Constraints**
Job_number	Int	4	• Primary Key
Labor_time	Time	5	• Not Null
Type_machine_used	Varchar(64)	66	• Not Null
Amount_of_time_machine_used	Time	5	• Not Null
Material_used	Varchar(64)	66	• Not Null

Transaction			
Variable	**Type**	**Size**	**Constraints**
Transaction_num	Int	4	• Primary Key

Cost	Int	4	• Not Null
Job_number	Int	4	• Not Null • Foreign Key REFERENCES Job
Account_number	Int	4	• Not Null • Foreign Key REFERENCES Account

Account			
Variable	**Type**	**Size**	**Constraints**
Account_number	Int	4	• Primary Key
Date_account_established	Date	3	• Not Null

Assembly_Account			
Variable	**Type**	**Size**	**Constraints**
Account_number	Int	4	• Primary Key
Date_account_established	Date	3	• Not Null
Cost1	Int	4	• Default = 0
Assembly_id	Int	4	• Foreign Key REFERENCES Assembly

Process_Account			
Variable	**Type**	**Size**	**Constraints**
Account_number	Int	4	• Primary Key
Date_account_established	Date	3	• Not Null
Cost2	Int	4	• Default = 0
Process_ID	Int	4	• Foreign Key REFERENCES Process

Department_Account			
Variable	**Type**	**Size**	**Constraints**
Account_number	Int	4	• Primary Key
Date_account_established	Date	3	• Not Null
Cost3	Int	4	• Default = 0
Department_number	Int	4	• Foreign Key REFERENCES Department

Discussion of Storage Structures for table

Table Name	Query# and Type	Search Key	Query Frequency	Selected File Organization
Customer	#1 – Insertion #13 – Random Search (result must be in name order)	#1 – no search key #13 – given range for category	#1 – 30/day #13 – 100/day	B+ Tree Index File where search key is name.
Justification				
I choose a B+ tree due to the speed it offers due to the high number of insertions and searches for this table. I chose a B+ tree because it offers less storage and better speed than the B tree. Insertion shouldn't be too hard. However, it is necessary to retrieve customers in order by their name in a given category range. I chose to have the search key be name instead of category so that it will decrease the I/O of the table to return the customers in name order. It will have to linearly search the B+ tree to see if the category is in the specified range.				

Table Name	Query# and Type	Search Key	Query Frequency	Selected File Organization
Assembly	#4 – Insertion	#4 – no search key	#4 – 40/day	Heap
Justification				
I chose a heap for this table as there is no need to ever search the table with the current queries. Therefore, I choose a heap as it offers the quickest insertion with the less storage.				

Table Name	Query# and Type	Search Key	Query Frequency	Selected File Organization
Process	#3 – Insertion #4 – Range Search #10 – Random Search # 11 – Range Search	#3 – no search key #4 – process_id #10 – department_number #11 – process_id #12 – department_number	#3 – infrequent #4 – 40/day #10 – 20/day #11 – 100/day #12 – 20/day	B+ tree where search key is process_id.

	#12 – Random search			
Justification				
I chose a B+ tree for the speed it offers with the high number of searches and insertions for this table. I chose the search key to be process_id due to the high number of searches that will need to use process_id. This table also has searches for department_number, however, it is a less frequent query than the searches for process_id.				

Table Name	**Query# and Type**	**Search Key**	**Query Frequency**	**Selected File Organization**
Fit Process	#3 – Insertion #4 – Range Search	#3 – no search key #4 – process_id	#3 – infrequent #4 – 40/day	B+ tree where search key is process_id.
Justification				
I chose a B+ tree for the speed it offers with the high number of searches and insertions for this table. I chose the search key to be process_id due to the high number of searches that will need to use process_id. This table only has searches done on it for process_id. This table will only be searched when the Process table is search. The search on this table is used to find more specific details about a certain process_id.				

Table Name	**Query# and Type**	**Search Key**	**Query Frequency**	**Selected File Organization**

Paint Process	#3 – Insertion #4 – Range Search	#3 – no search key #4 – process_id	#3 – infrequent #4 – 40/day	B+ tree where search key is process_id.
Justification				
I chose a B+ tree for the speed it offers with the high number of searches and insertions for this table. I chose the search key to be process_id due to the high number of searches that will need to use process_id. This table only has searches done on it for process_id. This table will only be searched when the Process table is search. The search on this table is used to find more specific details about a certain process_id.				

Table Name	**Query# and Type**	**Search Key**	**Query Frequency**	**Selected File Organization**
Cut Process	#3 – Insertion #4 – Range Search	#3 – no search key #4 – process_id	#3 – infrequent #4 – 40/day	B+ tree where search key is process_id.
Justification				
I chose a B+ tree for the speed it offers with the high number of searches and insertions for this table. I chose the search key to be process_id due to the high number of searches that will need to use process_id. This table only has searches done on it for process_id. This table will only be searched when the Process table is search. The search on this table is used to find more specific details about a certain process_id.				

Table Name	**Query# and Type**	**Search Key**	**Query Frequency**	**Selected File Organization**
Department	#2 – Insertion	#2 – no search key	#2 – infrequent	Heap
Justification				

A heap would be best for this table since it only has insertions and no searches, updates, or deletes. Thus, a heap would offer the fastest insertion since it only associates with an insertion query.

Table Name	Query# and Type	Search Key	Query Frequency	Selected File Organization
Job	#6 – Insertion #7 – Range Search #10 – Random Search #11 – Range search #12 – Random Search	#6 – no search key #7 – job_number #10 – process_id #11 – date_commenced #12 – date_completed	#6 – 50/day #7 – 50/day #10 – 20/day #11 – 100/day #12 – 20/day	I choose an indexed sequential files with a primary index on job number, secondary index on date commenced.
Justification				
I chose an indexed sequential file because of the different query request that this table has to go through. First of all, query #11 will only be used on this table because that query doesn't require knowledge about job type (just date commenced, process_id, and assembly_id). I choose a primary index on job_number which will be necessary for query #7. And, I chose to have a secondary index on date_commenced since query#11 is done 100/day. The other two queries are rather infrequent in comparison so another index is not needed.				

Table Name	Query# and Type	Search Key	Query Frequency	Selected File Organization
Fit Job	#7 – Insertion #10 – Range Search #12 – Range Search	#7 – none #10 – job_number #12 – job_number	#7 – 50/day #10 – 20/day #12 – 20/day	B+ tree where search key is job_number.
Justification				
I chose a B+ tree on job_number as the job_number is the most used search key out of the queries that this table goes through. I chose a B+ tree because of the speed it offers as well as the storage advantages that it offers.				

Table Name	Query# and Type	Search Key	Query Frequency	Selected File Organization
Paint Job	#7 – Insertion	#7 – none	#7 – 50/day	B+ tree where search key is job_number

	#10 – Range Search #12 – Range Search #15 – Range Search	#10 – job_number #12 – job_number #15 – job_number	#10 – 20/day #12 – 20/day #15 – 1/week	
Justification				
I chose a B+ tree on job_number as the job_number is the most used search key out of the queries that this table goes through. I chose a B+ tree because of the speed it offers as well as the storage advantages that it offers.				

Table Name	**Query# and Type**	**Search Key**	**Query Frequency**	**Selected File Organization**
Cut Job	#7 – Insertion #10 – Range Search #12 – Range Search #14 – Random Search	#7 – none #10 – job_number #12 – job_number #14 – job_number	#7 – 50/day #10 – 20/day #12 – 20/day #14 – 1/month	B+ tree where search key is job_number
Justification				
I chose a B+ tree on job_number as the job_number is the most used search key out of the queries that this table goes through. I chose a B+ tree because of the speed it offers as well as the storage advantages that it offers.				

Table Name	**Query# and Type**	**Search Key**	**Query Frequency**	**Selected File Organization**
Transaction	#8 – Insertion	#8 – no search key	#8 – 50/day	Heap file.
Justification				

I chose a heap file for this table because there are no searches being done on this table. A heap file offers the quickest insertion.

Table Name	Query# and Type	Search Key	Query Frequency	Selected File Organization
Account	#5 – Insertion	#5 – no search key number	#5 – 10/day	Heap file.
Justification				
Since this table is only involved in insertions, there is no need to create an index on this table. A heap would offer the best insertion time.				

Table Name	Query# and Type	Search Key	Query Frequency	Selected File Organization
Assembly Account	#5 – Insertion #8 – Range Search #9 – Range Search	#5 – no search key #8 – account_number #9 – account_number	#5 – 10/day #8 – 50/day #9 – 200/day	B+ tree where search key is account number.
Justification				
This table will be searched in a similar manner to the Department table. Since this table utilizes both insertion and search, it is beneficial to use a B+ tree as that will give us the fastest search time with minimal storage. The search key will be on account_number since that is the only value that we are searching on.				

Table Name	Query# and Type	Search Key	Query Frequency	Selected File Organization

Process Account	#5 – Insertion #8 – Range Search	#5 – no search key #8 – account_number	#5 – 10/day #8 – 50/day	B+ tree where search key is account number.
Justification				
This table will be searched in a similar manner to the Department table. Since this table utilizes both insertion and search, it is beneficial to use a B+ tree as that will give us the fastest search time with minimal storage. The search key will be on account_number since that is the only value that we are searching on.				

Table Name	**Query# and Type**	**Search Key**	**Query Frequency**	**Selected File Organization**
Department Account	#5 – Insertion #8 – Range Search	#5 – no search key #8 – account_number	#5 – 10/day #8 – 50/day	B+ tree where search key is account number.
Justification				
This table will be searched in a similar manner to the Department table. Since this table utilizes both insertion and search, it is beneficial to use a B+ tree as that will give us the fastest search time with minimal storage. The search key will be on account_number since that is the only value that we are searching on.				

Discussion of storage structures for tables (Azure SQL Database)

Azure SQL does not allow the option to create many storage structures. Every time that Azure makes an index, it creates a B+ tree to index the table. Therefore, Azure can only do 3 file organizations: B+ tree, clustered B+ tree, and a heap. Azure allows the option to create a clustered index. Also, if you don't create an index on the table, it will be inserted as a heap. Therefore, I couldn't create any hash-indexed files or anything other than the 3 choices that Azure offers me.

SQL Program for creation of tables and indexes

```
-- While working on the database design, it's useful to start from scratch every time
-- Hence, we drop tables in reverse order they are created (so the foreign key constraints are not violated)
```

```
DROP TABLE IF EXISTS Transaction1;
DROP TABLE IF EXISTS Department_Account;
DROP TABLE IF EXISTS Process_Account;
DROP TABLE IF EXISTS Assembly_Account;
DROP TABLE IF EXISTS Account;
DROP TABLE IF EXISTS Cut_Job;
DROP TABLE IF EXISTS Paint_Job;
DROP TABLE IF EXISTS Fit_Job;
DROP TABLE IF EXISTS Job;
DROP TABLE IF EXISTS Cut_Process;
DROP TABLE IF EXISTS Paint_Process;
DROP TABLE IF EXISTS Fit_Process;
DROP TABLE IF EXISTS Process;
DROP TABLE IF EXISTS Assembly1;
DROP TABLE IF EXISTS Department;
DROP TABLE IF EXISTS Customer;


-- Create tables
CREATE TABLE Customer (
  name VARCHAR(64) PRIMARY KEY,
  address VARCHAR(128) NOT NULL,
  category INT NOT NULL,

  CONSTRAINT category_range CHECK(category < 11 AND category > 0)
)

CREATE TABLE Department (
  department_number INT PRIMARY KEY,
  department_data VARCHAR(128) NOT NULL
)

CREATE TABLE Assembly1 ( -- Renamed to Assembly1 because Assembly isn't allowed
  assembly_id INT PRIMARY KEY,
  date_ordered DATE NOT NULL,
  assembly_details VARCHAR(256) NOT NULL,
  name VARCHAR(64) NOT NULL,
```

```
  CONSTRAINT FK_customer_name FOREIGN KEY (name) REFERENCES Customer
)

CREATE TABLE Process (
  process_id INT PRIMARY KEY,
  process_data VARCHAR(128) NOT NULL,
  assembly_id INT,
  department_number INT NOT NULL,

  CONSTRAINT FK_assembly_id FOREIGN KEY (assembly_id) REFERENCES Assembly1,
  CONSTRAINT FK_department_number FOREIGN KEY (department_number) REFERENCES Department
)

CREATE TABLE Fit_Process (
  process_id INT PRIMARY KEY,
  process_data VARCHAR(128) NOT NULL,
  fit_type VARCHAR(64) NOT NULL,
  assembly_id INT,
  department_number INT NOT NULL,

  CONSTRAINT FK_assembly_id2 FOREIGN KEY (assembly_id) REFERENCES Assembly1,
  CONSTRAINT FK_department_number2 FOREIGN KEY (department_number) REFERENCES Department
)

CREATE TABLE Paint_Process (
  process_id INT PRIMARY KEY,
  process_data VARCHAR(128) NOT NULL,
  paint_type VARCHAR(64) NOT NULL,
  painting_method VARCHAR(64) NOT NULL,
  assembly_id INT,
  department_number INT NOT NULL,

  CONSTRAINT FK_assembly_id3 FOREIGN KEY (assembly_id) REFERENCES Assembly1,
  CONSTRAINT FK_department_number3 FOREIGN KEY (department_number) REFERENCES Department
)
```

```
CREATE TABLE Cut_Process (
  process_id INT PRIMARY KEY,
  process_data VARCHAR(128) NOT NULL,
  cutting_type VARCHAR(64) NOT NULL,
  machine_type VARCHAR(64) NOT NULL,
  assembly_id INT,
  department_number INT NOT NULL,

  CONSTRAINT FK_assembly_id4 FOREIGN KEY (assembly_id) REFERENCES Assembly1,
  CONSTRAINT FK_department_number4 FOREIGN KEY (department_number) REFERENCES Department
)

CREATE TABLE Job (
  job_number INT PRIMARY KEY,
  date_commenced DATE NOT NULL,
  date_completed DATE,
  process_id INT NOT NULL,
  assembly_id INT NOT NULL,

  CONSTRAINT FK_process_id FOREIGN KEY (process_id) REFERENCES Process,
  CONSTRAINT FK_assembly_id5 FOREIGN KEY (assembly_id) REFERENCES Assembly1
)

CREATE TABLE Fit_Job (
  job_number INT PRIMARY KEY,
  labor_time TIME NOT NULL
)

CREATE TABLE Paint_Job (
  job_number INT PRIMARY KEY,
  labor_time TIME NOT NULL,
  color VARCHAR(64) NOT NULL,
  volume INT NOT NULL
)

CREATE TABLE Cut_Job (
  job_number INT PRIMARY KEY,
```

```
  labor_time TIME NOT NULL,
  type_machine_used VARCHAR(64) NOT NULL,
  amount_of_time_machine_used TIME NOT NULL,
  material_used VARCHAR(64) NOT NULL
)

CREATE TABLE Account (
  account_number INT PRIMARY KEY,
  date_account_established DATE NOT NULL
)

CREATE TABLE Assembly_Account (
  account_number INT PRIMARY KEY,
  date_account_established DATE NOT NULL,
  cost1 INT DEFAULT 0,
  assembly_id INT NOT NULL,

  CONSTRAINT FK_assembly_id9 FOREIGN KEY (assembly_id) REFERENCES Assembly1
)

CREATE TABLE Process_Account (
  account_number INT PRIMARY KEY,
  date_account_established DATE NOT NULL,
  cost2 INT DEFAULT 0,
  process_id INT NOT NULL,

  CONSTRAINT FK_process_id5 FOREIGN KEY (process_id) REFERENCES Process
)

CREATE TABLE Department_Account (
  account_number INT PRIMARY KEY,
  date_account_established DATE NOT NULL,
  cost3 INT DEFAULT 0,
  department_number INT NOT NULL

  CONSTRAINT FK_department_number5 FOREIGN KEY (department_number) REFERENCES Department
)
```

```
CREATE TABLE Transaction1 ( -- Renamed Transaction1 because Transaction isn't allowed
 transaction_num INT PRIMARY KEY,
 cost INT NOT NULL,
 job_number INT NOT NULL,
 account_number INT NOT NULL,

 CONSTRAINT FK_job_number FOREIGN KEY (job_number) REFERENCES Job,
 CONSTRAINT FK_account_number FOREIGN KEY (account_number) REFERENCES Account
)
-- Create Indexes on tables ----------------------------------

-- Customer Table Index on name
CREATE INDEX idx_customer
ON Customer (name);

-- Process Table Index on process_id
CREATE INDEX idx_process
ON Process (process_id);

-- Fit Process Table Index on process_id
CREATE INDEX idx_fit_process
ON Fit_Process (process_id);

-- Paint Process Table Index on process_id
CREATE INDEX idx_paint_process
ON Paint_Process (process_id);

-- Cut Process Table Index on process_id
CREATE INDEX idx_cut_process
ON Cut_Process (process_id);

-- Job Table with 2 Indexes
-- Primary Index on job_number; Secondary Index on date_commenced
CREATE INDEX idx_job
ON Job (job_number, date_commenced);
```

```sql
-- Fit Job Table Index on job_number
CREATE INDEX idx_fit_job
ON Fit_Job (job_number);

-- Paint Job Table Index on job_number
CREATE INDEX idx_paint_job
ON Paint_Job (job_number);

-- Cut Job Table Index on job_number
CREATE INDEX idx_cut_job
ON Cut_Job (job_number);

-- Assembly Account Table Index on account_number
CREATE INDEX idx_assembly_account
ON Assembly_Account (account_number);

-- Process Account Table Index on account_number
CREATE INDEX idx_process_account
ON Process_Account (account_number);

-- Department Account Table Index on account_number
CREATE INDEX idx_department_account
ON Department_Account (account_number);
```

Java source program for implementation of queries

```
import java.io.File;
import java.io.FileWriter;
import java.sql.Connection;
import java.sql.Statement;
import java.util.Scanner;
import java.sql.ResultSet;
import java.sql.SQLException;
import java.sql.DriverManager;
import java.sql.PreparedStatement;

public class DatabaseIP {

    // Database connection string
```

```
    final static String URL = "jdbc:sqlserver://trin0003-sql-
server.database.windows.net:1433;database=cs-dsa-4513-sql-db;user=trin0003@trin0003-sql-
server;password=ClearMap2013$;encrypt=true;trustServerCertificate=false;hostNameInCertifica
te=*.database.windows.net;loginTimeout=30;";

    final static String QUERY_TEMPLATE_1 = "INSERT INTO Customer " +
            "VALUES (?, ?, ?);";

    final static String QUERY_TEMPLATE_2 = "INSERT INTO Department " +
            "VALUES (?, ?);";

    final static String QUERY_TEMPLATE_3A = "INSERT INTO Process " +
            "VALUES (?, ?, ?, ?);";

    final static String QUERY_TEMPLATE_3FIT = "INSERT INTO Fit_Process " +
            "VALUES (?, ?, ?, ?, ?);";

    final static String QUERY_TEMPLATE_3PAINT = "INSERT INTO Paint_Process " +
            "VALUES (?, ?, ?, ?, ?, ?);";

    final static String QUERY_TEMPLATE_3CUT = "INSERT INTO Cut_Process " +
            "VALUES (?, ?, ?, ?, ?, ?);";

    final static String QUERY_TEMPLATE_4 = "INSERT INTO Assembly1 " +
            "VALUES (?, ?, ?, ?);";

    final static String QUERY_TEMPLATE_4B = "UPDATE Process\n" + "SET assembly_id =
?\n" + "WHERE process_id = ?;";
    final static String QUERY_TEMPLATE_4BFIT = "UPDATE Fit_Process\n" + "SET
assembly_id = ?\n" + "WHERE process_id = ?;";
    final static String QUERY_TEMPLATE_4BPAINT = "UPDATE Paint_Process\n" + "SET
assembly_id = ?\n" + "WHERE process_id = ?;";
    final static String QUERY_TEMPLATE_4BCUT = "UPDATE Cut_Process\n" + "SET
assembly_id = ?\n" + "WHERE process_id = ?;";

    final static String QUERY_TEMPLATE_5A = "INSERT INTO Account " +
            "VALUES (?, ?);";

    final static String QUERY_TEMPLATE_5B = "INSERT INTO Assembly_Account " +
            "VALUES (?, ?, ?, ?);";
    final static String QUERY_TEMPLATE_5C = "INSERT INTO Process_Account " +
            "VALUES (?, ?, ?, ?);";
    final static String QUERY_TEMPLATE_5D = "INSERT INTO Department_Account " +
            "VALUES (?, ?, ?, ?);";

    final static String QUERY_TEMPLATE_6 = "INSERT INTO Job " +
```

```
        "VALUES (?, ?, ?, ?, ?);";

    final static String QUERY_TEMPLATE_7 = "UPDATE Job\n" + "SET date_completed =
?\n" + "WHERE job_number = ?;";
    final static String QUERY_TEMPLATE_7FIT = "INSERT INTO Fit_Job " +
        "VALUES (?, ?);";
    final static String QUERY_TEMPLATE_7PAINT = "INSERT INTO Paint_Job " +
        "VALUES (?, ?, ?, ?);";
    final static String QUERY_TEMPLATE_7CUT = "INSERT INTO Cut_Job " +
        "VALUES (?, ?, ?, ?, ?);";

    final static String QUERY_TEMPLATE_8 = "INSERT INTO Transaction1 " +
        "VALUES (?, ?, ?, ?);";
    final static String QUERY_TEMPLATE_8ASSEMBLY = "UPDATE Assembly_Account\n"
+ "SET cost1 = cost1 + ?\n" + "WHERE account_number = ?;";
    final static String QUERY_TEMPLATE_8PROCESS = "UPDATE Process_Account\n" +
"SET cost2 = cost2 + ?\n" + "WHERE account_number = ?;";
    final static String QUERY_TEMPLATE_8DEPARTMENT = "UPDATE
Department_Account\n" + "SET cost3 = cost3 + ?\n" + "WHERE account_number = ?;";

    final static String QUERY_TEMPLATE_9 = "SELECT cost1 FROM Assembly_Account
WHERE assembly_id = ?;";

    final static String QUERY_TEMPLATE_10FIT = "SELECT  SUM(( DATEPART(hh,
labor_time) * 3600 ) + ( DATEPART(mi, labor_time) * 60 ) + DATEPART(ss, labor_time))/60
as minute\n"
        + "FROM Fit_Job WHERE Fit_Job.job_number in (\n"
        + "SELECT distinct(job_number) FROM Job\n"
        + "WHERE Job.process_id in (SELECT distinct(process_id) FROM Process WHERE
Process.department_number = ?) AND Job.date_completed = ? );";

    final static String QUERY_TEMPLATE_10PAINT = "SELECT  SUM(( DATEPART(hh,
labor_time) * 3600 ) + ( DATEPART(mi, labor_time) * 60 ) + DATEPART(ss, labor_time))/60
as minute\n"
        + "FROM Paint_Job WHERE Paint_Job.job_number in (\n"
        + "SELECT distinct(job_number) FROM Job\n"
        + "WHERE Job.process_id in (SELECT distinct(process_id) FROM Process WHERE
Process.department_number = ?) AND Job.date_completed = ? );";

    final static String QUERY_TEMPLATE_10CUT = "SELECT  SUM(( DATEPART(hh,
labor_time) * 3600 ) + ( DATEPART(mi, labor_time) * 60 ) + DATEPART(ss, labor_time))/60
as minute\n"
        + "FROM Cut_Job WHERE Cut_Job.job_number in (\n"
        + "SELECT distinct(job_number) FROM Job\n"
        + "WHERE Job.process_id in (SELECT distinct(process_id) FROM Process WHERE
Process.department_number = ?) AND Job.date_completed = ? );";
```

```
   final static String QUERY_TEMPLATE_11 = "SELECT Job.process_id,
Process.department_number, Job.date_commenced\n"
         + "    FROM Job, Process\n"
         + "    WHERE Job.assembly_id = ? AND Process.process_id = Job.process_id \n"
         + "    ORDER BY 1 ;";

   final static String QUERY_TEMPLATE_12A = "SELECT DISTINCT(Job.job_number),
Job.assembly_id, Fit_Job.labor_time\n"
         + "    FROM Job, Fit_Job\n"
         + "    WHERE date_completed = ? and Job.process_id in (SELECT process.process_id
FROM Process WHERE department_number = ?) AND Fit_Job.job_number =
Job.job_number;";

   final static String QUERY_TEMPLATE_12B = "SELECT DISTINCT(Job.job_number),
Job.assembly_id, Paint_Job.color, Paint_Job.volume, Paint_Job.labor_time\n"
         + "    FROM Job, Paint_Job\n"
         + "    WHERE date_completed = ? and Job.process_id in (SELECT process.process_id
FROM Process WHERE department_number = ?) AND Paint_Job.job_number =
Job.job_number;";

   final static String QUERY_TEMPLATE_12C = "SELECT DISTINCT(Job.job_number),
Job.assembly_id, Cut_Job.type_machine_used, Cut_Job.amount_of_time_machine_used,
Cut_Job.material_used, Cut_Job.labor_time\n"
         + "    FROM Job, Cut_Job\n"
         + "    WHERE date_completed = ? and Job.process_id in (SELECT process.process_id
FROM Process WHERE department_number = ?) AND Cut_Job.job_number =
Job.job_number;";

   final static String QUERY_TEMPLATE_13 = "SELECT name, category AS name FROM
Customer\n"
         + "    WHERE category >= ? AND category <= ?\n"
         + "    ORDER BY 1 ;";

   final static String QUERY_TEMPLATE_14 = "DELETE FROM Cut_Job WHERE
job_number >= ? AND job_number <= ?";

   final static String QUERY_TEMPLATE_15 = "UPDATE Paint_Job SET color = ? WHERE
job_number= ?;";

   // User input prompt //
   final static String PROMPT =
         "\nWELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM \n" +
         "(1) Enter a new customer \n" +
         "(2) Enter a new department \n" +
         "(3) Enter a new process and department together \n" +
```

```
        "(4) Enter a new assembly and associate it with one or more processes \n" +
        "(5) Create a new account and associate it with a process, assembly, or department \n" +
        "(6) Enter a new job and date the job began\n" +
        "(7) At the completion of a job, enter the date completed and relevant info \n" +
        "(8) Enter a transaction and update all the costs of affected accounts with the transaction
cost \n" +
        "(9) Retrieve the total cost incurred on a specific assembly \n" +
        "(10) Retrieve the total labor time within a department for jobs completed in the
department during a specific date \n" +
        "(11) Retrieve the processes which a specific assembly has passed so far and the
department responsible for each process \n" +
        "(12) Retrieve the jobs(with its associated assembly and type) completed during a
specific date in a specific department \n" +
        "(13) Retrieve the customers(in name order) whose category is in a specific range \n" +
        "(14) Delete all cut-jobs whose job-no is in a specific range \n" +
        "(15) Change the color of a specific paint job \n" +
        "(16) Import: Enter new customers from a data file until the file is empty (the user must
be asked to enter the input file name) \n" +
        "(17) Export: Retrieve the customers(in name order) whose category is in a given range
and output them to a data file instead of screen \n" +
        "(18) Quit \n";


    public static void main(String[] args) throws SQLException {

        final Scanner sc = new Scanner(System.in); // Scanner is used to collect the user input
        String option = ""; // Initialize user option selection as nothing
        while (!option.equals("18")) { // Ask user for options until option 3 is selected
            System.out.println(PROMPT); // Print the available options
            option = sc.next(); // Read in the user option selection

            switch (option) { // Switch between different options
                case "1": // Enter a new Customer
                    try { // In case of an error, this returns it to the main menu instead of terminating
program
                        // Collect data to input for the Customer
                        System.out.println("Please enter name of the new customer:");
                        sc.nextLine();
                        final String name = sc.nextLine();

                        System.out.println("Please enter address of the new customer:");

                        final String address = sc.nextLine();

                        System.out.println("Please enter Customer category (a number from 1-10): ");
                        final int category = sc.nextInt();
```

```
                sc.nextLine();

                System.out.println("Connecting to the database...");
                // Get a database connection and prepare a query statement
                try (final Connection connection = DriverManager.getConnection(URL)) {
                   try (final PreparedStatement statement =
connection.prepareStatement(QUERY_TEMPLATE_1)){
                      // Make a new customer and populate the database with it.
                      statement.setString(1, name);
                      statement.setString(2, address);
                      statement.setInt(3, category);

                      final int rows_inserted = statement.executeUpdate();
                      System.out.println(String.format("Done. %d rows inserted.",
rows_inserted));
                   }
                }
             } catch (Exception e) {
                System.out.println("You got an error! Returning to the main menu.");
             }

             break;
          case "2":
             try { // In case of an error, this returns it to the main menu instead of terminating
program
                // Read in the user input for Department information
                System.out.println("Please enter new department number:");
                final int department_number = sc.nextInt();

                System.out.println("Please enter department data:");
                sc.nextLine();

                final String department_data = sc.nextLine();



                try (final Connection connection = DriverManager.getConnection(URL)) {
                   // Add department first
                   try (final PreparedStatement statement =
connection.prepareStatement(QUERY_TEMPLATE_2)) {

                      statement.setInt(1, department_number);
                      statement.setString(2, department_data);

                      final int rows_inserted = statement.executeUpdate();
```

```
                    System.out.println(String.format("Done. %d rows inserted.",
rows_inserted));
                }
            }
        } catch (Exception e) {
            System.out.println("You got an error! Returning to the main menu.");
        }


        break;

    case "3": // Enter a Process
        try { // In case of an error, this returns it to the main menu instead of terminating
program
            System.out.println("Please enter a new process ID: ");
            final int process_id = sc.nextInt();

            System.out.println("Please enter the corresponding process_data: ");
            sc.nextLine();
            final String process_data = sc.nextLine();


            System.out.println("Please enter new department number associated with
process:");
            final int department_number3 = sc.nextInt();

            System.out.println("Please enter type of process (Fit, Paint, Cut)? ");
            sc.nextLine();
            final String type = sc.nextLine();

            String fit_type = "";
            String paint_type = "";
            String paint_method = "";
            String cutting_type = "";
            String machine_type = "";

            if (type.equals("Fit")) {

                System.out.println("Please enter the corresponding fit_type: ");
                fit_type = sc.nextLine();

            } else if (type.equals("Paint")) {

                System.out.println("Please enter the corresponding paint_type: ");
                paint_type = sc.nextLine();
                System.out.println("Please enter the corresponding paint_method: ");
```

```
                paint_method = sc.nextLine();

            } else if (type.equals("Cut")) {

                System.out.println("Please enter the corresponding cutting type: ");
                cutting_type = sc.nextLine();
                System.out.println("Please enter the corresponding machine type: ");
                machine_type = sc.nextLine();

            }

            System.out.println("Connecting to the database...");

            try (final Connection connection = DriverManager.getConnection(URL)) {
                // Add department first
                try (final PreparedStatement statement =
connection.prepareStatement(QUERY_TEMPLATE_3A)) {

                    statement.setInt(1, process_id);
                    statement.setString(2, process_data);
                    statement.setNull(3,java.sql.Types.INTEGER);
                    statement.setInt(4, department_number3);



                    final int rows_inserted2 = statement.executeUpdate();
                    System.out.println(String.format("Done. %d rows inserted.",
rows_inserted2));

                    if (type.equals("Fit")) {

                        //Add fit Process next
                        final PreparedStatement statement3 =
connection.prepareStatement(QUERY_TEMPLATE_3FIT);
                        statement3.setInt(1, process_id);
                        statement3.setString(2, process_data);
                        statement3.setString(3,fit_type);
                        statement3.setNull(4,java.sql.Types.INTEGER);
                        statement3.setInt(5, department_number3);

                        final int rows_inserted3 = statement3.executeUpdate();
                        System.out.println(String.format("Done. %d rows inserted.",
rows_inserted3));

                    } else if (type.equals("Paint")) {
```

```
                        //Add paint Process next
                        final PreparedStatement statement3 =
connection.prepareStatement(QUERY_TEMPLATE_3PAINT);
                        statement3.setInt(1, process_id);
                        statement3.setString(2, process_data);
                        statement3.setString(3,paint_type);
                        statement3.setString(4, paint_method);
                        statement3.setNull(5,java.sql.Types.INTEGER);
                        statement3.setInt(6, department_number3);

                        final int rows_inserted3 = statement3.executeUpdate();
                        System.out.println(String.format("Done. %d rows inserted.",
rows_inserted3));

                    } else if (type.equals("Cut")) {

                        //Add cut Process next
                        final PreparedStatement statement3 =
connection.prepareStatement(QUERY_TEMPLATE_3CUT);
                        statement3.setInt(1, process_id);
                        statement3.setString(2, process_data);
                        statement3.setString(3,cutting_type);
                        statement3.setString(4, machine_type);
                        statement3.setNull(5,java.sql.Types.INTEGER);
                        statement3.setInt(6, department_number3);

                        final int rows_inserted3 = statement3.executeUpdate();
                        System.out.println(String.format("Done. %d rows inserted.",
rows_inserted3));

                    }
                }
            }
        } catch (Exception e) {
            System.out.println("You got an error! Returning to the main menu.");
        }

        break;
    case "4": // Enter a new assembly and associate it with one or more processes
        try { // In case of an error, this returns it to the main menu instead of terminating
program
            // Read in the user input for assembly information
            System.out.println("Please enter new assembly id");
            final int assembly_id = sc.nextInt();
```

```
                System.out.println("Please enter date ordered of assembly in yyyy-mm-dd
format:");
                sc.nextLine();

                final String date_ordered= sc.nextLine();

                System.out.println("Please enter assembly_details: ");
                final String assembly_details = sc.nextLine();

                System.out.println("Please enter the customer name who ordered the asesembly:
");
                final String customer_name = sc.nextLine();

                System.out.println("How many processes is this assembly associated with: ");
                final int num_of_processes = sc.nextInt();

                int process_id_array[] = new int[num_of_processes];

                System.out.println("List all the process ID's associated. Please click enter after
each ID: ");

                for(int i = 0; i < num_of_processes; ++i)
                {
                   process_id_array[i] = sc.nextInt();
                }

                try (final Connection connection = DriverManager.getConnection(URL)) {
                   // Add assembly first
                   try (final PreparedStatement statement =
connection.prepareStatement(QUERY_TEMPLATE_4)) {

                      statement.setInt(1, assembly_id);
                      statement.setDate(2, java.sql.Date.valueOf(date_ordered));
                      statement.setString(3, assembly_details);
                      statement.setString(4, customer_name);

                      final int rows_inserted = statement.executeUpdate();
                      System.out.println(String.format("Done. %d rows inserted. Inserted
Assembly.", rows_inserted));

                      for(int i = 0; i < num_of_processes; ++i)
                      {
                         // Now associate the processes with the new assembly id
                         final PreparedStatement statement2 =
connection.prepareStatement(QUERY_TEMPLATE_4B);
                      statement2.setInt(1, assembly_id);
```

```
                        statement2.setInt(2, process_id_array[i]);
                        final int rows_inserted2 = statement2.executeUpdate();
                        System.out.println(String.format("Done. %d rows inserted. Process
associated.", rows_inserted2));

                        // Associate every Fit Process
                        final PreparedStatement statement3 =
connection.prepareStatement(QUERY_TEMPLATE_4BFIT);
                        statement3.setInt(1, assembly_id);
                        statement3.setInt(2, process_id_array[i]);
                        final int rows_inserted3 = statement3.executeUpdate();
                        System.out.println(String.format("Done. %d rows inserted. Fit Process
associated.", rows_inserted3));

                        // Associate every Cut Process
                        final PreparedStatement statement4 =
connection.prepareStatement(QUERY_TEMPLATE_4BCUT);
                        statement4.setInt(1, assembly_id);
                        statement4.setInt(2, process_id_array[i]);
                        final int rows_inserted4 = statement4.executeUpdate();
                        System.out.println(String.format("Done. %d rows inserted. Cut Process
associated.", rows_inserted4));

                        // Associated every Paint Process
                        final PreparedStatement statement5 =
connection.prepareStatement(QUERY_TEMPLATE_4BPAINT);
                        statement5.setInt(1, assembly_id);
                        statement5.setInt(2, process_id_array[i]);
                        final int rows_inserted5 = statement5.executeUpdate();
                        System.out.println(String.format("Done. %d rows inserted. Paint Process
associated.", rows_inserted5));

                    }
                }
            }
        } catch (Exception e) {
            System.out.println("You got an error! Returning to the main menu.");
        }

        break;

    case "5": //Enter a new account and associate it with the process, assembly, or
department
        try { // In case of an error, this returns it to the main menu instead of terminating
program
            // Read in the user input for Account information
```

```
                System.out.println("Please enter new account number:");
                final int account_number = sc.nextInt();

                System.out.println("Please enter date account established in yyyy-mm-dd
format:");
                sc.nextLine();

                final String date_account_established = sc.nextLine();

                System.out.println("Please enter associated process_id for the account:");
                final int account_process_id = sc.nextInt();

                System.out.println("Please enter associated assembly_id for the account:");
                final int account_assembly_id = sc.nextInt();

                System.out.println("Please enter associated department_number for the
account:");
                final int account_department_number = sc.nextInt();

                try (final Connection connection = DriverManager.getConnection(URL)) {
                   // Add department first
                   try (final PreparedStatement statement =
connection.prepareStatement(QUERY_TEMPLATE_5A)) {

                      statement.setInt(1, account_number);
                      statement.setDate(2, java.sql.Date.valueOf(date_account_established));

                      final int rows_inserted = statement.executeUpdate();
                      System.out.println(String.format("Done. %d rows inserted. Account
created.", rows_inserted));

                      // Insert Assembly Account
                      final PreparedStatement statement2 =
connection.prepareStatement(QUERY_TEMPLATE_5B);
                      statement2.setInt(1, account_number);
                      statement2.setDate(2, java.sql.Date.valueOf(date_account_established));
                      statement2.setInt(3, 0);
                      statement2.setInt(4, account_assembly_id);
                      final int rows_inserted2 = statement2.executeUpdate();
                      System.out.println(String.format("Done. %d rows inserted. Assembly
Account created.", rows_inserted2));

                      // Insert Process Account
                      final PreparedStatement statement3 =
connection.prepareStatement(QUERY_TEMPLATE_5C);
                      statement3.setInt(1, account_number);
```

```
                    statement3.setDate(2, java.sql.Date.valueOf(date_account_established));
                    statement3.setInt(3, 0);
                    statement3.setInt(4, account_process_id);
                    final int rows_inserted3 = statement3.executeUpdate();
                    System.out.println(String.format("Done. %d rows inserted. Process Account
created.", rows_inserted3));

                    // Insert Department Account
                    final PreparedStatement statement4 =
connection.prepareStatement(QUERY_TEMPLATE_5D);
                    statement4.setInt(1, account_number);
                    statement4.setDate(2, java.sql.Date.valueOf(date_account_established));
                    statement4.setInt(3, 0);
                    statement4.setInt(4, account_department_number);
                    final int rows_inserted4 = statement4.executeUpdate();
                    System.out.println(String.format("Done. %d rows inserted. Department
Account created.", rows_inserted4));
                  }
               }
            } catch (Exception e) {
               System.out.println("You got an error! Returning to the main menu.");
            }

            break;

         case "6":
            try { // In case of an error, this returns it to the main menu instead of terminating
program
               // Read in the user input for Job information
               System.out.println("Please enter new job number:");
               final int job_number = sc.nextInt();

               System.out.println("Please enter date commenced for the job in yyyy-mm-dd
format:");
               sc.nextLine();

               final String date_commenced = sc.nextLine();

               System.out.println("Please enter the associated assembly id for the job: ");
               final int job_assembly_id = sc.nextInt();

               System.out.println("Please enter the associated process id for the job: ");
               final int job_process_id = sc.nextInt();

               try (final Connection connection = DriverManager.getConnection(URL)) {
                  // Add department first
```

```
                    try (final PreparedStatement statement =
connection.prepareStatement(QUERY_TEMPLATE_6)) {

                        statement.setInt(1, job_number);
                        statement.setDate(2, java.sql.Date.valueOf(date_commenced));
                        statement.setNull(3, java.sql.Types.DATE);
                        statement.setInt(4, job_process_id);
                        statement.setInt(5, job_assembly_id);

                        final int rows_inserted = statement.executeUpdate();
                        System.out.println(String.format("Done. %d rows inserted.",
rows_inserted));
                    }
                }

            } catch (Exception e) {
                System.out.println("You got an error! Returning to the main menu.");
            }
            break;

        case "7": // Enter date completed and information related to type of job

            try { // In case of an error, this returns it to the main menu instead of terminating
program
                System.out.println("Please enter the job number completed :");
                final int job_number_completed = sc.nextInt();

                System.out.println("Please enter date completed for job in yyyy-mm-dd format:");
                sc.nextLine();
                final String date_completed = sc.nextLine();

                System.out.println("Please enter type of job (Fit, Paint, Cut)? ");
                final String job_type = sc.nextLine();

                // Have to intialize all variables
                String color, type_machine_used, material_used, labor_time,
amount_of_time_machine_used;
                color = "";
                type_machine_used = "";
                material_used = "";
                labor_time = "";
                amount_of_time_machine_used = "";

                int volume = 0;

                if(job_type.equals("Fit")) {
```

```
                System.out.println("Please enter labor time in hh:mm:ss format");
                labor_time = sc.nextLine();

            } else if (job_type.equals("Paint")) {

                System.out.println("Please enter labor time in hh:mm:ss format");
                labor_time = sc.nextLine();

                System.out.println("Please enter color for Paint job: ");
                color = sc.nextLine();

                System.out.println("Please enter the volume of paint: ");
                volume = sc.nextInt();

            } else if (job_type.equals("Cut")) {

                System.out.println("Please enter labor time in hh:mm:ss format");
                labor_time = sc.nextLine();

                System.out.println("Please enter the type of machine used: ");
                type_machine_used = sc.nextLine();

                System.out.println("Please enter amount of time machine used in hh:mm:ss
format");
                amount_of_time_machine_used = sc.nextLine();

                System.out.println("Please enter material used");
                material_used = sc.nextLine();
            }

            try (final Connection connection = DriverManager.getConnection(URL)) {
                // Add department first
                try (final PreparedStatement statement =
connection.prepareStatement(QUERY_TEMPLATE_7)) {

                    statement.setDate(1, java.sql.Date.valueOf(date_completed));
                    statement.setInt(2, job_number_completed);

                    final int rows_inserted = statement.executeUpdate();
                    System.out.println(String.format("Done. %d rows inserted.",
rows_inserted));

                    if(job_type.equals("Fit")) {
```

```
                        final PreparedStatement statement2 =
connection.prepareStatement(QUERY_TEMPLATE_7FIT);
                        statement2.setInt(1, job_number_completed);
                        statement2.setTime(2, java.sql.Time.valueOf(labor_time));

                        final int rows_inserted2= statement2.executeUpdate();
                        System.out.println(String.format("Done. %d rows inserted. Fit Job
Added.", rows_inserted2));

                    } else if (job_type.equals("Paint")) {

                        final PreparedStatement statement2 =
connection.prepareStatement(QUERY_TEMPLATE_7PAINT);
                        statement2.setInt(1, job_number_completed);
                        statement2.setTime(2, java.sql.Time.valueOf(labor_time));
                        statement2.setString(3, color);
                        statement2.setInt(4, volume);

                        final int rows_inserted2= statement2.executeUpdate();
                        System.out.println(String.format("Done. %d rows inserted. Paint Job
Added.", rows_inserted2));

                    } else if (job_type.equals("Cut")) {

                        final PreparedStatement statement2 =
connection.prepareStatement(QUERY_TEMPLATE_7CUT);
                        statement2.setInt(1, job_number_completed);
                        statement2.setTime(2, java.sql.Time.valueOf(labor_time));
                        statement2.setString(3, type_machine_used);
                        statement2.setTime(4,
java.sql.Time.valueOf(amount_of_time_machine_used));
                        statement2.setString(5, material_used);

                        final int rows_inserted2= statement2.executeUpdate();
                        System.out.println(String.format("Done. %d rows inserted. Cut Job
Added.", rows_inserted2));

                    }
                }
            }

        } catch (Exception e) {
            System.out.println("You got an error! Returning to the main menu.");
        }
        break;
    case "8": // Enter transaction and update costs of affected accounts
```

```
            try { // In case of an error, this returns it to the main menu instead of terminating
program
                // Read in the user input for transaction info
                System.out.println("Please enter new transaction number");
                final int transaction_number = sc.nextInt();

                System.out.println("Please enter cost:");
                final int transaction_cost = sc.nextInt();

                System.out.println("Enter the associated account number: ");
                final int transaction_account_number = sc.nextInt();

                System.out.println("Please enter the associated job number: ");
                final int transaction_job_number = sc.nextInt();


                try (final Connection connection = DriverManager.getConnection(URL)) {
                   // Add department first
                   try (final PreparedStatement statement =
connection.prepareStatement(QUERY_TEMPLATE_8)) {

                       statement.setInt(1, transaction_number);
                       statement.setInt(2, transaction_cost);
                       statement.setInt(3, transaction_job_number);
                       statement.setInt(4, transaction_account_number);

                       final int rows_inserted = statement.executeUpdate();
                       System.out.println(String.format("Done. %d rows inserted.",
rows_inserted));

                       final PreparedStatement statement2 =
connection.prepareStatement(QUERY_TEMPLATE_8ASSEMBLY);
                       statement2.setInt(1, transaction_cost);
                       statement2.setInt(2, transaction_account_number);

                       final int rows_inserted2 = statement2.executeUpdate();
                       System.out.println(String.format("Done. %d rows inserted. Assembly
Account updated", rows_inserted2));

                       final PreparedStatement statement3 =
connection.prepareStatement(QUERY_TEMPLATE_8PROCESS);
                       statement3.setInt(1, transaction_cost);
                       statement3.setInt(2, transaction_account_number);

                       final int rows_inserted3 = statement3.executeUpdate();
```

```
                    System.out.println(String.format("Done. %d rows inserted. Process Account
updated", rows_inserted3));

                    final PreparedStatement statement4 =
connection.prepareStatement(QUERY_TEMPLATE_8DEPARTMENT);
                    statement4.setInt(1, transaction_cost);
                    statement4.setInt(2, transaction_account_number);

                    final int rows_inserted4 = statement4.executeUpdate();
                    System.out.println(String.format("Done. %d rows inserted. Department
Account updated", rows_inserted4));
                }
            }
        } catch (Exception e) {
            System.out.println("You got an error! Returning to the main menu.");
        }

        break;

    case "9":
        try { // In case of an error, this returns it to the main menu instead of terminating
program
            // Read in the user input for assembly id
            System.out.println("Please enter assembly ID you want to find cost of:");
            final int cost_assembly_id = sc.nextInt();


            try (final Connection connection = DriverManager.getConnection(URL)) {
                // Add department first
                try (final PreparedStatement statement =
connection.prepareStatement(QUERY_TEMPLATE_9)) {

                    statement.setInt(1, cost_assembly_id);
                    final ResultSet resultSet = statement.executeQuery();

                    resultSet.next();
                    System.out.println(String.format("The cost associated with the assembly ID
is %s", resultSet.getInt(1)));
                }
            }
        } catch (Exception e) {
            System.out.println("You got an error! Returning to the main menu.");
        }
        break;
    case "10": // Retrieve total labor time
```

```
            try { // In case of an error, this returns it to the main menu instead of terminating
program
                // Read in the user input for department and completion date
                System.out.println("Please enter the department number:");
                final int time_department_number = sc.nextInt();

                System.out.println("Please enter the completion date in yyyy-mm-dd format:");
                sc.nextLine();
                final String time_completion_date = sc.nextLine();

                System.out.println("Connecting to the database...");

                int fit_time = 0;
                int paint_time = 0;
                int cut_time = 0;
                int total_time_in_minutes = 0;

                // Get a database connection and prepare a query statement
                try (final Connection connection = DriverManager.getConnection(URL)) {
                   try (final PreparedStatement statement =
connection.prepareStatement(QUERY_TEMPLATE_10FIT)){  // get total fit labor time

                        statement.setInt(1, time_department_number);
                        statement.setDate(2, java.sql.Date.valueOf(time_completion_date));

                        final ResultSet resultSet = statement.executeQuery();

                        resultSet.next();
                        fit_time += resultSet.getInt(1);

                        // get total paint labor time
                        final PreparedStatement statement2 =
connection.prepareStatement(QUERY_TEMPLATE_10PAINT);
                        statement2.setInt(1, time_department_number);
                        statement2.setDate(2, java.sql.Date.valueOf(time_completion_date));

                        final ResultSet resultSet2 = statement2.executeQuery();

                        resultSet2.next();
                        paint_time += resultSet2.getInt(1);

                        // get total cut labor time
                        final PreparedStatement statement3 =
connection.prepareStatement(QUERY_TEMPLATE_10CUT);
                        statement3.setInt(1, time_department_number);
                        statement3.setDate(2, java.sql.Date.valueOf(time_completion_date));
```

```
                    final ResultSet resultSet3 = statement3.executeQuery();

                    resultSet3.next();
                    cut_time += resultSet3.getInt(1);

                    total_time_in_minutes = fit_time + paint_time + cut_time;
                    System.out.println(String.format("The total labor time for jobs completed in
the department during a given date is %s"
                                    , total_time_in_minutes));
                }
              }
            } catch (Exception e) {
              System.out.println("You got an error! Returning to the main menu.");
            }
            break;

        case "11":
            try { // In case of an error, this returns it to the main menu instead of terminating
program
              // Read in the user input for assembly id
              System.out.println("Please enter the assembly id:");
              final int process_assembly_id = sc.nextInt();

              System.out.println("Connecting to the database...");
              // Get a database connection and prepare a query statement
              try (final Connection connection = DriverManager.getConnection(URL)) {
                try (final PreparedStatement statement =
connection.prepareStatement(QUERY_TEMPLATE_11)){  // get processes

                    statement.setInt(1, process_assembly_id);
                    final ResultSet resultSet = statement.executeQuery();

                    System.out.println("Processes through which a given assembly ID has
passed so far in date commenced order: ");
                    System.out.println(" Process ID | Department Number | Date Commenced ");

                    while (resultSet.next()) {
                      System.out.println(String.format("%s | %s | %s",
                            resultSet.getInt(1),
                            resultSet.getInt(2),
                            resultSet.getDate(3)));
                    }
                }
              }
            } catch (Exception e) {
```

```
                System.out.println("You got an error! Returning to the main menu.");
            }
            break;

        case "12": // Retrieve jobs completed during given date and given department
            try { // In case of an error, this returns it to the main menu instead of terminating
program
                // Read in the user input for job information
                System.out.println("Please enter the completion date in yyyy-mm-dd format: ");
                sc.nextLine();
                final String job_completion_date = sc.nextLine();

                System.out.println("Please enter the department number: ");
                final int job_department_number = sc.nextInt();

                System.out.println("Connecting to the database...");
                // Get a database connection and prepare a query statement
                try (final Connection connection = DriverManager.getConnection(URL)) {
                    try (final PreparedStatement statement =
connection.prepareStatement(QUERY_TEMPLATE_12A)){  // search fit jobs

                        statement.setDate(1, java.sql.Date.valueOf(job_completion_date));
                        statement.setInt(2, job_department_number);
                        final ResultSet resultSet = statement.executeQuery();

                        // Print out Fit Jobs
                        System.out.println("Fit Jobs completed during a given date in a given
department: ");
                        System.out.println("Job Number | Assembly ID | Labor Time
(hh:mm:ss)");
                        while (resultSet.next()) {
                            System.out.println(String.format("%s | %s | %s",
                                    resultSet.getInt(1),
                                    resultSet.getInt(2),
                                    resultSet.getTime(3)));
                        }
                        System.out.println("");

                        // Print out Paint Jobs
                        final PreparedStatement statement2 =
connection.prepareStatement(QUERY_TEMPLATE_12B);
                        statement2.setDate(1, java.sql.Date.valueOf(job_completion_date));
                        statement2.setInt(2, job_department_number);
                        final ResultSet resultSet2 = statement2.executeQuery();
```

```
                    System.out.println("Paint Jobs completed during a given date in a given
department: ");
                    System.out.println("Job Number | Assembly ID | color | volume | Labor
Time (hh:mm:ss)");
                    while (resultSet2.next()) {
                       System.out.println(String.format("%s | %s | %s | %s | %s",
                            resultSet2.getInt(1),
                            resultSet2.getInt(2),
                            resultSet2.getString(3),
                            resultSet2.getInt(4),
                            resultSet2.getTime(5)));
                    }
                    System.out.println("");

                    // Print out Cut Jobs
                    final PreparedStatement statement3 =
connection.prepareStatement(QUERY_TEMPLATE_12C);
                    statement3.setDate(1, java.sql.Date.valueOf(job_completion_date));
                    statement3.setInt(2, job_department_number);
                    final ResultSet resultSet3 = statement3.executeQuery();

                    System.out.println("Cut Jobs completed during a given date in a given
department: ");
                    System.out.println("Job Number | Assembly ID | Type Machine Used |
Amount of Time Machine Used (hh:mm:ss) | Material Used | Labor Time (hh:mm:ss)");
                        while (resultSet3.next()) {
                           System.out.println(String.format("%s | %s | %s | %s | %s | %s",
                                resultSet3.getInt(1),
                                resultSet3.getInt(2),
                                resultSet3.getString(3),
                                resultSet3.getTime(4),
                                resultSet3.getString(5),
                                resultSet3.getTime(6)));
                        }

                    }
                  }
                } catch (Exception e) {
                   System.out.println("You got an error! Returning to the main menu.");
                }
                break;
            case "13": // Retrieve customers in name order whose category is in a given range
              try { // In case of an error, this returns it to the main menu instead of terminating
program
                // Collect data to input for the Customer retrieval
                System.out.println("Please enter desired lower bound of category range: ");
```

```
                final int lower_bound = sc.nextInt();

                System.out.println("Please enter desired upper bound of category range:");
                final int upper_bound = sc.nextInt();

                System.out.println("Connecting to the database...");
                // Get a database connection and prepare a query statement
                try (final Connection connection = DriverManager.getConnection(URL)) {
                   try (final PreparedStatement statement =
connection.prepareStatement(QUERY_TEMPLATE_13)){
                      // Make a new customer and populate the database with it.
                      statement.setInt(1,lower_bound);
                      statement.setInt(2, upper_bound);

                      final ResultSet resultSet = statement.executeQuery();

                      // Print out Customers
                      System.out.println("Customers (in name order)");
                      while (resultSet.next()) {
                         System.out.println(String.format("%s",
                               resultSet.getString(1)));
                      }
                   }
                }
             } catch (Exception e) {
                System.out.println("You got an error! Returning to the main menu.");
             }

             break;
          case "14": // Delete all cut jobs in a given range
             try { // In case of an error, this returns it to the main menu instead of terminating
program
                // Collect data to input for the job deletion
                System.out.println("Please enter desired lower bound of job number range: ");
                final int job_lower_bound = sc.nextInt();

                System.out.println("Please enter desired upper bound of job number range:");
                final int job_upper_bound = sc.nextInt();

                System.out.println("Connecting to the database...");
                // Get a database connection and prepare a query statement
                try (final Connection connection = DriverManager.getConnection(URL)) {
                   try (final PreparedStatement statement =
connection.prepareStatement(QUERY_TEMPLATE_14)){
                      // Make a new customer and populate the database with it.
                      statement.setInt(1,job_lower_bound);
```

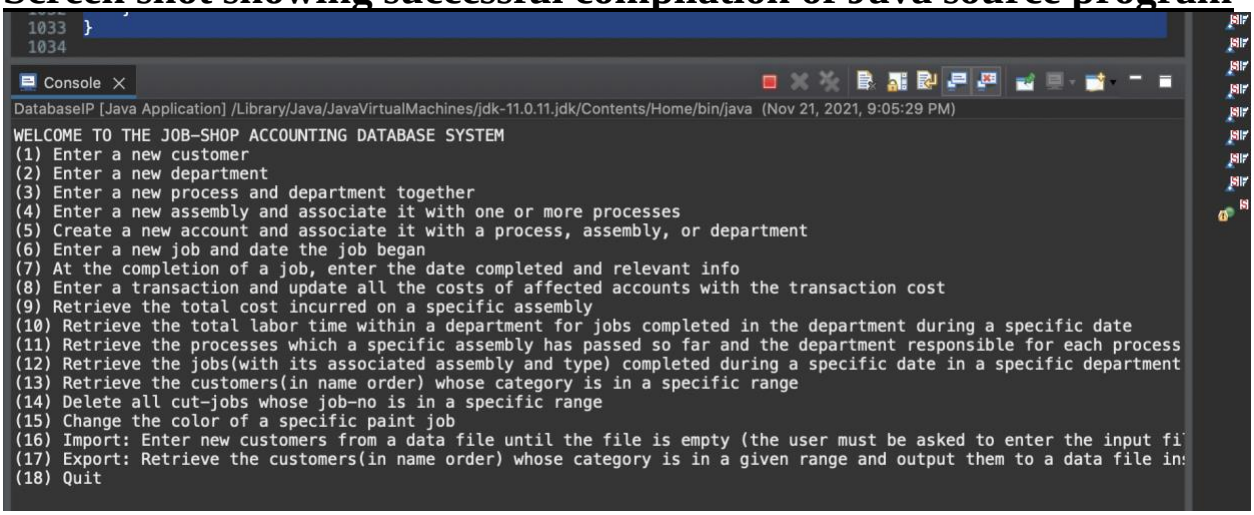
```
                    statement.setInt(2, job_upper_bound);

                    statement.executeUpdate();

                    // Print out Customers
                    System.out.println(String.format("Job numbers from %s to %s are deletd.",
                          job_lower_bound, job_upper_bound));
                 }
               }
            } catch (Exception e) {
               System.out.println("You got an error! Returning to the main menu.");
            }
            break;
         case "15": // Change color of a given paint job
            try { // In case of an error, this returns it to the main menu instead of terminating
program
               // Collect data to input for the color change
               System.out.println("What is the paint job number you wish to update: ");
               final int color_job_number = sc.nextInt();

               System.out.println("Please enter the color you wish to update to:");
               sc.nextLine();
               final String new_color = sc.nextLine();

               System.out.println("Connecting to the database...");
               // Get a database connection and prepare a query statement
               try (final Connection connection = DriverManager.getConnection(URL)) {
                  try (final PreparedStatement statement =
connection.prepareStatement(QUERY_TEMPLATE_15)){
                    // Make a new customer and populate the database with it.
                    statement.setString(1, new_color);
                    statement.setInt(2, color_job_number);

                    int rows_updated = statement.executeUpdate();
                    System.out.println(String.format("Done. %d rows updated.",
rows_updated));
                 }
               }
            } catch (Exception e) {
               System.out.println("You got an error! Returning to the main menu.");
            }
            break;

         case "16":
            // try and catch are used to not terminate loop in case of error.
            try {
```

```
                String line;

                // Retrieve input file name from user
                System.out.println("Enter the file-name to import data.");
                sc.nextLine();
                String file_name = sc.nextLine();

                File file = new File(file_name);

                // Creating new Scanner Object to read in file
                Scanner filescanner = new Scanner(file);

                // Read in input file
                while(filescanner.hasNextLine()) {
                   line = filescanner.nextLine();

                   // Dividing line to parts separated by Delimiter (",")
                   String[] parts = line.split(",");

                   String file_customer_name = parts[0];
                   String file_address = parts[1];
                   int file_category= Integer.parseInt(parts[2]);

                   System.out.println("Connecting to the database...");
                   // Get a database connection and prepare a query statement
                   try (final Connection connection = DriverManager.getConnection(URL)) {
                      try (final PreparedStatement statement =
connection.prepareStatement(QUERY_TEMPLATE_1)){
                       // Make a new customer and populate the database with it.
                         statement.setString(1, file_customer_name);
                         statement.setString(2, file_address);
                         statement.setInt(3, file_category);

                         final int rows_inserted = statement.executeUpdate();
                         System.out.println(String.format("Done. %d rows inserted.",
rows_inserted));
                      }
                   }


                }

                } catch (Exception e) {
                   System.out.print("You got an error!. Returning to main menu");
                }
             break;
```

```
            case "17":
               // try and catch are used to not terminate loop in case of error.
               try {

                  // Enter the filename to output result
                  System.out.println("Enter the file-name to Export data.");
                  sc.nextLine();
                  final String file_name1 = sc.nextLine();

                  // Taking lower bound of category from user
                  System.out.println("Enter the lower bound of category.");
                  final int lower_bound2 = sc.nextInt();

                  // Taking upper bound of category from user
                  System.out.println("Enter the upper bound of category.");
                  final int upper_bound2 = sc.nextInt();

                  // Creating new file writer Object
                  FileWriter fw = new FileWriter(file_name1);

                  System.out.println("Connecting to the database...");
                  // Get a database connection and prepare a query statement
                  try (final Connection connection = DriverManager.getConnection(URL)) {
                     try (final PreparedStatement statement =
connection.prepareStatement(QUERY_TEMPLATE_13)){
                        // Make a new customer and populate the database with it.
                        statement.setInt(1,lower_bound2);
                        statement.setInt(2, upper_bound2);
                        final ResultSet resultSet = statement.executeQuery();

                        // Output customer name to data file
                        while (resultSet.next()) {
                           fw.write("Customer name is " + resultSet.getString(1) + "\n");
                        }
                        fw.close();
                     } catch (SQLException e) {
                        e.getCause().getMessage();
                     }
                  }

                  } catch (Exception e) {
                     System.out.println("You got an error!. Returning to main menu");
                  }
               break;
            case "18": // Do nothing, the while loop will terminate upon the next iteration
               System.out.println("Quitting.");
```

```
            break;

         default: // Unrecognized option, re-prompt the user for the correct one
            System.out.println(String.format(
               "Unrecognized option: %s\n" +
               "Please try again!",
               option));
            break;
      }
   }

   sc.close(); // Close the scanner before exiting the application
  }
}
```

Screen shot showing successful compilation of Java source program



5 queries of Query#1

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

1
Please enter name of the new customer:
Bob Hope
Please enter address of the new customer:
1098 Washington Avenue, Oklahoma City, Oklahoma, 70941
Please enter Customer category (a number from 1-10):
3
Connecting to the database...
Done. 1 rows inserted.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
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(15) Change the color of a specific paint job
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(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

1
Please enter name of the new customer:
Mike Tyson
Please enter address of the new customer:
9998 Oklahoma St., Morgantown, West Virginia, 12424
Please enter Customer category (a number from 1-10):
4
Connecting to the database...
Done. 1 rows inserted.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
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(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

1
Please enter name of the new customer:
Buzz Lightyear
Please enter address of the new customer:
10922 Main St., Garden Grove, California, 90210
Please enter Customer category (a number from 1-10):
7
Connecting to the database...
Done. 1 rows inserted.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

1
Please enter name of the new customer:
Pope Stevens
Please enter address of the new customer:
90412 Norman Avenue, Norman, Oklahoma, 70891
Please enter Customer category (a number from 1-10):
10
Connecting to the database...
Done. 1 rows inserted.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

1
Please enter name of the new customer:
Koi Fish
Please enter address of the new customer:
8958 Geico Trail, Nowhere, Oklahoma, 90423
Please enter Customer category (a number from 1-10):
6
Connecting to the database...
Done. 1 rows inserted.

Content of Customer Table after 5 queries of Query#1

Results Messages

	name	address	category
1	Bob Hope	1098 Washington Avenue, O…	3
2	Buzz Lightyear	10922 Main St., Garden Gr…	7
3	Koi Fish	8958 Geico Trail, Nowhere…	6
4	Mike Tyson	9998 Oklahoma St., Morgan…	4
5	Pope Stevens	90412 Norman Avenue, Norm…	10

s

5 queries of Query#2

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

2
Please enter new department number:
1
Please enter department data:
This department is a pretty good department
Done. 1 rows inserted.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
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(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)

(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

2
Please enter new department number:
2
Please enter department data:
The underwater department
Done. 1 rows inserted.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

2
Please enter new department number:
3
Please enter department data:
The department in heaven
Done. 1 rows inserted.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

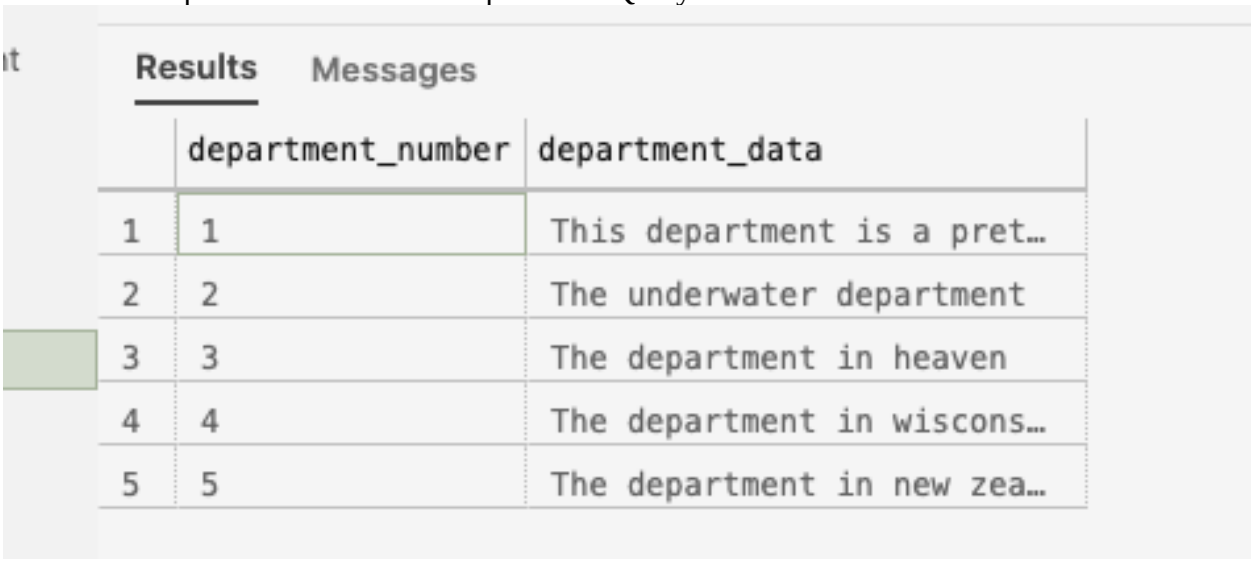
2
Please enter new department number:
4
Please enter department data:
The department in wisconsin
Done. 1 rows inserted.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department

(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

2
Please enter new department number:
5
Please enter department data:
The department in new zealand
Done. 1 rows inserted.

Content of Department Table after 5 queries of Query#2



Results Messages

	department_number	department_data
1	1	This department is a pret…
2	2	The underwater department
3	3	The department in heaven
4	4	The department in wiscons…
5	5	The department in new zea…

10 Queries of Query#3

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

3
Please enter a new process ID:
420

Please enter the corresponding process_data:
This process is meant to be done quickly
Please enter new department number associated with process:
1
Please enter type of process (Fit, Paint, Cut)?
Fit
Please enter the corresponding fit_type:
The fit must be tight
Connecting to the database...
Done. 1 rows inserted.
Done. 1 rows inserted.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

421
Unrecognized option: 421
Please try again!

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

3
Please enter a new process ID:
421
Please enter the corresponding process_data:
This process is going to manufacture desks
Please enter new department number associated with process:
1
Please enter type of process (Fit, Paint, Cut)?
Paint
Please enter the corresponding paint_type:
Glossy
Please enter the corresponding paint_method:
By Hand
Connecting to the database...

Done. 1 rows inserted.
Done. 1 rows inserted.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

3
Please enter a new process ID:
422
Please enter the corresponding process_data:
This process is going to make desks
Please enter new department number associated with process:
1
Please enter type of process (Fit, Paint, Cut)?
Cut
Please enter the corresponding cutting type:
Square
Please enter the corresponding machine type:
Csar Saw
Connecting to the database...
Done. 1 rows inserted.
Done. 1 rows inserted.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

3
Please enter a new process ID:
423
Please enter the corresponding process_data:
This is going to make notebooks
Please enter new department number associated with process:
2
Please enter type of process (Fit, Paint, Cut)?
Fit
Please enter the corresponding fit_type:

Not too tight
Connecting to the database...
Done. 1 rows inserted.
Done. 1 rows inserted.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

3
Please enter a new process ID:
424
Please enter the corresponding process_data:
THis is going to make the color of the notebook cover
Please enter new department number associated with process:
2
Please enter type of process (Fit, Paint, Cut)?
Paint
Please enter the corresponding paint_type:
Matte
Please enter the corresponding paint_method:
Laser Painted
Connecting to the database...
Done. 1 rows inserted.
Done. 1 rows inserted.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

3
Please enter a new process ID:
425
Please enter the corresponding process_data:
This will cut the notebook into rectangles
Please enter new department number associated with process:
2
Please enter type of process (Fit, Paint, Cut)?

Cut
Please enter the corresponding cutting type:
Rectangular
Please enter the corresponding machine type:
A Laser Cutter
Connecting to the database...
Done. 1 rows inserted.
Done. 1 rows inserted.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

3
Please enter a new process ID:
426
Please enter the corresponding process_data:
This will make monitors
Please enter new department number associated with process:
3
Please enter type of process (Fit, Paint, Cut)?
Fit
Please enter the corresponding fit_type:
Has to fit on my desk
Connecting to the database...
Done. 1 rows inserted.
Done. 1 rows inserted.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

3
Please enter a new process ID:
427
Please enter the corresponding process_data:
This will paint the back of the monitor black
Please enter new department number associated with process:

3
Please enter type of process (Fit, Paint, Cut)?
Paint
Please enter the corresponding paint_type:
Shiny Paint
Please enter the corresponding paint_method:
With your fingers
Connecting to the database...
Done. 1 rows inserted.
Done. 1 rows inserted.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

3
Please enter a new process ID:
428
Please enter the corresponding process_data:
This will make macbooks
Please enter new department number associated with process:
4
Please enter type of process (Fit, Paint, Cut)?
Cut
Please enter the corresponding cutting type:
Cut Meta
Please enter the corresponding machine type:
Metal Cutter
Connecting to the database...
Done. 1 rows inserted.
Done. 1 rows inserted.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

3
Please enter a new process ID:

429
Please enter the corresponding process_data:
This will make apple headphones
Please enter new department number associated with process:
5
Please enter type of process (Fit, Paint, Cut)?
Paint
Please enter the corresponding paint_type:
Paint White
Please enter the corresponding paint_method:
With a brush
Connecting to the database...
Done. 1 rows inserted.
Done. 1 rows inserted.

Content of Process Table after 10 queries of Query#3

Results Messages

	process_id	process_data	assembly_id	department_number
1	420	This process is meant to …	*NULL*	1
2	421	This process is going to …	*NULL*	1
3	422	This process is going to …	*NULL*	1
4	423	This is going to make not…	*NULL*	2
5	424	THis is going to make the…	*NULL*	2
6	425	This will cut the noteboo…	*NULL*	2
7	426	This will make monitors	*NULL*	3
8	427	This will paint the back …	*NULL*	3
9	428	This will make macbooks	*NULL*	4
10	429	This will make apple head…	*NULL*	5

Content of Fit Process Table after 10 queries of Query#3

Results Messages

	process_id	process_data	fit_type	assembly_id	department_number
1	420	This process is meant to …	The fit must be tight	*NULL*	1
2	423	This is going to make not…	Not too tight	*NULL*	2
3	426	This will make monitors	Has to fit on my desk	*NULL*	3

Content of Paint Process Table after 10 queries of Query#3

Results Messages

	process_id	process_data	paint_type	painting_method	assembly_id	department_number
1	421	This process is going to …	Glossy	By Hand	*NULL*	1
2	424	THis is going to make the…	Matte	Laser Painted	*NULL*	2
3	427	This will paint the back …	Shiny Paint	With your fingers	*NULL*	3
4	429	This will make apple head…	Paint White	With a brush	*NULL*	5

Content of Cut Process Table after 10 queries of Query#3

Results Messages

	process_id	process_data	cutting_type	machine_type	assembly_id	department_number
1	422	This process is going to …	Square	Csar Saw	*NULL*	1
2	425	This will cut the noteboo…	Rectangular	A Laser Cutter	*NULL*	2
3	428	This will make macbooks	Cut Meta	Metal Cutter	*NULL*	4

10 Queries of Query#4

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

4
Please enter new assembly id
69
Please enter date ordered of assembly in yyyy-mm-dd format:
2020-01-01
Please enter assembly_details:
This assembles manufactures notebooks
Please enter the customer name who ordered the asesembly:
Bob Hope
How many processes is this assembly associated with:
1
List all the process ID's associated. Please click enter after each ID:
420
Done. 1 rows inserted. Inserted Assembly.
Done. 1 rows inserted. Process associated.
Done. 1 rows inserted. Fit Process associated.
Done. 0 rows inserted. Cut Process associated.
Done. 0 rows inserted. Paint Process associated.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together

(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

4
Please enter new assembly id
70
Please enter date ordered of assembly in yyyy-mm-dd format:
2020-01-01
Please enter assembly_details:
This assembles manufactures the best
Please enter the customer name who ordered the asesembly:
Bob Hope
How many processes is this assembly associated with:
1
List all the process ID's associated. Please click enter after each ID:
421
Done. 1 rows inserted. Inserted Assembly.
Done. 1 rows inserted. Process associated.
Done. 0 rows inserted. Fit Process associated.
Done. 0 rows inserted. Cut Process associated.
Done. 1 rows inserted. Paint Process associated.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

4
Please enter new assembly id
72
Please enter date ordered of assembly in yyyy-mm-dd format:
2020-01-02
Please enter assembly_details:
This assembles Teslas
Please enter the customer name who ordered the asesembly:
Bob Hope
How many processes is this assembly associated with:
1
List all the process ID's associated. Please click enter after each ID:
422
Done. 1 rows inserted. Inserted Assembly.

Done. 1 rows inserted. Process associated.
Done. 0 rows inserted. Fit Process associated.
Done. 1 rows inserted. Cut Process associated.
Done. 0 rows inserted. Paint Process associated.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

4
Please enter new assembly id
73
Please enter date ordered of assembly in yyyy-mm-dd format:
2020-01-03
Please enter assembly_details:
This assembles notebookos
Please enter the customer name who ordered the asesembly:
Buzz Lightyear
How many processes is this assembly associated with:
1
List all the process ID's associated. Please click enter after each ID:
423
Done. 1 rows inserted. Inserted Assembly.
Done. 1 rows inserted. Process associated.
Done. 1 rows inserted. Fit Process associated.
Done. 0 rows inserted. Cut Process associated.
Done. 0 rows inserted. Paint Process associated.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

4
Please enter new assembly id
74
Please enter date ordered of assembly in yyyy-mm-dd format:
2020-01-05

Please enter assembly_details:
This assembles laptops
Please enter the customer name who ordered the asesembly:
Buzz Lightyear
How many processes is this assembly associated with:
0
List all the process ID's associated. Please click enter after each ID:
Done. 1 rows inserted. Inserted Assembly.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
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(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

4
Please enter new assembly id
75
Please enter date ordered of assembly in yyyy-mm-dd format:
2020-01-01
Please enter assembly_details:
This assembles the Mach7 Landing Pad
Please enter the customer name who ordered the asesembly:
Koi Fish
How many processes is this assembly associated with:
1
List all the process ID's associated. Please click enter after each ID:
424
Done. 1 rows inserted. Inserted Assembly.
Done. 1 rows inserted. Process associated.
Done. 0 rows inserted. Fit Process associated.
Done. 0 rows inserted. Cut Process associated.
Done. 1 rows inserted. Paint Process associated.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
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(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

4

Please enter new assembly id
76
Please enter date ordered of assembly in yyyy-mm-dd format:
2020-01-09
Please enter assembly_details:
This assembles fountain pains
Please enter the customer name who ordered the asesembly:
Koi Fish
How many processes is this assembly associated with:
1
List all the process ID's associated. Please click enter after each ID:
425
Done. 1 rows inserted. Inserted Assembly.
Done. 1 rows inserted. Process associated.
Done. 0 rows inserted. Fit Process associated.
Done. 1 rows inserted. Cut Process associated.
Done. 0 rows inserted. Paint Process associated.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
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(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

4
Please enter new assembly id
77
Please enter date ordered of assembly in yyyy-mm-dd format:
2020-01-10
Please enter assembly_details:
This assembles mice for computeres
Please enter the customer name who ordered the asesembly:
Mike Tyson
How many processes is this assembly associated with:
1
List all the process ID's associated. Please click enter after each ID:
426
Done. 1 rows inserted. Inserted Assembly.
Done. 1 rows inserted. Process associated.
Done. 1 rows inserted. Fit Process associated.
Done. 0 rows inserted. Cut Process associated.
Done. 0 rows inserted. Paint Process associated.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
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(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department

(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

4
Please enter new assembly id
78
Please enter date ordered of assembly in yyyy-mm-dd format:
2020-01-03
Please enter assembly_details:
This assembles calculators
Please enter the customer name who ordered the asesembly:
Mike Tyson
How many processes is this assembly associated with:
0
List all the process ID's associated. Please click enter after each ID:
Done. 1 rows inserted. Inserted Assembly.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
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(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

4
Please enter new assembly id
79
Please enter date ordered of assembly in yyyy-mm-dd format:
2020-01-24
Please enter assembly_details:
This assembles java programs
Please enter the customer name who ordered the asesembly:
Pope Stevens
How many processes is this assembly associated with:
3
List all the process ID's associated. Please click enter after each ID:
427
428
429
Done. 1 rows inserted. Inserted Assembly.
Done. 1 rows inserted. Process associated.
Done. 0 rows inserted. Fit Process associated.
Done. 0 rows inserted. Cut Process associated.
Done. 1 rows inserted. Paint Process associated.
Done. 1 rows inserted. Process associated.
Done. 0 rows inserted. Fit Process associated.
Done. 1 rows inserted. Cut Process associated.
Done. 0 rows inserted. Paint Process associated.
Done. 1 rows inserted. Process associated.
Done. 0 rows inserted. Fit Process associated.
Done. 0 rows inserted. Cut Process associated.
Done. 1 rows inserted. Paint Process associated.

Content of Assembly Table after 10 queries of Query#4

Results Messages

	assembly_id	date_ordered	assembly_details	name
1	69	2020-01-01	This assembly manufacture…	Bob Hope
2	70	2020-01-01	THis assembly manufacture…	Bob Hope
3	72	2020-01-02	This assembles Teslas	Bob Hope
4	73	2020-01-03	This assembles notebooks	Buzz Lightyear
5	74	2020-01-05	This assembles laptops	Buzz Lightyear
6	75	2020-01-01	This assembles the Mach7 …	Koi Fish
7	76	2020-01-09	This assembles fountain p…	Koi Fish
8	77	2020-01-10	This assembles mice for c…	Mike Tyson
9	78	2020-01-03	This assembles calculators	Mike Tyson
10	79	2020-01-24	This assembles java progr…	Pope Stevens

Content of Process Table after 10 queries of Query#4

Results Messages

	process_id	process_data	assembly_id	department_number
1	420	This process is meant to …	69	1
2	421	This process is going to …	70	1
3	422	This process is going to …	72	1
4	423	This is going to make not…	73	2
5	424	THis is going to make the…	75	2
6	425	This will cut the noteboo…	76	2
7	426	This will make monitors	77	3
8	427	This will paint the back …	79	3
9	428	This will make macbooks	79	4
10	429	This will make apple head…	79	5

Content of Fit Process Table after 10 queries of Query#4

Results Messages

	process_id	process_data	fit_type	assembly_id	department_number
1	420	This process is meant to …	The fit must be tight	69	1
2	423	This is going to make not…	Not too tight	73	2
3	426	This will make monitors	Has to fit on my desk	77	3

Content of Paint Process Table after 10 queries of Query#4

Results Messages

	process_id	process_data	paint_type	painting_method	assembly_id	department_num…
1	421	This process is going to …	Glossy	By Hand	70	1
2	424	THis is going to make the…	Matte	Laser Painted	75	2
3	427	This will paint the back …	Shiny Pa…	With your fing…	79	3
4	429	This will make apple head…	Paint Wh…	With a brush	79	5

Content of Cut Process Table after 10 queries of Query#4

Results Messages

	process_id	process_data	cutting_type	machine_type	assembly_id	department_number
1	422	This process is going to …	Square	Csar Saw	72	1
2	425	This will cut the noteboo…	Rectangular	A Laser Cutter	76	2
3	428	This will make macbooks	Cut Meta	Metal Cutter	79	4

10 Queries of Query#5

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
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(6) Enter a new job and date the job began
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(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
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(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

5

Please enter new account number:
2000
Please enter date account established in yyyy-mm-dd format:
2020-01-02
Please enter associated process_id for the account:
420
Please enter associated assembly_id for the account:
69
Please enter associated department_number for the account:
1
Done. 1 rows inserted. Account created.
Done. 1 rows inserted. Assembly Account created.
Done. 1 rows inserted. Process Account created.
Done. 1 rows inserted. Department Account created.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
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(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

5
Please enter new account number:
20001
Please enter date account established in yyyy-mm-dd format:
2020-01-04
Please enter associated process_id for the account:
421
Please enter associated assembly_id for the account:
70
Please enter associated department_number for the account:
1
Done. 1 rows inserted. Account created.
Done. 1 rows inserted. Assembly Account created.
Done. 1 rows inserted. Process Account created.
Done. 1 rows inserted. Department Account created.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
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(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

5
Please enter new account number:
20002
Please enter date account established in yyyy-mm-dd format:
2020-04-01
Please enter associated process_id for the account:
422
Please enter associated assembly_id for the account:
72
Please enter associated department_number for the account:
1
Done. 1 rows inserted. Account created.
Done. 1 rows inserted. Assembly Account created.
Done. 1 rows inserted. Process Account created.
Done. 1 rows inserted. Department Account created.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
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(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

5
Please enter new account number:
2003
Please enter date account established in yyyy-mm-dd format:
2020-01-03
Please enter associated process_id for the account:
423
Please enter associated assembly_id for the account:
73
Please enter associated department_number for the account:
2
Done. 1 rows inserted. Account created.
Done. 1 rows inserted. Assembly Account created.
Done. 1 rows inserted. Process Account created.
Done. 1 rows inserted. Department Account created.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
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(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

5
Please enter new account number:
2004
Please enter date account established in yyyy-mm-dd format:
2020-01-02
Please enter associated process_id for the account:
424
Please enter associated assembly_id for the account:
75
Please enter associated department_number for the account:
2
Done. 1 rows inserted. Account created.
Done. 1 rows inserted. Assembly Account created.
Done. 1 rows inserted. Process Account created.
Done. 1 rows inserted. Department Account created.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
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Please enter new account number:
2005
Please enter date account established in yyyy-mm-dd format:
2020-01-04
Please enter associated process_id for the account:
425
Please enter associated assembly_id for the account:
76
Please enter associated department_number for the account:
2
Done. 1 rows inserted. Account created.
Done. 1 rows inserted. Assembly Account created.
Done. 1 rows inserted. Process Account created.
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(18) Quit

5
Please enter new account number:
2006
Please enter date account established in yyyy-mm-dd format:
2020-01-01
Please enter associated process_id for the account:
426
Please enter associated assembly_id for the account:
77
Please enter associated department_number for the account:
3
Done. 1 rows inserted. Account created.
Done. 1 rows inserted. Assembly Account created.
Done. 1 rows inserted. Process Account created.
Done. 1 rows inserted. Department Account created.
Please try again!

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
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(3) Enter a new process and department together
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5
Please enter new account number:
2007
Please enter date account established in yyyy-mm-dd format:
2020-01-01
Please enter associated process_id for the account:
427
Please enter associated assembly_id for the account:
79
Please enter associated department_number for the account:
3
Done. 1 rows inserted. Account created.
Done. 1 rows inserted. Assembly Account created.
Done. 1 rows inserted. Process Account created.
Done. 1 rows inserted. Department Account created.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
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(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process

(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

5
Please enter new account number:
2008
Please enter date account established in yyyy-mm-dd format:
2020-01-02
Please enter associated process_id for the account:
428
Please enter associated assembly_id for the account:
79
Please enter associated department_number for the account:
4
Done. 1 rows inserted. Account created.
Done. 1 rows inserted. Assembly Account created.
Done. 1 rows inserted. Process Account created.
Done. 1 rows inserted. Department Account created.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

5
Please enter new account number:
2009
Please enter date account established in yyyy-mm-dd format:
2020-01-02
Please enter associated process_id for the account:
429
Please enter associated assembly_id for the account:
79
Please enter associated department_number for the account:
5
Done. 1 rows inserted. Account created.
Done. 1 rows inserted. Assembly Account created.
Done. 1 rows inserted. Process Account created.
Done. 1 rows inserted. Department Account created.

Content of Account Table after 10 queries of Query#5

Results Messages

	account_n…	date_account_established
1	2000	2020-01-02
2	2003	2020-01-03
3	2004	2020-01-02
4	2005	2020-01-04
5	2006	2020-01-01
6	2007	2020-01-01
7	2008	2020-01-02
8	2009	2020-01-02
9	20001	2020-01-04
1…	20002	2020-04-01

Content of Assembly Account Table after 10 queries of Query#5

Results Messages

	account_number	date_account_established	cost1	assembly_id
1	2000	2020-01-02	0	69
2	2003	2020-01-03	0	73
3	2004	2020-01-02	0	75
4	2005	2020-01-04	0	76
5	2006	2020-01-01	0	77
6	2007	2020-01-01	0	79
7	2008	2020-01-02	0	79
8	2009	2020-01-02	0	79
9	20001	2020-01-04	0	70
10	20002	2020-04-01	0	72

Content of Process Account Table after 10 queries of Query#5

Results Messages

	account_number	date_account_established	cost2	process_id
1	2000	2020-01-02	0	420
2	2003	2020-01-03	0	423
3	2004	2020-01-02	0	424
4	2005	2020-01-04	0	425
5	2006	2020-01-01	0	426
6	2007	2020-01-01	0	427
7	2008	2020-01-02	0	428
8	2009	2020-01-02	0	429
9	20001	2020-01-04	0	421
10	20002	2020-04-01	0	422

Content of Department Account Table after 10 queries of Query#5

Results Messages

	account_number	date_account_established	cost3	department_number
1	2000	2020-01-02	0	1
2	2003	2020-01-03	0	2
3	2004	2020-01-02	0	2
4	2005	2020-01-04	0	2
5	2006	2020-01-01	0	3
6	2007	2020-01-01	0	3
7	2008	2020-01-02	0	4
8	2009	2020-01-02	0	5
9	20001	2020-01-04	0	1
10	20002	2020-04-01	0	1

10 Queries of Query#6

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

6
Please enter new job number:
22
Please enter date commenced for the job in yyyy-mm-dd format:
2020-04-02
Please enter the associated assembly id for the job:
69
Please enter the associated process id for the job:
420
Done. 1 rows inserted.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

6
Please enter new job number:
23
Please enter date commenced for the job in yyyy-mm-dd format:
2020-01-05
Please enter the associated assembly id for the job:
70
Please enter the associated process id for the job:
421
Done. 1 rows inserted.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes

(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

6
Please enter new job number:
24
Please enter date commenced for the job in yyyy-mm-dd format:
2020-01-04
Please enter the associated assembly id for the job:
72
Please enter the associated process id for the job:
422
Done. 1 rows inserted.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

6
Please enter new job number:
25
Please enter date commenced for the job in yyyy-mm-dd format:
2020-01-02
Please enter the associated assembly id for the job:
73
Please enter the associated process id for the job:
423
Done. 1 rows inserted.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department

(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

6
Please enter new job number:
26
Please enter date commenced for the job in yyyy-mm-dd format:
2020-01-02
Please enter the associated assembly id for the job:
75
Please enter the associated process id for the job:
424
Done. 1 rows inserted.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

6
Please enter new job number:
27
Please enter date commenced for the job in yyyy-mm-dd format:
2020-01-02
Please enter the associated assembly id for the job:
76
Please enter the associated process id for the job:
424
Done. 1 rows inserted.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

6

Please enter new job number:
28
Please enter date commenced for the job in yyyy-mm-dd format:
2020-01-02
Please enter the associated assembly id for the job:
77
Please enter the associated process id for the job:
426
Done. 1 rows inserted.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

6
Please enter new job number:
29
Please enter date commenced for the job in yyyy-mm-dd format:
2020-01-02
Please enter the associated assembly id for the job:
79
Please enter the associated process id for the job:
427
Done. 1 rows inserted.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

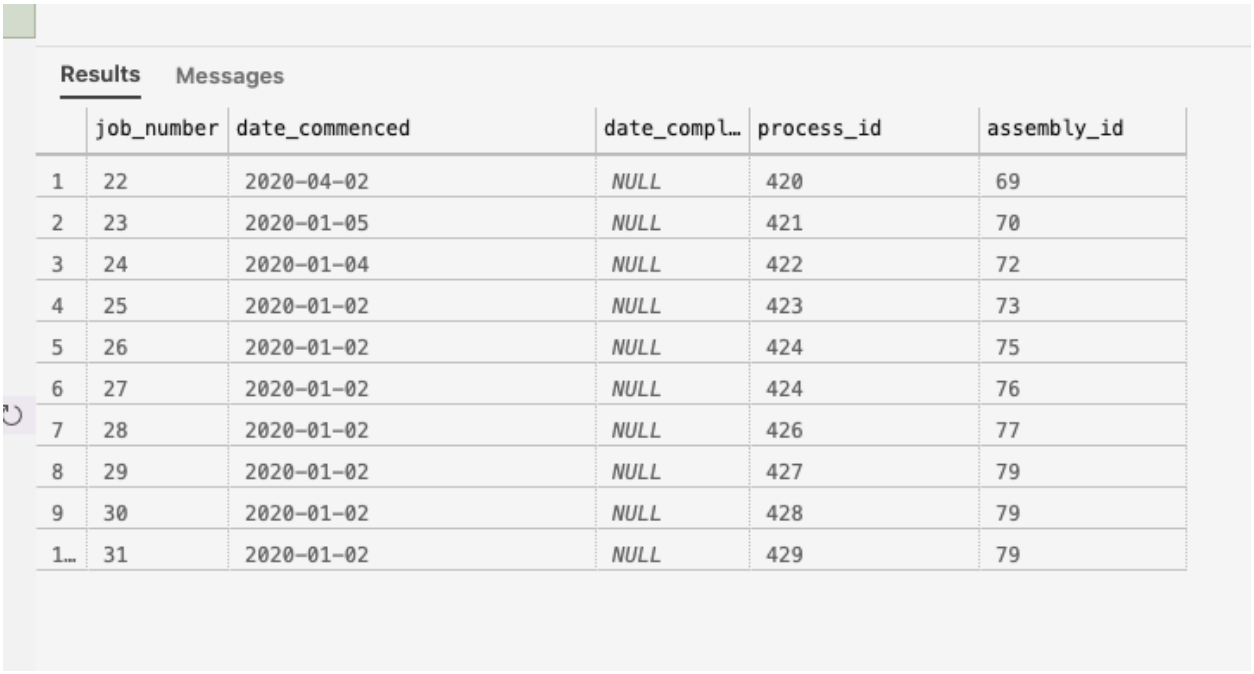
6
Please enter new job number:
30
Please enter date commenced for the job in yyyy-mm-dd format:
2020-01-02
Please enter the associated assembly id for the job:
79
Please enter the associated process id for the job:
428

Done. 1 rows inserted.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

6
Please enter new job number:
31
Please enter date commenced for the job in yyyy-mm-dd format:
2020-01-02
Please enter the associated assembly id for the job:
79
Please enter the associated process id for the job:
429
Done. 1 rows inserted.

Content of Job Table after 10 queries of Query#6



Results Messages

	job_number	date_commenced	date_compl…	process_id	assembly_id
1	22	2020-04-02	NULL	420	69
2	23	2020-01-05	NULL	421	70
3	24	2020-01-04	NULL	422	72
4	25	2020-01-02	NULL	423	73
5	26	2020-01-02	NULL	424	75
6	27	2020-01-02	NULL	424	76
7	28	2020-01-02	NULL	426	77
8	29	2020-01-02	NULL	427	79
9	30	2020-01-02	NULL	428	79
1…	31	2020-01-02	NULL	429	79

10 Queries of Query#7

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together

(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

7
Please enter the job number completed :
22
Please enter date completed for job in yyyy-mm-dd format:
2020-07-04
Please enter type of job (Fit, Paint, Cut)?
Fit
Please enter labor time in hh:mm:ss format
07:45:09
Done. 1 rows inserted.
Done. 1 rows inserted. Fit Job Added.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

7
Please enter the job number completed :
23
Please enter date completed for job in yyyy-mm-dd format:
2020-07-27
Please enter type of job (Fit, Paint, Cut)?
Paint
Please enter labor time in hh:mm:ss format
09:42:09
Please enter color for Paint job:
Red
Please enter the volume of paint:
25
Done. 1 rows inserted.
Done. 1 rows inserted. Paint Job Added.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department

(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

7
Please enter the job number completed :
24
Please enter date completed for job in yyyy-mm-dd format:
2020-07-09
Please enter type of job (Fit, Paint, Cut)?
Cut
Please enter labor time in hh:mm:ss format
09:04:04
Please enter the type of machine used:
Laser Cutter
Please enter amount of time machine used in hh:mm:ss format
05:02:05
Please enter material used
Metal
Done. 1 rows inserted.
Done. 1 rows inserted. Cut Job Added.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

7
Please enter the job number completed :
25
Please enter date completed for job in yyyy-mm-dd format:
2020-03-20
Please enter type of job (Fit, Paint, Cut)?
Fit
Please enter labor time in hh:mm:ss format
09:24:09
Done. 1 rows inserted.
Done. 1 rows inserted. Fit Job Added.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department

(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

7
Please enter the job number completed :
26
Please enter date completed for job in yyyy-mm-dd format:
2020-04-01
Please enter type of job (Fit, Paint, Cut)?
Paint
Please enter labor time in hh:mm:ss format
09:09:05
Please enter color for Paint job:
Red
Please enter the volume of paint:
30
Done. 1 rows inserted.
Done. 1 rows inserted. Paint Job Added.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
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(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

7
Please enter the job number completed :
27
Please enter date completed for job in yyyy-mm-dd format:
2020-03-27
Please enter type of job (Fit, Paint, Cut)?
Cut
Please enter labor time in hh:mm:ss format
09:04:24
Please enter the type of machine used:
Laser
Please enter amount of time machine used in hh:mm:ss format
02:02:02
Please enter material used
Wood
Done. 1 rows inserted.
Done. 1 rows inserted. Cut Job Added.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer

(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

7
Please enter the job number completed :
28
Please enter date completed for job in yyyy-mm-dd format:
2020-09-10
Please enter type of job (Fit, Paint, Cut)?
Fit
Please enter labor time in hh:mm:ss format
04:04:04
Done. 1 rows inserted.
Done. 1 rows inserted. Fit Job Added.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

7
Please enter the job number completed :
29
Please enter date completed for job in yyyy-mm-dd format:
2020-09-10
Please enter type of job (Fit, Paint, Cut)?
Paint
Please enter labor time in hh:mm:ss format
04:52:42
Please enter color for Paint job:
Pink
Please enter the volume of paint:
40
Done. 1 rows inserted.
Done. 1 rows inserted. Paint Job Added.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together

(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

7
Please enter the job number completed :
30
Please enter date completed for job in yyyy-mm-dd format:
2020-09-10
Please enter type of job (Fit, Paint, Cut)?
Cut
Please enter labor time in hh:mm:ss format
04:09:09
Please enter the type of machine used:
Laser
Please enter amount of time machine used in hh:mm:ss format
02:02:04
Please enter material used
Plastic
Done. 1 rows inserted.
Done. 1 rows inserted. Cut Job Added.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

7
Please enter the job number completed :
31
Please enter date completed for job in yyyy-mm-dd format:
2020-09-10
Please enter type of job (Fit, Paint, Cut)?
Fit
Please enter labor time in hh:mm:ss format
09:09:53
Done. 1 rows inserted.
Done. 1 rows inserted. Fit Job Added.

Content of Job Table after 10 queries of Query#7

Results Messages

	job_number	date_commenced	date_completed	process_id	assembly_id
1	22	2020-04-02	2020-07-04	420	69
2	23	2020-01-05	2020-07-27	421	70
3	24	2020-01-04	2020-07-09	422	72
4	25	2020-01-02	2020-03-20	423	73
5	26	2020-01-02	2020-04-01	424	75
6	27	2020-01-02	2020-03-27	424	76
7	28	2020-01-02	2020-09-10	426	77
8	29	2020-01-02	2020-09-10	427	79
9	30	2020-01-02	2020-09-10	428	79
10	31	2020-01-02	2020-09-10	429	79

Content of Fit Job Table after 10 queries of Query#7

Results Messages

	job_number	labor_time
1	22	07:45:09
2	25	09:24:09
3	28	04:04:04
4	31	09:09:53

Content of Paint Job Table after 10 queries of Query#7

Results Messages

	job_number	labor_time	color	volume
1	23	09:42:09	Red	25
2	26	09:09:05	Red	30
3	29	04:52:42	Pink	40

Content of Cut Job Table after 10 queries of Query#7

Results Messages

	job_number	labor_time	type_machi…	amount_of_time_m…	material_used
1	24	09:04:04	Laser Cu…	05:02:05	Metal
2	27	09:04:24	Laser	02:02:02	Wood
3	30	04:09:09	Laser	02:02:04	Plastic

10 Queries of Query#8

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

8
Please enter new transaction number
35
Please enter cost:
100
Enter the associated account number:
2000
Please enter the associated job number:
22
Done. 1 rows inserted.
Done. 1 rows inserted. Assembly Account updated
Done. 1 rows inserted. Process Account updated

Done. 1 rows inserted. Department Account updated

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
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(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

8
Please enter new transaction number
36
Please enter cost:
200
Enter the associated account number:
20001
Please enter the associated job number:
23
Done. 1 rows inserted.
Done. 1 rows inserted. Assembly Account updated
Done. 1 rows inserted. Process Account updated
Done. 1 rows inserted. Department Account updated

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

8
Please enter new transaction number
37
Please enter cost:
100
Enter the associated account number:
20002
Please enter the associated job number:
24
Done. 1 rows inserted.
Done. 1 rows inserted. Assembly Account updated
Done. 1 rows inserted. Process Account updated
Done. 1 rows inserted. Department Account updated

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

8
Please enter new transaction number
38
Please enter cost:
130
Enter the associated account number:
2003
Please enter the associated job number:
25
Done. 1 rows inserted.
Done. 1 rows inserted. Assembly Account updated
Done. 1 rows inserted. Process Account updated
Done. 1 rows inserted. Department Account updated

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

8
Please enter new transaction number
39
Please enter cost:
102
Enter the associated account number:
2004
Please enter the associated job number:
26
Done. 1 rows inserted.
Done. 1 rows inserted. Assembly Account updated
Done. 1 rows inserted. Process Account updated
Done. 1 rows inserted. Department Account updated

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer

(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

8
Please enter new transaction number
40
Please enter cost:
105
Enter the associated account number:
2005
Please enter the associated job number:
27
Done. 1 rows inserted.
Done. 1 rows inserted. Assembly Account updated
Done. 1 rows inserted. Process Account updated
Done. 1 rows inserted. Department Account updated

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
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(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

8
Please enter new transaction number
41
Please enter cost:
105
Enter the associated account number:
2006
Please enter the associated job number:
28
Done. 1 rows inserted.
Done. 1 rows inserted. Assembly Account updated
Done. 1 rows inserted. Process Account updated
Done. 1 rows inserted. Department Account updated

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together

(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

8
Please enter new transaction number
42
Please enter cost:
900
Enter the associated account number:
2007
Please enter the associated job number:
29
Done. 1 rows inserted.
Done. 1 rows inserted. Assembly Account updated
Done. 1 rows inserted. Process Account updated
Done. 1 rows inserted. Department Account updated

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

8
Please enter new transaction number
43
Please enter cost:
800
Enter the associated account number:
2008
Please enter the associated job number:
30
Done. 1 rows inserted.
Done. 1 rows inserted. Assembly Account updated
Done. 1 rows inserted. Process Account updated
Done. 1 rows inserted. Department Account updated

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department

(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

8
Please enter new transaction number
44
Please enter cost:
700
Enter the associated account number:
2009
Please enter the associated job number:
31
Done. 1 rows inserted.
Done. 1 rows inserted. Assembly Account updated
Done. 1 rows inserted. Process Account updated
Done. 1 rows inserted. Department Account updated

Content of Assembly Account Table after 10 queries of Query#8

Results Messages

	account_number	date_account_established	cost1	assembly_id
1	2000	2020-01-02	100	69
2	2003	2020-01-03	130	73
3	2004	2020-01-02	102	75
4	2005	2020-01-04	105	76
5	2006	2020-01-01	105	77
6	2007	2020-01-01	900	79
7	2008	2020-01-02	800	79
8	2009	2020-01-02	700	79
9	20001	2020-01-04	200	70
10	20002	2020-04-01	100	72

Content of Process Account Table after 10 queries of Query#8

Results Messages

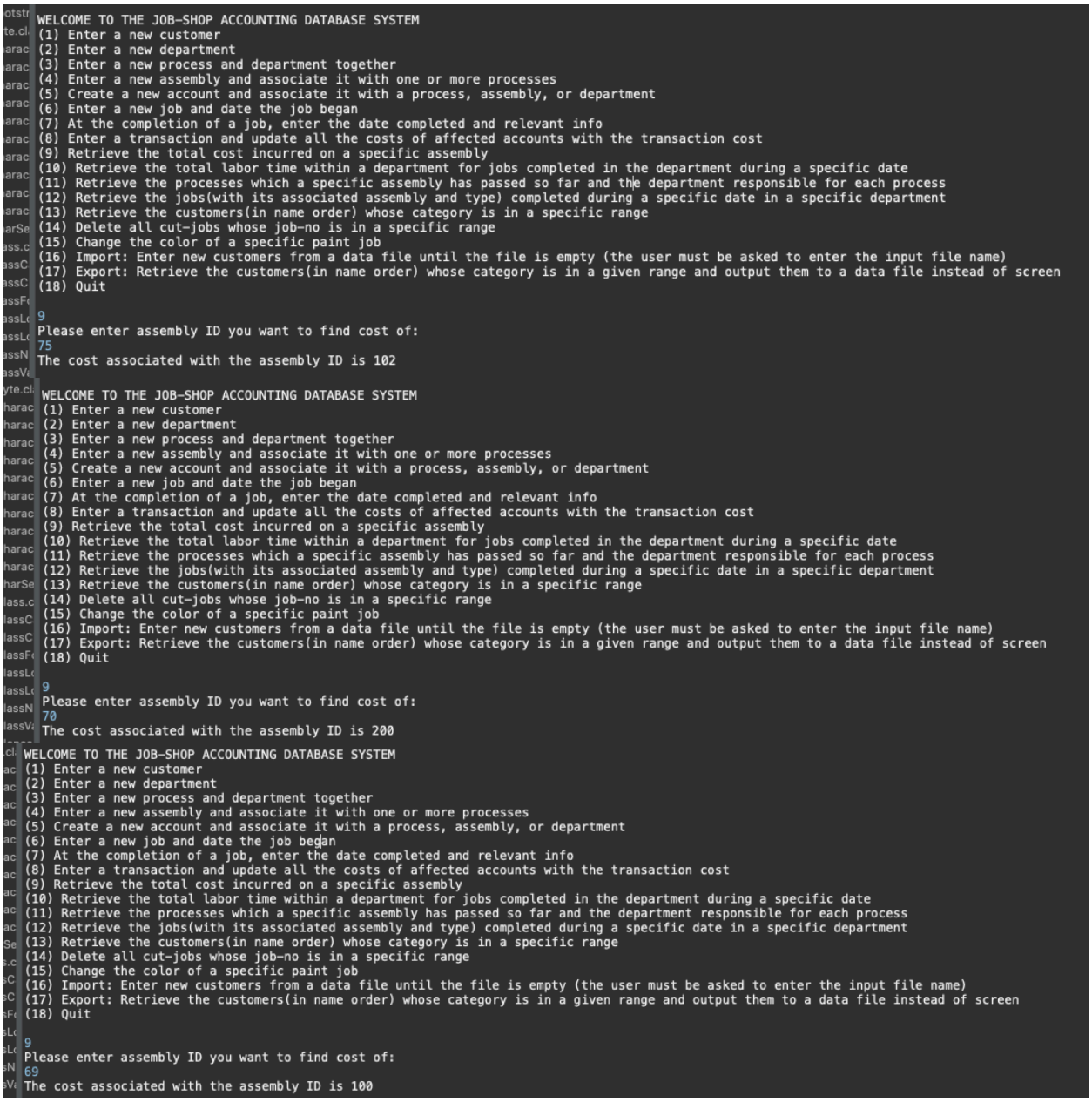
	account_number	date_account_established	cost2	process_id
1	2000	2020-01-02	100	420
2	2003	2020-01-03	130	423
3	2004	2020-01-02	102	424
4	2005	2020-01-04	105	425
5	2006	2020-01-01	105	426
6	2007	2020-01-01	900	427
7	2008	2020-01-02	800	428
8	2009	2020-01-02	700	429
9	20001	2020-01-04	200	421
10	20002	2020-04-01	100	422

Content of Department Account Table after 10 queries of Query#8

Results Messages

	account_number	date_account_established	cost3	department_number
1	2000	2020-01-02	100	1
2	2003	2020-01-03	130	2
3	2004	2020-01-02	102	2
4	2005	2020-01-04	105	2
5	2006	2020-01-01	105	3
6	2007	2020-01-01	900	3
7	2008	2020-01-02	800	4
8	2009	2020-01-02	700	5
9	20001	2020-01-04	200	1
10	20002	2020-04-01	100	1

3 Queries of Query#9



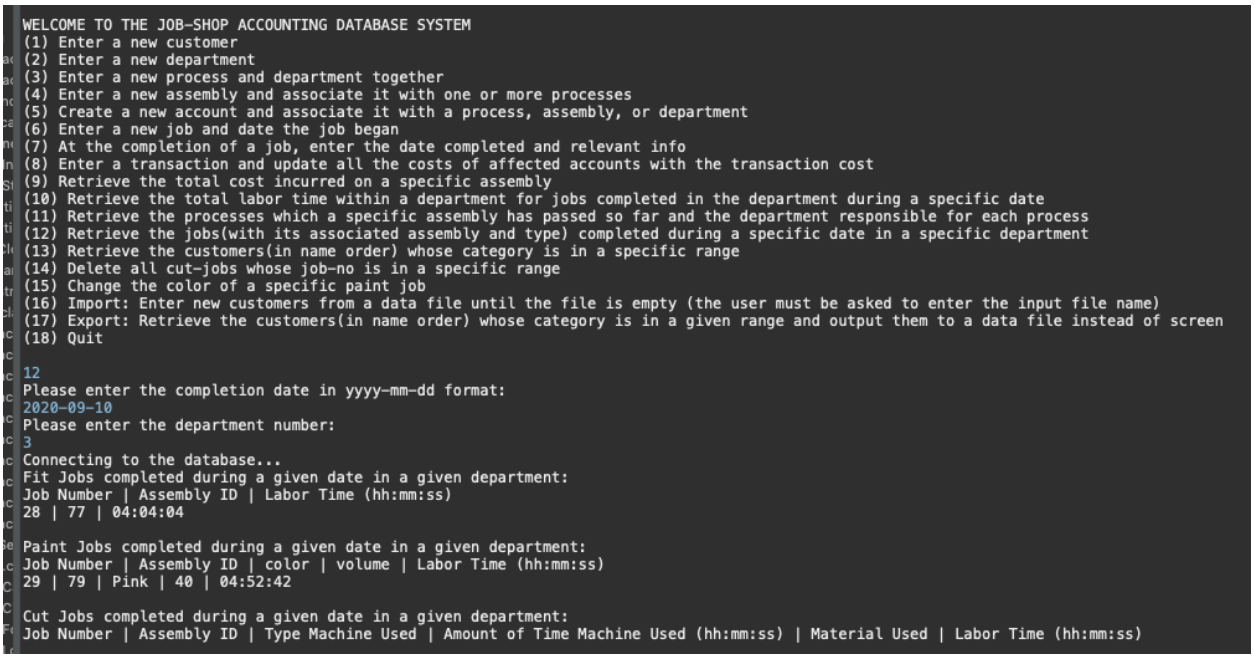
3 Queries of Query#10

3 Queries of Query#11

```
WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

11
Please enter the assembly id:
79
Connecting to the database...
Processes through which a given assembly ID has passed so far in date commenced order:
 Process ID | Department Number | Date Commenced
427 | 3 | 2020-01-02
428 | 4 | 2020-01-02
429 | 5 | 2020-01-02
WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

11
Please enter the assembly id:
73
Connecting to the database...
Processes through which a given assembly ID has passed so far in date commenced order:
 Process ID | Department Number | Date Commenced
423 | 2 | 2020-01-02
WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

11
Please enter the assembly id:
69
Connecting to the database...
Processes through which a given assembly ID has passed so far in date commenced order:
 Process ID | Department Number | Date Commenced
420 | 1 | 2020-04-02
```

3 Queries of Query#12

```
WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

12
Please enter the completion date in yyyy-mm-dd format:
2020-03-27
Please enter the department number:
2
Connecting to the database...
Fit Jobs completed during a given date in a given department:
Job Number | Assembly ID | Labor Time (hh:mm:ss)

Paint Jobs completed during a given date in a given department:
Job Number | Assembly ID | color | volume | Labor Time (hh:mm:ss)

Cut Jobs completed during a given date in a given department:
Job Number | Assembly ID | Type Machine Used | Amount of Time Machine Used (hh:mm:ss) | Material Used | Labor Time (hh:mm:ss)
27 | 76 | Laser | 02:02:02 | Wood | 09:04:24

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

12
Please enter the completion date in yyyy-mm-dd format:
2020-07-04
Please enter the department number:
1
Connecting to the database...
Fit Jobs completed during a given date in a given department:
Job Number | Assembly ID | Labor Time (hh:mm:ss)
22 | 69 | 07:45:09

Paint Jobs completed during a given date in a given department:
Job Number | Assembly ID | color | volume | Labor Time (hh:mm:ss)

Cut Jobs completed during a given date in a given department:
Job Number | Assembly ID | Type Machine Used | Amount of Time Machine Used (hh:mm:ss) | Material Used | Labor Time (hh:mm:ss)
```



3 Queries of Query#13

```
WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

13
Please enter desired lower bound of category range:
7
Please enter desired upper bound of category range:
10
Connecting to the database...
Customers (in name order)
Buzz Lightyear
Pope Stevens
WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

13
Please enter desired lower bound of category range:
3
Please enter desired upper bound of category range:
6
Connecting to the database...
Customers (in name order)
Bob Hope
Koi Fish
Mike Tyson

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

13
Please enter desired lower bound of category range:
1
Please enter desired upper bound of category range:
4
Connecting to the database...
Customers (in name order)
Bob Hope
Mike Tyson
```

3 Queries of Query#14

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department

(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

14
Please enter desired lower bound of job number range:
20
Please enter desired upper bound of job number range:
24
Connecting to the database...
Job numbers from 20 to 24 are deletd.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

14
Please enter desired lower bound of job number range:
29
Please enter desired upper bound of job number range:
31
Connecting to the database...
Job numbers from 29 to 31 are deletd.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)

(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

14
Please enter desired lower bound of job number range:
1
Please enter desired upper bound of job number range:
10
Connecting to the database...
Job numbers from 1 to 10 are deletd.

Original Cut Job Table of Query#14

Results Messages

	job_number	labor_time	type_machine_…	amount_of…	material_u…
1	24	09:04:04	Laser Cutter	05:02:05	Metal
2	27	09:04:24	Laser	02:02:02	Wood
3	30	04:09:09	Laser	02:02:04	Plastic

Cut Job Table After first Query of Query#14

Results Messages

	job_number	labor_time	type_machine_used	amount_of_time_machine_used	material_used
1	27	09:04:24	Laser	02:02:02	Wood
2	30	04:09:09	Laser	02:02:04	Plastic

Cut Job Table After second Query of Query#14

Results Messages

	job_number	labor_time	type_machine_used	amount_of_time_machine_used	material_used
1	27	09:04:24	Laser	02:02:02	Wood

Cut Job Table After third Query of Query#14

Results Messages

	job_number	labor_time	type_machine_used	amount_of_time_machine_used	material_used
1	27	09:04:24	Laser	02:02:02	Wood

3 Queries of Query#15

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department

(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

15
What is the paint job number you wish to update:
23
Please enter the color you wish to update to:
Lightning Yellow
Connecting to the database...
Done. 1 rows updated.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

15
What is the paint job number you wish to update:
26
Please enter the color you wish to update to:
Purple
Connecting to the database...
Done. 1 rows updated.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)

(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

15
What is the paint job number you wish to update:
29
Please enter the color you wish to update to:
Sooner Crimson
Connecting to the database...
Done. 1 rows updated.

Original Paint Job Table of Query#15

Results Messages

	job_number	labor_time	color	volume
1	23	09:42:09	Red	25
2	26	09:09:05	Red	30
3	29	04:52:42	Pink	40

Original Paint Job Table of Query#15

Results Messages

	job_number	labor_time	color	volume
1	23	09:42:09	Lightning Yellow	25
2	26	09:09:05	Red	30
3	29	04:52:42	Pink	40

Original Paint Job Table of Query#15

Results grid Messages

	job_number	labor_time	color	volume
1	23	09:42:09	Lightning Yellow	25
2	26	09:09:05	Purple	30
3	29	04:52:42	Pink	40

Original Paint Job Table of Query#15

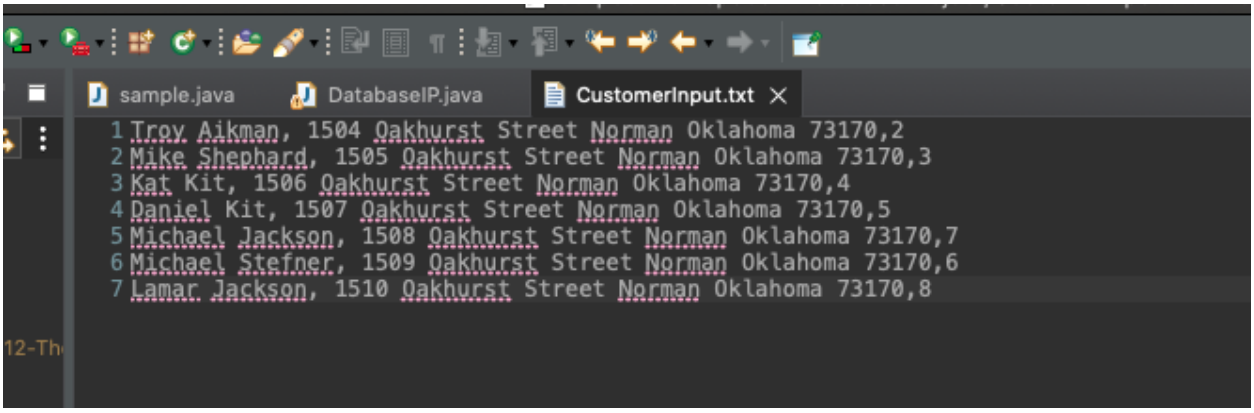
	job_number	labor_time	color	volume
1	23	09:42:09	Lightning Yellow	25
2	26	09:09:05	Purple	30
3	29	04:52:42	Sooner Crimson	40

1 Query of Query#16

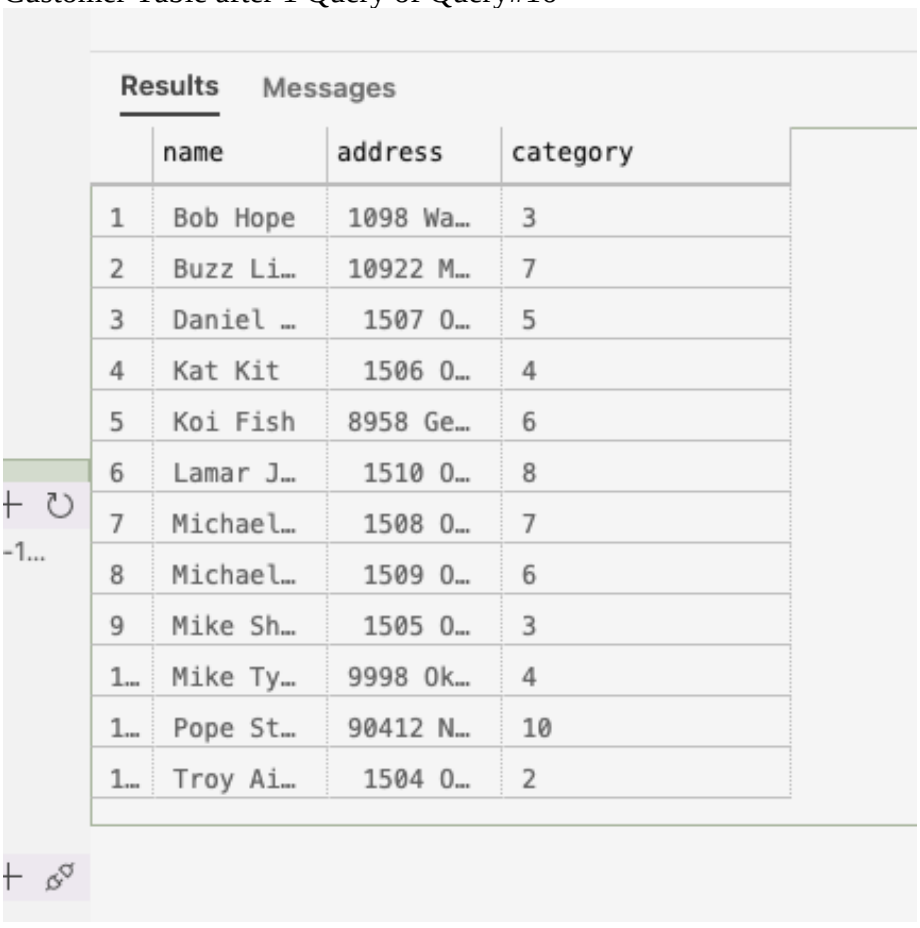
WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

16
Enter the file-name to import data.
CustomerInput.txt
Connecting to the database...
Done. 1 rows inserted.
Connecting to the database...
Done. 1 rows inserted.
Connecting to the database...
Done. 1 rows inserted.
Connecting to the database...
Done. 1 rows inserted.
Connecting to the database...
Done. 1 rows inserted.
Connecting to the database...
Done. 1 rows inserted.
Connecting to the database...
Done. 1 rows inserted.]

Input text



Customer Table after 1 Query of Query#16



Results Messages

	name	address	category
1	Bob Hope	1098 Wa…	3
2	Buzz Li…	10922 M…	7
3	Daniel …	1507 O…	5
4	Kat Kit	1506 O…	4
5	Koi Fish	8958 Ge…	6
6	Lamar J…	1510 O…	8
7	Michael…	1508 O…	7
8	Michael…	1509 O…	6
9	Mike Sh…	1505 O…	3
1…	Mike Ty…	9998 Ok…	4
1…	Pope St…	90412 N…	10
1…	Troy Ai…	1504 O…	2

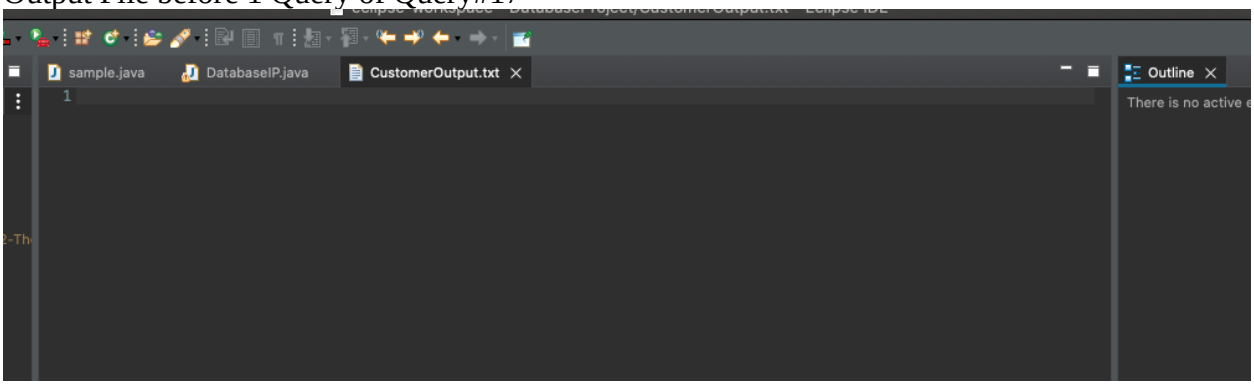
1 Query of Query#17

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date

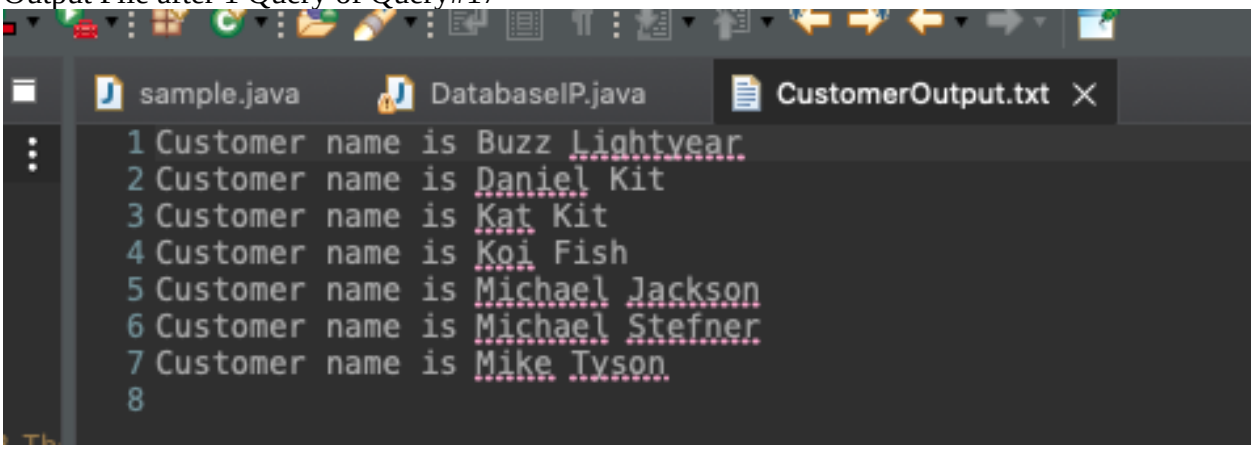
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

17
Enter the file-name to Export data.
CustomerOutput.txt
Enter the lower bound of category.
4
Enter the upper bound of category.
7
Connecting to the database...

Output File before 1 Query of Query#17



Output File after 1 Query of Query#17



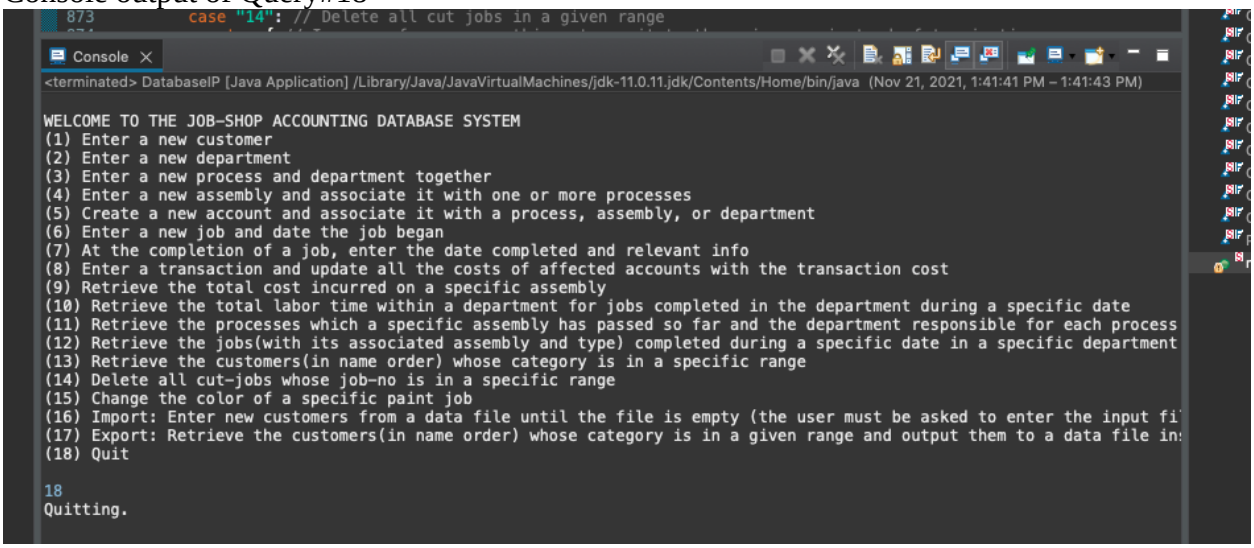
1 Query of Query#18

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department

(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input file name)
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file instead of screen
(18) Quit

18

Console output of Query#18



Error #1 (Entering a string for department number)

```
WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input fi
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file in
(18) Quit

2
Please enter new department number:
Bob
You got an error! Returning to the main menu.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input fi
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file in
(18) Quit

Unrecognized option: Bob
Please try again!
```

Error #2 (Associating a Process to a department that doesn't exist)

Department Table

Error #2 Console Output

```
WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input fi
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file in
(18) Quit

3
Please enter a new process ID:
99
Please enter the corresponding process_data:
Nothing, this is gonna be an error test
Please enter new department number associated with process:
10
Please enter type of process (Fit, Paint, Cut)?
Fit
Please enter the corresponding fit_type:
labor
Connecting to the database...
You got an error! Returning to the main menu.
```

Error #2 (Adding a duplicate primary key)

```
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input fi
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file in
(18) Quit

1
Please enter name of the new customer:
Darth Vader
Please enter address of the new customer:
Nothing
Please enter Customer category (a number from 1-10):
3
Connecting to the database...
Done. 1 rows inserted.

WELCOME TO THE JOB-SHOP ACCOUNTING DATABASE SYSTEM
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process and department together
(4) Enter a new assembly and associate it with one or more processes
(5) Create a new account and associate it with a process, assembly, or department
(6) Enter a new job and date the job began
(7) At the completion of a job, enter the date completed and relevant info
(8) Enter a transaction and update all the costs of affected accounts with the transaction cost
(9) Retrieve the total cost incurred on a specific assembly
(10) Retrieve the total labor time within a department for jobs completed in the department during a specific date
(11) Retrieve the processes which a specific assembly has passed so far and the department responsible for each process
(12) Retrieve the jobs(with its associated assembly and type) completed during a specific date in a specific department
(13) Retrieve the customers(in name order) whose category is in a specific range
(14) Delete all cut-jobs whose job-no is in a specific range
(15) Change the color of a specific paint job
(16) Import: Enter new customers from a data file until the file is empty (the user must be asked to enter the input fi
(17) Export: Retrieve the customers(in name order) whose category is in a given range and output them to a data file in
(18) Quit

1
Please enter name of the new customer:
Darth Vader
Please enter address of the new customer:
Nothing
Please enter Customer category (a number from 1-10):
3
Connecting to the database...
You got an error! Returning to the main menu.
```

Web App Source Program

DataHandler.java

```
package jsp_azure_test;
import java.sql.Connection;
import java.sql.ResultSet;
import java.sql.SQLException;
import java.sql.DriverManager;
import java.sql.PreparedStatement;

public class DataHandler {
	private Connection conn;

	// Initialize and save the database connection

	final static String url = "jdbc:sqlserver://trin0003-sql-server.database.windows.net:1433;database=cs-dsa-4513-sql-
db;user=trin0003@trin0003-sql-
server;password=ClearMap2013$;encrypt=true;trustServerCertificate=false;hostNameInCertificate=*.database.windows.net;loginTimeout=30;";

	private void getDBConnection() throws SQLException {
		if (conn != null) {
			return;
		}
		this.conn = DriverManager.getConnection(url);
	}
	// Return the result of selecting everything from the Customer table
	public ResultSet getAllCustomers() throws SQLException {
		getDBConnection(); // Prepare the database connection
		// Prepare the SQL statement
		final String sqlQuery = "SELECT * FROM Customer;";
		final PreparedStatement stmt = conn.prepareStatement(sqlQuery);
		// Execute the query
		return stmt.executeQuery();
	}

	// Return the result of selecting Customers with their category in the given range from Customer table
	public ResultSet retrieveCustomers(int lower_b, int upper_b) throws SQLException {
			getDBConnection(); // Prepare the database connection
			// Prepare the SQL statement
			final String sqlQuery = "SELECT name, category AS name FROM Customer" +
					"    WHERE category >= ? AND category <= ? ORDER BY 1 ;";
			final PreparedStatement stmt = conn.prepareStatement(sqlQuery);
			// Replace the '?' in the above statement with the given attribute values
			stmt.setInt(1, lower_b);
			stmt.setInt(2, upper_b);
			// Execute the query
			return stmt.executeQuery();
		}
	// Inserts a record into the Customer table with the given attribute values
	public boolean addCustomer( String name, String address, int category) throws SQLException {
		getDBConnection(); // Prepare the database connection
		// Prepare the SQL statement
		final String sqlQuery =
                                                        "INSERT INTO Customer " +
                                                                "(name, address, category) " +
                                                                        "VALUES " +
                                                                        "(?, ?, ?)";
		final PreparedStatement stmt = conn.prepareStatement(sqlQuery);
		// Replace the '?' in the above statement with the given attribute values
		stmt.setString(1, name);
		stmt.setString(2, address);
		stmt.setInt(3, category);
		// Execute the query, if only one record is updated, then we indicate success by returning true
		return stmt.executeUpdate() == 1;
	}
}
```

Add_new_customer_form.java

```
<!DOCTYPE html>
<html>
<head>
<meta charset="UTF-8">
<title>Add Customer</title>
</head>
<body>
<h2>Add Customer</h2>
<!--
Form for collecting user input for the new customer record.
Upon form submission, add_new_customer.jsp file will be invoked.
-->
<form action="add_new_customer.jsp">
<!-- The form organized in an HTML table for better clarity. -->
<table border=1>
<tr>
<th colspan="2">Enter the Customer Data:</th>
</tr>
<tr>
<td>Customer Name:</td>
<td><div style="text-align: center;">
<input type=text name=name>
</div></td>
</tr>
<tr>
<td>Customer Address:</td>
<td><div style="text-align: center;">
<input type=text name=address>
</div></td>
</tr>
<tr>
<td>Category:</td>
<td><div style="text-align: center;">
<input type=text name=category>
</div></td>
</tr>
<tr>
```

```
<td><div style="text-align: center;">
<input type="reset" value="Clear">
</div></td>
<td><div style="text-align: center;">
<input type="submit" value="Insert">
</div></td>
</tr>
</table>
</form>
</body>
</html>
```

Add_new_customer.jsp

```
<%@ page language="java" contentType="text/html; charset=UTF-8"
pageEncoding="UTF-8"%>
<!DOCTYPE html PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN"
"http://www.w3.org/TR/html4/loose.dtd">
<html>
<head>
<meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
<title>Query Result</title>
</head>
<body>
<%@page import="jsp_azure_test.DataHandler"%>
<%@page import="java.sql.ResultSet"%>
<%@page import="java.sql.Array"%>
<%
// The handler is the one in charge of establishing the connection.
DataHandler handler = new DataHandler();
// Get the attribute values passed from the input form.
String name = request.getParameter("name");
String address = request.getParameter("address");
String category = request.getParameter("category");
/*
* If the user hasn't filled out all the cname, address and category. This is very simple
checking.
```

```
*/

if (name.equals("") || address.equals("") || category.equals("")) {
response.sendRedirect("add_new_customer_form.jsp");
} else {

int category1 = Integer.parseInt(category);
// Now perform the query with the data from the form.
boolean success = handler.addCustomer(name, address, category1);
if (!success) { // Something went wrong
%>
<h2>There was a problem inserting the course</h2>
<%
} else { // Confirm success to the user
%>
<h2>New Customer Details:</h2>
Page 23 of 23
<ul>
<li>Customer Name: <%=name%></li>
<li>Address: <%=address%></li>
<li>Category: <%=category%></li>
</ul>
<h2>Was successfully inserted.</h2>
<a href="get_all_customers.jsp">See all Customers.</a>
<%
}
}
%>
</body>
</html>
```

Get_all_customers.jsp

```
<%@ page language="java" contentType="text/html; charset=UTF-8"
        pageEncoding="UTF-8"%>
<!DOCTYPE html>
<html>
```

```
<head>
<meta charset="UTF-8">
        <title>Customers</title>
</head>
<body>
<%@page import="jsp_azure_test.DataHandler"%>
<%@page import="java.sql.ResultSet"%>
<%
        // We instantiate the data handler here, and get all the customers from the database
        final DataHandler handler = new DataHandler();
        final ResultSet customers = handler.getAllCustomers();
%>
<!-- The table for displaying all the movie records -->
<table cellspacing="2" cellpadding="2" border="1">
        <tr> <!-- The table headers row -->
                <td align="center">
                        <h4>Customer</h4>
                </td>
                <td align="center">
                        <h4>Address</h4>
                </td>
                <td align="center">
                        <h4>Category</h4>
        </tr>
        <%
                while(customers.next()) { // For each Customer record returned...
                        // Extract the attribute values for every row returned
                        final String name = customers.getString("name");
                        final String caddress = customers.getString("address");
                        final String category = customers.getString("category");
                        out.println("<tr>"); // Start printing out the new table row
                        out.println( // Print each attribute value
                                "<td align=\"center\">" + name +
                                "</td><td align=\"center\"> " + caddress+
                                "</td><td align=\"center\"> " + category + "</td>");
                        out.println("</tr>");
                }
```

```
                %>
            </table>
        </body>
</html>
```

Retrieve_customer_form.jsp

```
<!DOCTYPE html>
<html>
<head>
<meta charset="UTF-8">
<title>Retrieve customers given category range</title>
</head>
<body>
<h2>Give Customers Range</h2>
<!--
Form for collecting user input for the new customer record.
Upon form submission, retrieve_customers.jsp file will be invoked.
-->
<form action="retrieve_customers.jsp">
<!-- The form organized in an HTML table for better clarity. -->
<table border=1>
<tr>
<th colspan="2">Enter the Category Range:</th>
</tr>
<tr>
<td>Lower Bound (Inclusive):</td>
<td><div style="text-align: center;">
<input type="text" name="lower_b">
</div></td>
</tr>
<tr>
<td>Upper Bound (Inclusive):</td>
<td><div style="text-align: center;">
<input type="text" name="upper_b">
</div></td>
```

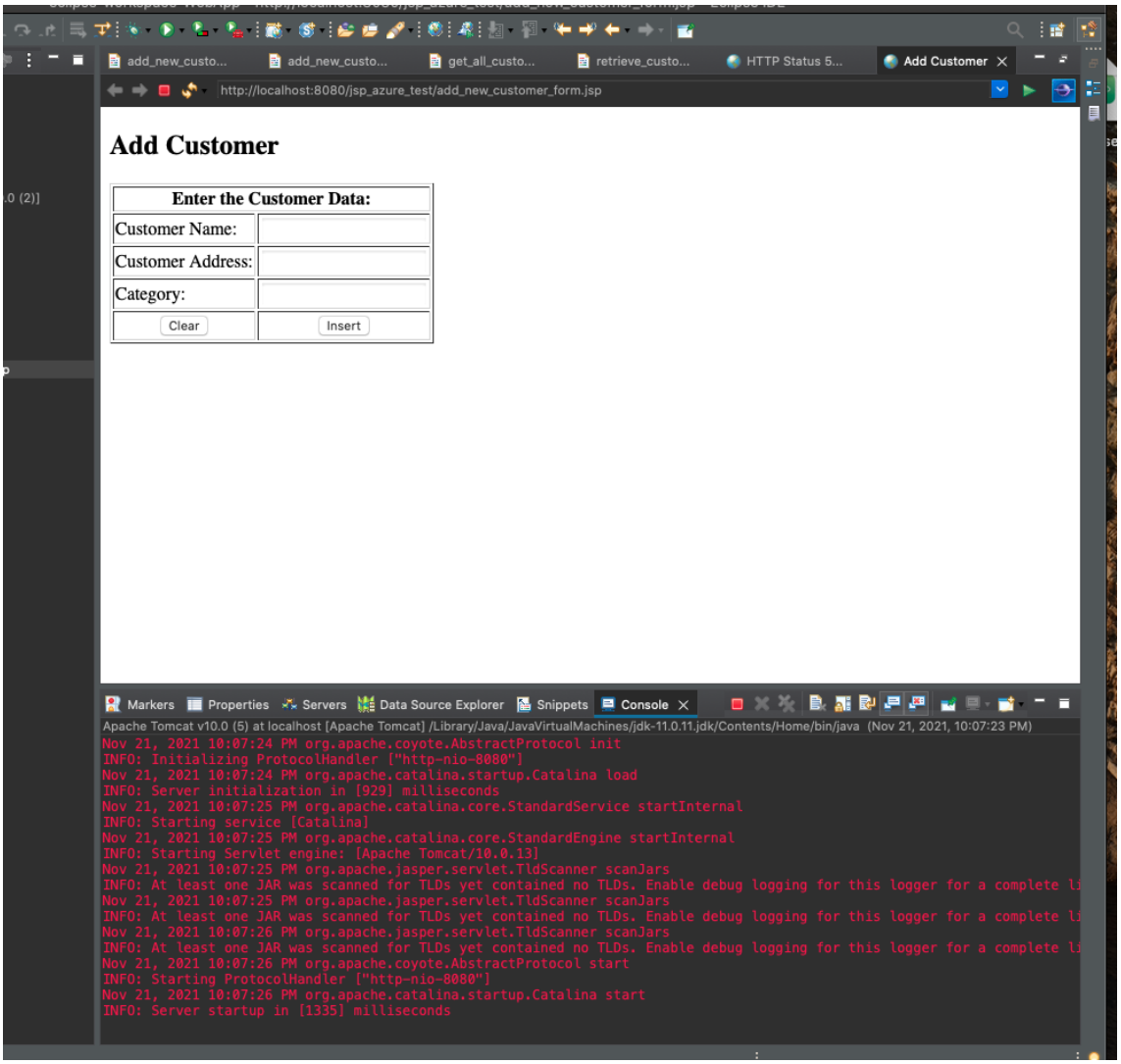
```
</tr>
<tr>
<td><div style="text-align: center">
<input type=reset value=Clear>
</div></td>
<td><div style="text-align: center">
<input type=submit value=Insert>
</div></td>
</tr>
</table>
</form>
</body>
</html>
```

Retrieve_customeres.jsp

```
<%@ page language="java" contentType="text/html; charset=UTF-8"
    pageEncoding="UTF-8"%>
<!DOCTYPE html>
<html>
    <head>
    <meta charset="UTF-8">
        <title>Customers</title>
    </head>
    <body>
    <%@page import="jsp_azure_test.DataHandler"%>
    <%@page import="java.sql.ResultSet"%>
    <%
        // We instantiate the data handler here, and get all the customers from the database
        final DataHandler handler = new DataHandler();
        // Get the attribute values passed from the input form.
        String lower_b = request.getParameter("lower_b");
        String upper_b = request.getParameter("upper_b");


        if (lower_b.equals("") || upper_b.equals("")) {
        response.sendRedirect("retrieve_customer_form.jsp");
        } else {
```

```
                int lower_b1 = Integer.parseInt(lower_b);
                int upper_b1 = Integer.parseInt(upper_b);
                // Now perform the query with the data from the form.
                final ResultSet customers = handler.retrieveCustomers(lower_b1, upper_b1);
        %>
        <!-- The table for displaying all the Customer records -->
        <table cellspacing="2" cellpadding="2" border="1">
                <tr> <!-- The table headers row -->
                        <td align="center">
                                <h4>Customer</h4>
                        </td>
                        <td align="center">
                                <h4>category</h4>
                        </td>
                <%
                        while(customers.next()) { // Read out all customer records
                                // Get values from the ResultSet to display customers
                                final String name = customers.getString(1);
                                final String category = customers.getString(2);
                                out.println("<tr>"); // Start printing out the new table row
                                out.println( // Print each attribute value
                                        "<td align=\"center\">" + name +
                                        "</td><td align=\"center\"> " + category + "</td>");
                                out.println("</tr>");
                        }
                }
                        %>
                </table>
        </body>
</html>
```

Screenshot for Successful Compilation



Screenshot for Retrieve All Customers

Customer	Address	Category
Bob Hope	1098 Washington Avenue, Oklahoma City, Oklahoma, 70941	3
Buzz Lightyear	10922 Main St., Garden Grove, California, 90210	7
Daniel Kit	1507 Oakhurst Street Norman Oklahoma 73170	5
Darth Vader	Nothing	3
Kat Kit	1506 Oakhurst Street Norman Oklahoma 73170	4
Koi Fish	8958 Geico Trail, Nowhere, Oklahoma, 90423	6
Lamar Jackson	1510 Oakhurst Street Norman Oklahoma 73170	8
Michael Jackson	1508 Oakhurst Street Norman Oklahoma 73170	7
Michael Stefner	1509 Oakhurst Street Norman Oklahoma 73170	6
Mike Shephard	1505 Oakhurst Street Norman Oklahoma 73170	3
Mike Tyson	9998 Oklahoma St., Morgantown, West Virginia, 12424	4
Pope Stevens	90412 Norman Avenue, Norman, Oklahoma, 70891	10
Troy Aikman	1504 Oakhurst Street Norman Oklahoma 73170	2

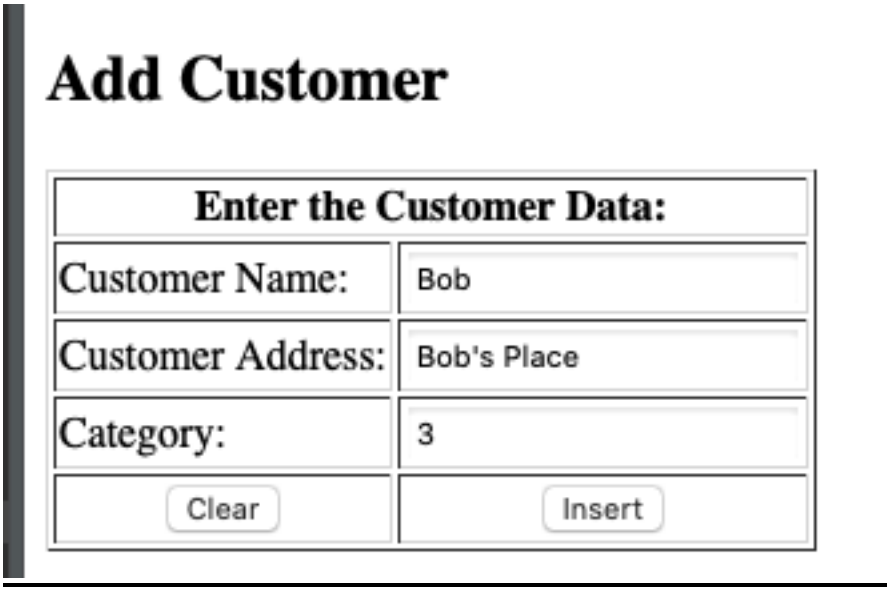
Screenshot for Query 13

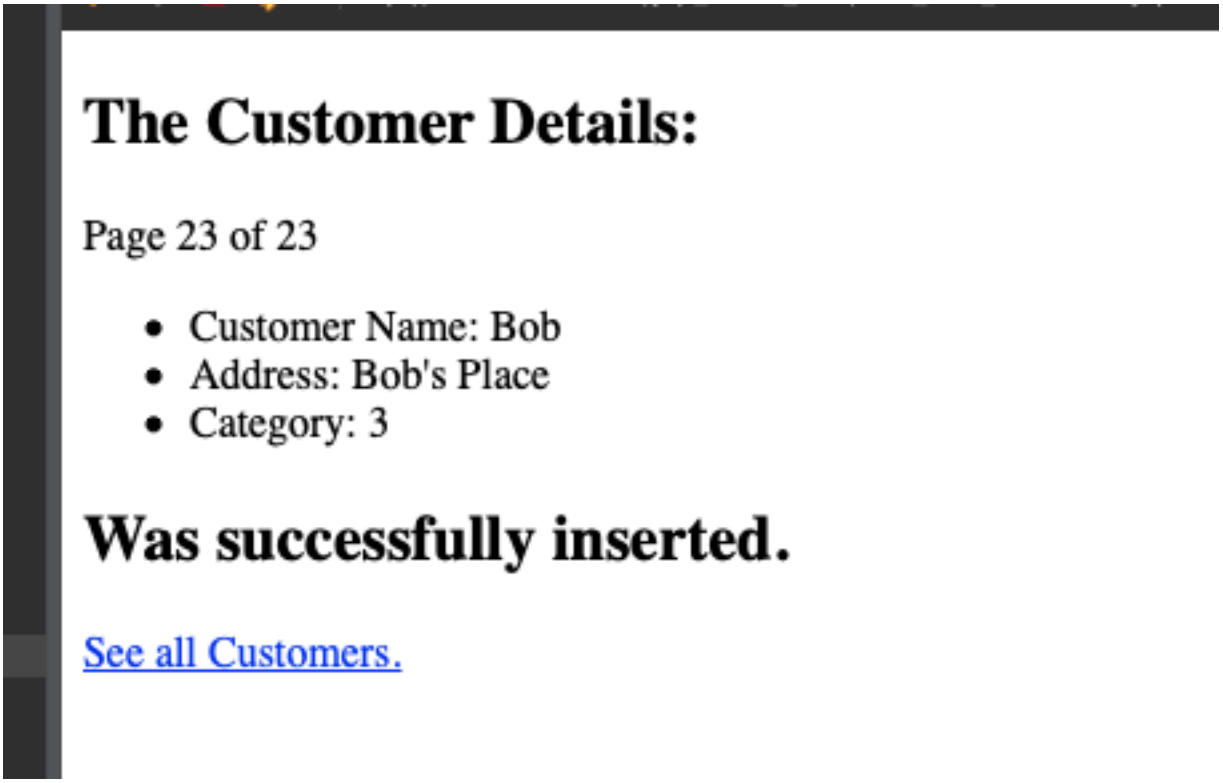
Give Customers Range

Enter the Category Range:	
Lower Bound:	2
Upper Bound:	5
Clear	Insert

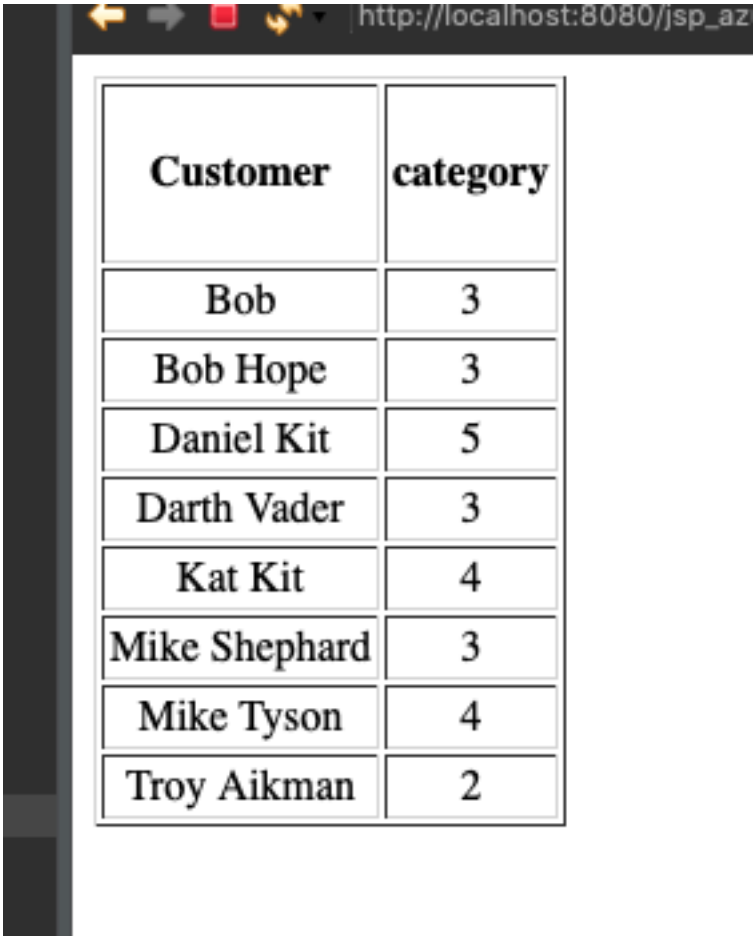
Customer	category
Bob Hope	3
Daniel Kit	5
Darth Vader	3
Kat Kit	4
Mike Shephard	3
Mike Tyson	4
Troy Aikman	2

Screenshot for Query 1





Screenshot for Query 13



Customer	category
Bob	3
Bob Hope	3
Daniel Kit	5
Darth Vader	3
Kat Kit	4
Mike Shephard	3
Mike Tyson	4
Troy Aikman	2