CSCI3170 (2023-2024 1st term)
Introduction to Database Systems
Project – Sales System

Group Registration Deadline:	23:59 25th October 2023
Phase 1 Deadline:	23:59 03rd November 2023
Phase 2 Deadline:	23:59 1st December 2023
For enquiry:	fcui22@cse.cuhk.edu.hk

1 Introduction

You are required to implement a sales system for a computer part store so that all information about transactions, computer parts and salespersons is stored. The system has to support interactive inquiries from users. You are required to use Java JDBC API to access the database and implement a Java application to satisfy all system functions defined in this specification.

There are two phases. In phase 1, you are required to design the database for the sales system (including an ER-diagram and a relational schema which doesn't contain redundant fields and tables). After the deadline of Phase 1, a suggested solution will be provided. You are required to use the suggested solution as a guideline to complete Phase 2. In Phase 2, you are required to implement the sales system as a Java command-line program. Our tutors will give tutorials on how to connect to MySQL database system through Java JDBC API and deploy your work on the required platform.

This is a group project and each group consists of three members. Each group is required to submit ONLY one solution for each project phase. Please sign the group registration form on blackboard before the group registration deadline.

2 Milestones

Preparation

- Read the document thoroughly and make sure you understand all the assumptions and regulations stated in Section 4.

Phase 1

- According to the data specifications in Section 3, design an ER-diagram and transform it into a relational schema which doesn't contain redundant fields and tables.

Phase 2

- According to the suggested solution of Phase 1, implement a Java application that fulfills all requirements stated in Section 5.
- Debug your system with different datasets and user inputs.
- Write a readme file to describe the compilation and deployment of your system.

3 Data Specifications

All data files for the system are in UNIX text file format (i.e. Newline character is \n) encoded in ASCII. Your Java application is required to read records stored in the files and insert them into appropriate tables in the provided MySQL DBMS via JDBC API. There are five input files, a list of categories, a list of manufacturers, a list of parts, a list of salesperson and a list of transaction records.

3.1 Category

Each computer part belongs to a category. In this system, there are several categories and each of them has its own name.

Item Name	Format	Description
Category ID	Non-empty positive integer with exactly 1 digit.	A unique identifier for a category.
Category Name	Non-empty string with at most 20 characters.	The name of a category.

3.2 Manufacturer

Each computer part is produced by a manufacturer. Each manufacturer has its name, address and phone number.

Item Name	Format	Description
Manufacturer ID	Non-empty positive integer with at most 2 digits.	A unique identifier for a manufacturer.
Manufacturer Name	Non-empty string with at most 20 characters.	The name of a manufacturer.
Manufacturer Address	Non-empty string with at most 50 characters.	The address of a manufacturer.
Manufacturer Phone Number	Non-empty positive integer with exactly 8 digits.	The phone number of a manufacturer.

3.3 Part

Each computer part has its name, manufacturer, category and available quantity.

Item Name	Format	Description
Part ID	Non-empty positive integer with at most 3 digits.	A unique identifier for a part.
Part Name	Non-empty string with at most 20 characters.	The name of a part.
Part Price	Non-empty positive integer with at most 5 digits.	The price of a part.
Part Manufacturer ID	Non-empty positive integer with at most 2 digits.	The manufacturer ID of a part.
Part Category ID	Non-empty positive integer with exactly 1 digit.	The category ID of a part.
Part Warranty	Non-empty positive integer with exactly at most 2 digits.	The length of the warranty period of a product in terms of weeks.
Part Available Quantity	Non-empty non-negative integer with at most 2 digits.	The quantity of a part available for sale.

3.4 Salesperson

Salespersons are responsible for selling computer parts in a store. Each salesperson has his/her name, address and phone number.

Item Name	Format	Description
Salesperson ID	Non-empty positive integer with at most 2 digits.	A unique identifier for a salesperson.
Salesperson Name	Non-empty string with at most 20 characters.	The name of a salesperson.
Salesperson Address	Non-empty string with at most 50 characters.	The address of a salesperson.
Salesperson Phone Number	Non-empty positive integer with exactly 8 digits.	The phone number of a salesperson.
Salesperson Experience	Non-empty positive integer with exactly 1 digits.	The experience of salesperson in terms of years

3.5 Transaction Records

There is a record for each transaction performed in the sales system. It records the part sold, salesperson involved and the date of the transaction.

Item Name	Format	Description
Transaction ID	Non-empty positive integer with at most 4 digits.	The ID of a transaction record.
Part ID	Non-empty positive integer with at most 3 digits.	The ID of the part sold.
Salesperson ID	Non-empty positive integer with at most 2 digits.	The ID of the salesperson.
Transaction Date	Non-empty date in the format of DD/MM/YYYY.	The date of the transaction.

4 Assumptions and Regulations

4.1 System

- All numerical values will not be larger than the maximum integer value that can be handled by Java.
- The system is case sensitive.
- Every date has the following format: [DD]/[MM]/[YYYY] and has the same time zone as Hong Kong (GMT+8). (Note: Y=year, M=month, D=day)
- There is no duplicate row in any input and output.
- There is no empty row in any input and output.
- The current date is the system date of the MySQL DBMS server.
- Your Java program may assume that any value entered into any input field is correct **in format only**.
- Your Java program may assume that any data file inputted into it is correct **in format and content**.

4.2 Category

- The ID and the name of a category are both unique.
- All categories are identified by their ID.

4.3 Manufacturer

- The ID of a manufacturer is unique and all manufacturers are identified by their ID.
- Some manufacturers may share the same name, phone number or address.

4.4 Part

- The ID of a part is unique and all parts are identified by their ID.
- Some parts may have the same name, price, available quantity, warranty, manufacturer ID or category ID.

4.5 Salesperson

- The ID of a salesperson is unique and all salespersons can be identified by their ID only.
- Some salespersons may have the same name, address, phone number or years of experience.

4.6 Transaction Records

- The ID of a transaction is unique and all transactions can be identified by their ID only.
- Each transaction corresponds to the sale of one part.
- Some salesperson may never sell any part and some parts may have never been sold.
- A part can be sold only if it is still available (i.e. available quantity > 0).
- A salesperson can sell the same part more than once by having more than one transaction.
- There may be more than one transaction in one day.
- After a salesperson sells a part, the system should reduce the available quantity of that part by one and add a transaction record accordingly.

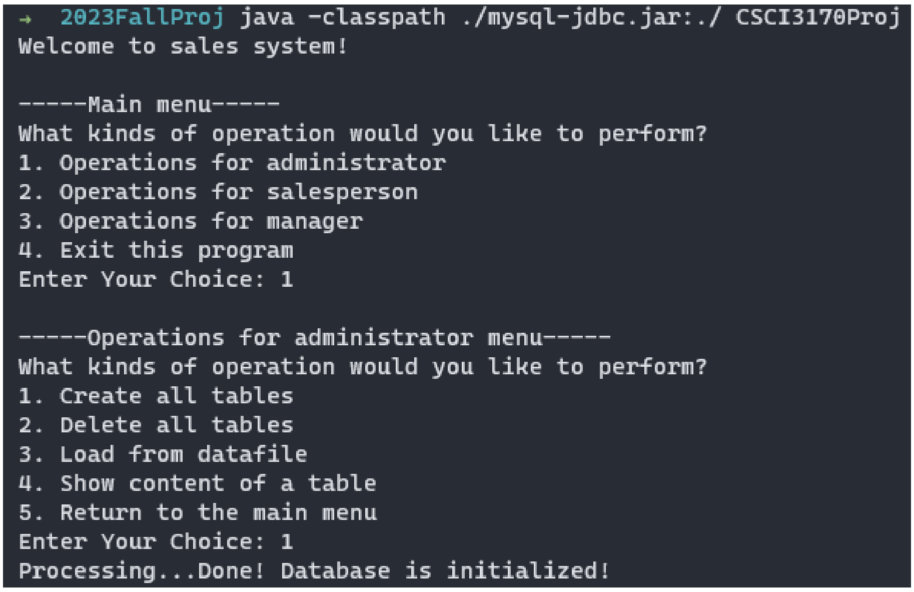
5 Function Requirements

You are required to write a simple command line application in Java. After performing a function specified in any of the following sub-sections, the program should go back to the topmost level of menu. Any error or informative message of the Java program should be displayed in a new line. The Java program consists of the following functions:

5.1 Administrator

The functions that can be used by an administrator are:

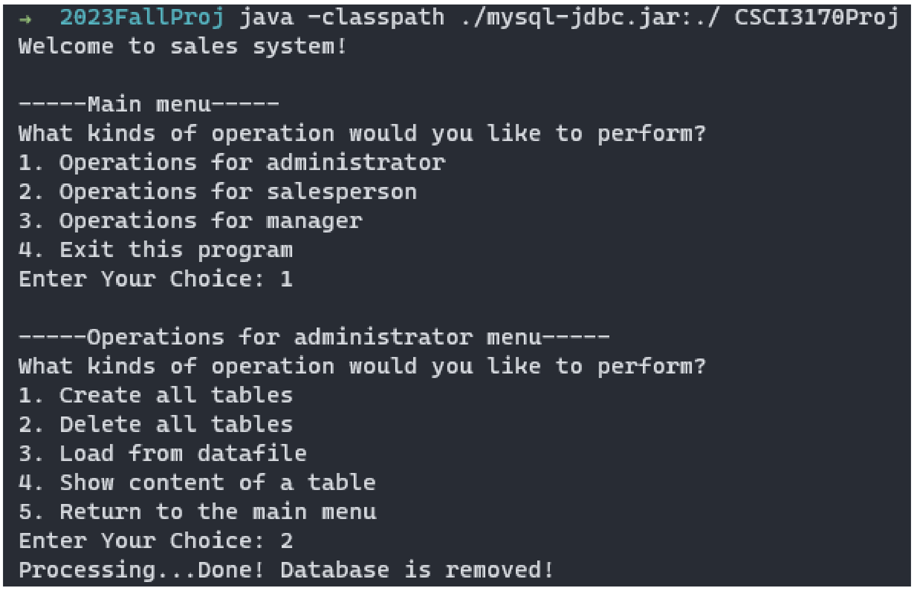
- **Create table schemas in the database**: This function creates all tables for the sales system in the MySQL DBMS based on the relational schema given.



```
→  2023FallProj java -classpath ./mysql-jdbc.jar:./ CSCI3170Proj
Welcome to sales system!

-----Main menu-----
What kinds of operation would you like to perform?
1. Operations for administrator
2. Operations for salesperson
3. Operations for manager
4. Exit this program
Enter Your Choice: 1

-----Operations for administrator menu-----
What kinds of operation would you like to perform?
1. Create all tables
2. Delete all tables
3. Load from datafile
4. Show content of a table
5. Return to the main menu
Enter Your Choice: 1
Processing...Done! Database is initialized!
```

Figure 1: Expected interactive input and output while creating table schemas in MySQL DBMS.

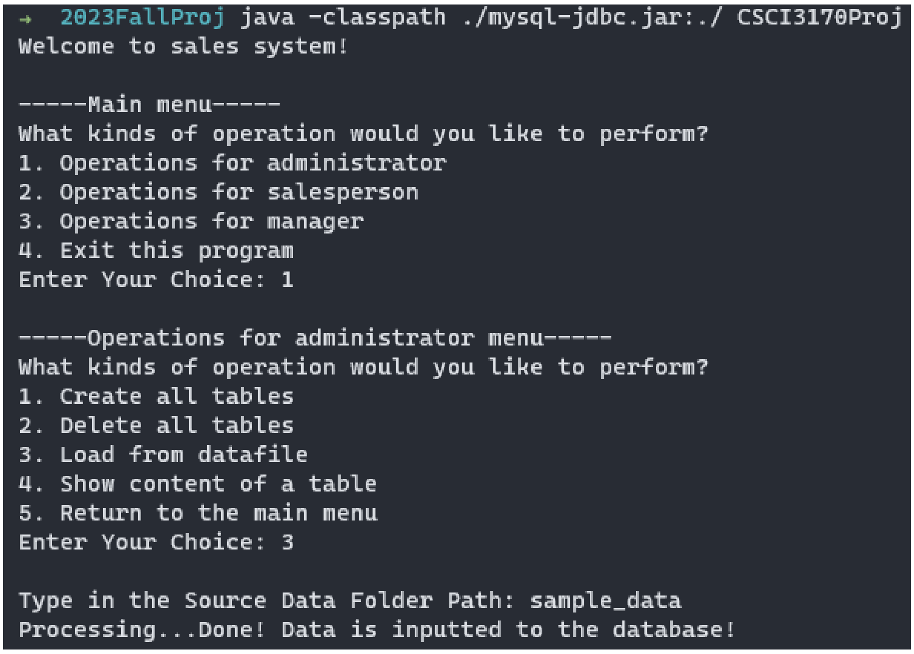
- **Delete table schemas in the database:** This function deletes all existing tables of the sales system from MySQL DBMS.



```
→  2023FallProj java -classpath ./mysql-jdbc.jar:./ CSCI3170Proj
Welcome to sales system!

-----Main menu-----
What kinds of operation would you like to perform?
1. Operations for administrator
2. Operations for salesperson
3. Operations for manager
4. Exit this program
Enter Your Choice: 1

-----Operations for administrator menu-----
What kinds of operation would you like to perform?
1. Create all tables
2. Delete all tables
3. Load from datafile
4. Show content of a table
5. Return to the main menu
Enter Your Choice: 2
Processing...Done! Database is removed!
```

Figure 2: Expected interactive input and output while deleting table schemas from MySQL DBMS.

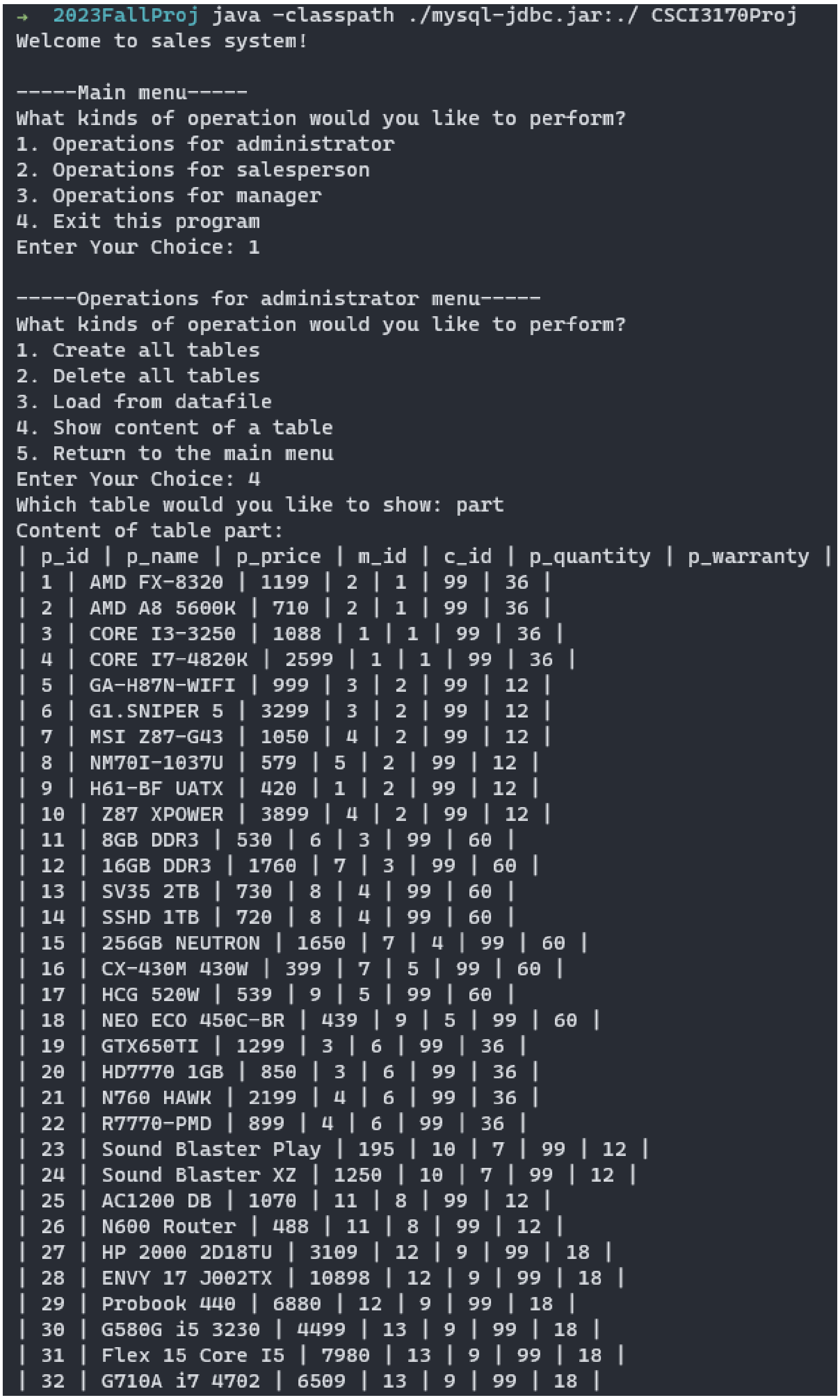
- **Load data from a dataset**: This function reads all data files from a user-specified folder and inserts the records into the appropriate table in the database. (Your program can assume that the user-specified folder must contain all five input files. These five input files are named *category.txt*, *manufacturer.txt*, *part.txt*, *salesperson.txt* and *transaction.txt*. Each data file stores the data corresponds to its filename.)



```
→  2023FallProj java -classpath ./mysql-jdbc.jar:./ CSCI3170Proj
Welcome to sales system!

-----Main menu-----
What kinds of operation would you like to perform?
1. Operations for administrator
2. Operations for salesperson
3. Operations for manager
4. Exit this program
Enter Your Choice: 1

-----Operations for administrator menu-----
What kinds of operation would you like to perform?
1. Create all tables
2. Delete all tables
3. Load from datafile
4. Show content of a table
5. Return to the main menu
Enter Your Choice: 3

Type in the Source Data Folder Path: sample_data
Processing...Done! Data is inputted to the database!
```

Figure 3: Expected interactive input and output while loading data from data files to the table schemas in MySQL DBMS.

- **Show the content of a specified table:** This function shows the content of a user-specified table.



```
→  2023FallProj java -classpath ./mysql-jdbc.jar:./ CSCI3170Proj
Welcome to sales system!

-----Main menu-----
What kinds of operation would you like to perform?
1. Operations for administrator
2. Operations for salesperson
3. Operations for manager
4. Exit this program
Enter Your Choice: 1

-----Operations for administrator menu-----
What kinds of operation would you like to perform?
1. Create all tables
2. Delete all tables
3. Load from datafile
4. Show content of a table
5. Return to the main menu
Enter Your Choice: 4
Which table would you like to show: part
Content of table part:
| p_id | p_name | p_price | m_id | c_id | p_quantity | p_warranty |
| 1 | AMD FX-8320 | 1199 | 2 | 1 | 99 | 36 |
| 2 | AMD A8 5600K | 710 | 2 | 1 | 99 | 36 |
| 3 | CORE I3-3250 | 1088 | 1 | 1 | 99 | 36 |
| 4 | CORE I7-4820K | 2599 | 1 | 1 | 99 | 36 |
| 5 | GA-H87N-WIFI | 999 | 3 | 2 | 99 | 12 |
| 6 | G1.SNIPER 5 | 3299 | 3 | 2 | 99 | 12 |
| 7 | MSI Z87-G43 | 1050 | 4 | 2 | 99 | 12 |
| 8 | NM70I-1037U | 579 | 5 | 2 | 99 | 12 |
| 9 | H61-BF UATX | 420 | 1 | 2 | 99 | 12 |
| 10 | Z87 XPOWER | 3899 | 4 | 2 | 99 | 12 |
| 11 | 8GB DDR3 | 530 | 6 | 3 | 99 | 60 |
| 12 | 16GB DDR3 | 1760 | 7 | 3 | 99 | 60 |
| 13 | SV35 2TB | 730 | 8 | 4 | 99 | 60 |
| 14 | SSHD 1TB | 720 | 8 | 4 | 99 | 60 |
| 15 | 256GB NEUTRON | 1650 | 7 | 4 | 99 | 60 |
| 16 | CX-430M 430W | 399 | 7 | 5 | 99 | 60 |
| 17 | HCG 520W | 539 | 9 | 5 | 99 | 60 |
| 18 | NEO ECO 450C-BR | 439 | 9 | 5 | 99 | 60 |
| 19 | GTX650TI | 1299 | 3 | 6 | 99 | 36 |
| 20 | HD7770 1GB | 850 | 3 | 6 | 99 | 36 |
| 21 | N760 HAWK | 2199 | 4 | 6 | 99 | 36 |
| 22 | R7770-PMD | 899 | 4 | 6 | 99 | 36 |
| 23 | Sound Blaster Play | 195 | 10 | 7 | 99 | 12 |
| 24 | Sound Blaster XZ | 1250 | 10 | 7 | 99 | 12 |
| 25 | AC1200 DB | 1070 | 11 | 8 | 99 | 12 |
| 26 | N600 Router | 488 | 11 | 8 | 99 | 12 |
| 27 | HP 2000 2D18TU | 3109 | 12 | 9 | 99 | 18 |
| 28 | ENVY 17 J002TX | 10898 | 12 | 9 | 99 | 18 |
| 29 | Probook 440 | 6880 | 12 | 9 | 99 | 18 |
| 30 | G580G i5 3230 | 4499 | 13 | 9 | 99 | 18 |
| 31 | Flex 15 Core I5 | 7980 | 13 | 9 | 99 | 18 |
| 32 | G710A i7 4702 | 6509 | 13 | 9 | 99 | 18 |
```

Figure 4: Expected interactive input and output while showing content of *category* table.

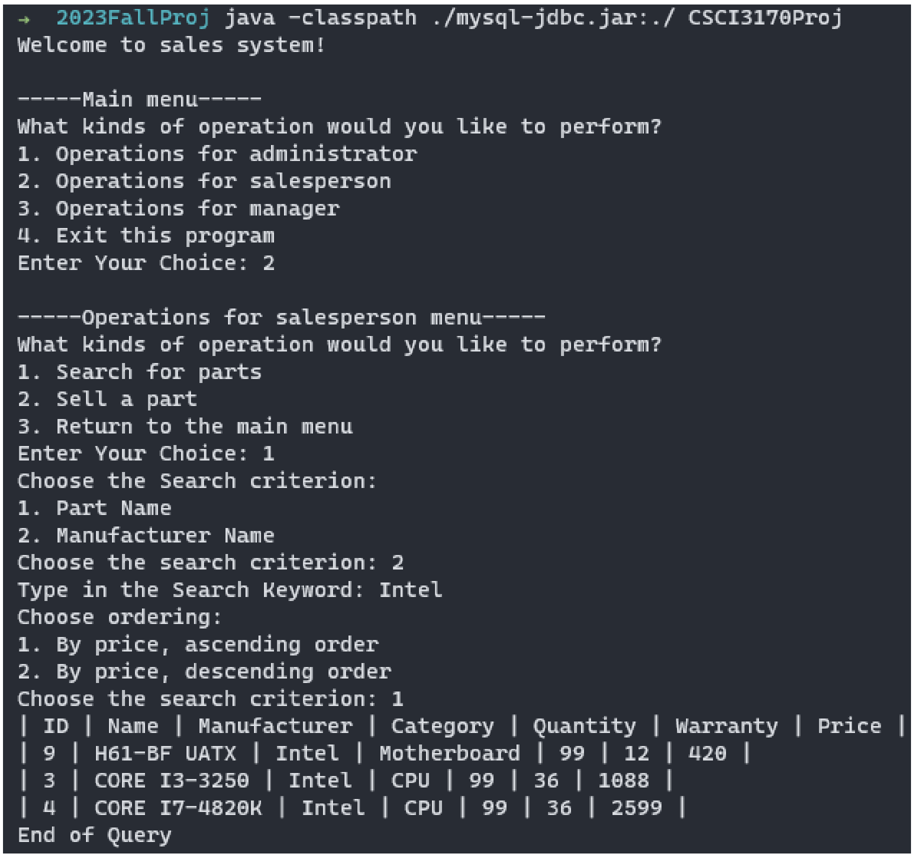
5.2 Salesperson

The functions that can be used by a salesperson are:

- **Search for Parts**: The system has to provide an interface to allow a salesperson to search for computer parts available in the store based on any one of the two different search criteria below.
  - By Part Name (partial matching)
  - By Manufacturer Name (partial matching)

  You can assume that only one search criterion can be selected by the salesperson for each query. After he/she enters the search keyword, the program should perform the query and return all matching parts in terms of their *Part ID*, *Part Name*, *Manufacturer Name, Category Name, Available Quantity, Warranty Period and Part Price*. The salesperson can then choose any one of two different ways to sort the parts:
  - By price, ascending order
  - By price, descending order

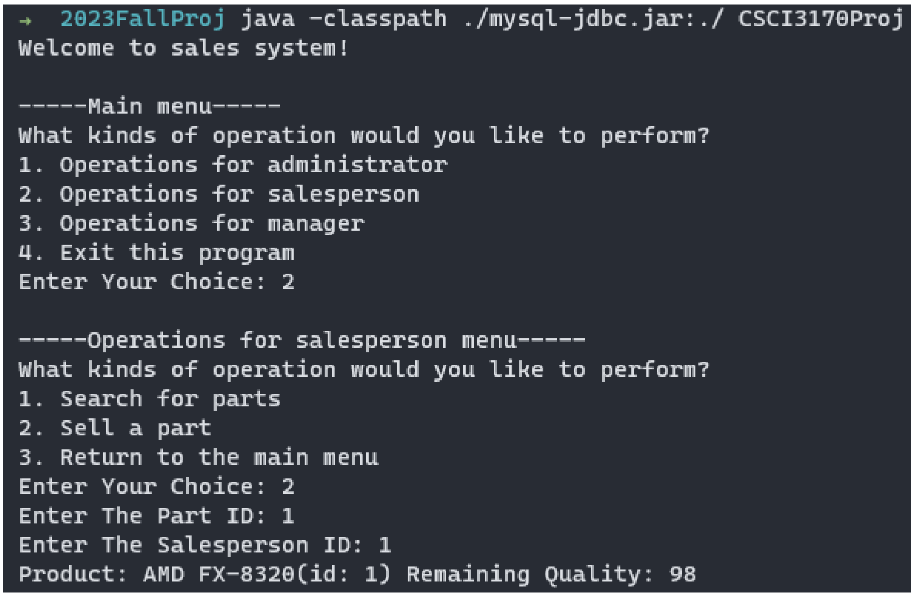
  Finally, the result should be outputted as a table as follows:



```
→  2023FallProj java -classpath ./mysql-jdbc.jar:./ CSCI3170Proj
Welcome to sales system!

-----Main menu-----
What kinds of operation would you like to perform?
1. Operations for administrator
2. Operations for salesperson
3. Operations for manager
4. Exit this program
Enter Your Choice: 2

-----Operations for salesperson menu-----
What kinds of operation would you like to perform?
1. Search for parts
2. Sell a part
3. Return to the main menu
Enter Your Choice: 1
Choose the Search criterion:
1. Part Name
2. Manufacturer Name
Choose the search criterion: 2
Type in the Search Keyword: Intel
Choose ordering:
1. By price, ascending order
2. By price, descending order
Choose the search criterion: 1
| ID | Name | Manufacturer | Category | Quantity | Warranty | Price |
| 9 | H61-BF UATX | Intel | Motherboard | 99 | 12 | 420 |
| 3 | CORE I3-3250 | Intel | CPU | 99 | 36 | 1088 |
| 4 | CORE I7-4820K | Intel | CPU | 99 | 36 | 2599 |
End of Query
```

Figure 5: Expected interactive input and output while searching for parts.

- **Perform Transaction:** After a salesperson helps a customer finding a part, he/she can then sell the part (i.e. perform a transaction) through the sales system. First, he/she needs to input part ID of the part being sold and his/her salesperson ID. Then the system should check whether that part is available (*Part Available Quantity* > 0). If the part is available, it is then sold and the database is updated accordingly. Finally there should be an informative message on remaining available quantity of the part sold. If the part cannot be sold, an error message should also be shown.



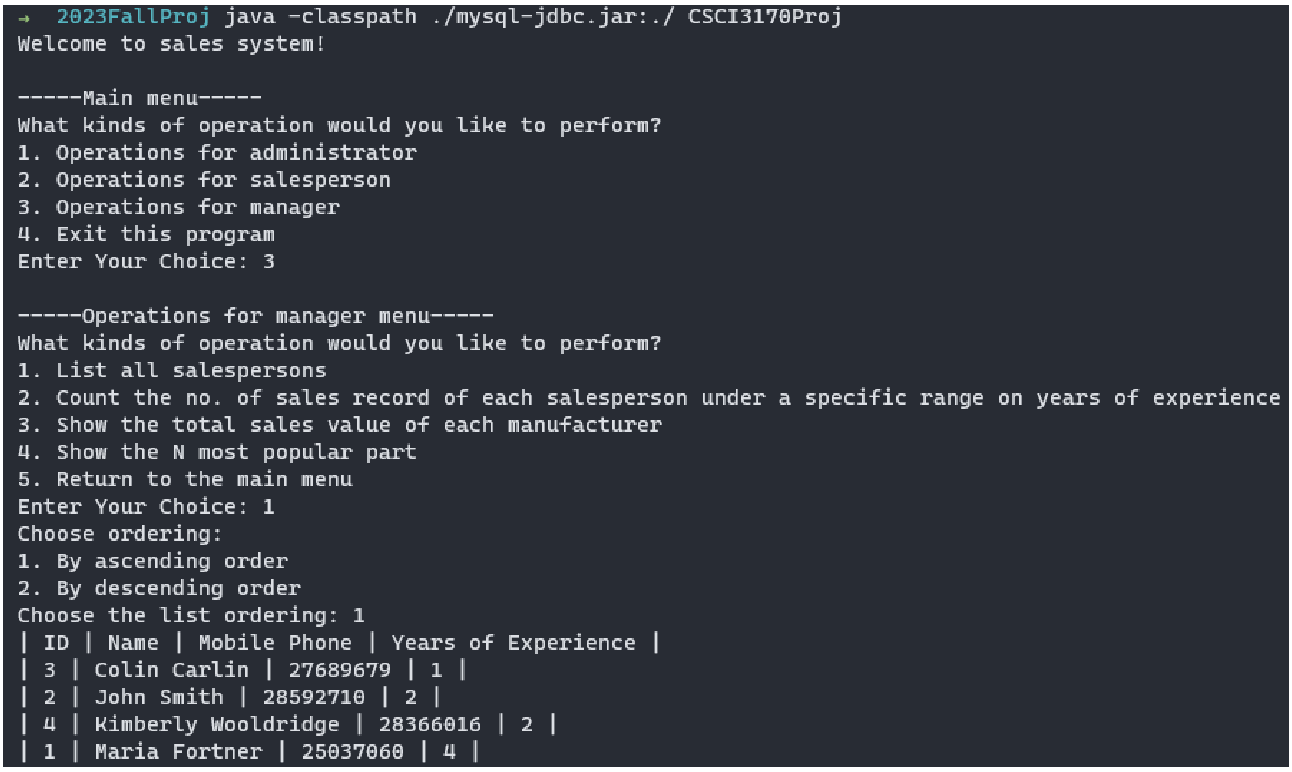
```
→  2023FallProj java -classpath ./mysql-jdbc.jar:./ CSCI3170Proj
Welcome to sales system!

-----Main menu-----
What kinds of operation would you like to perform?
1. Operations for administrator
2. Operations for salesperson
3. Operations for manager
4. Exit this program
Enter Your Choice: 2

-----Operations for salesperson menu-----
What kinds of operation would you like to perform?
1. Search for parts
2. Sell a part
3. Return to the main menu
Enter Your Choice: 2
Enter The Part ID: 1
Enter The Salesperson ID: 1
Product: AMD FX-8320(id: 1) Remaining Quality: 98
```

Figure 6: Expected interactive input and output while performing transaction.

5.3 Manager

The functions that can be used by a manager are:

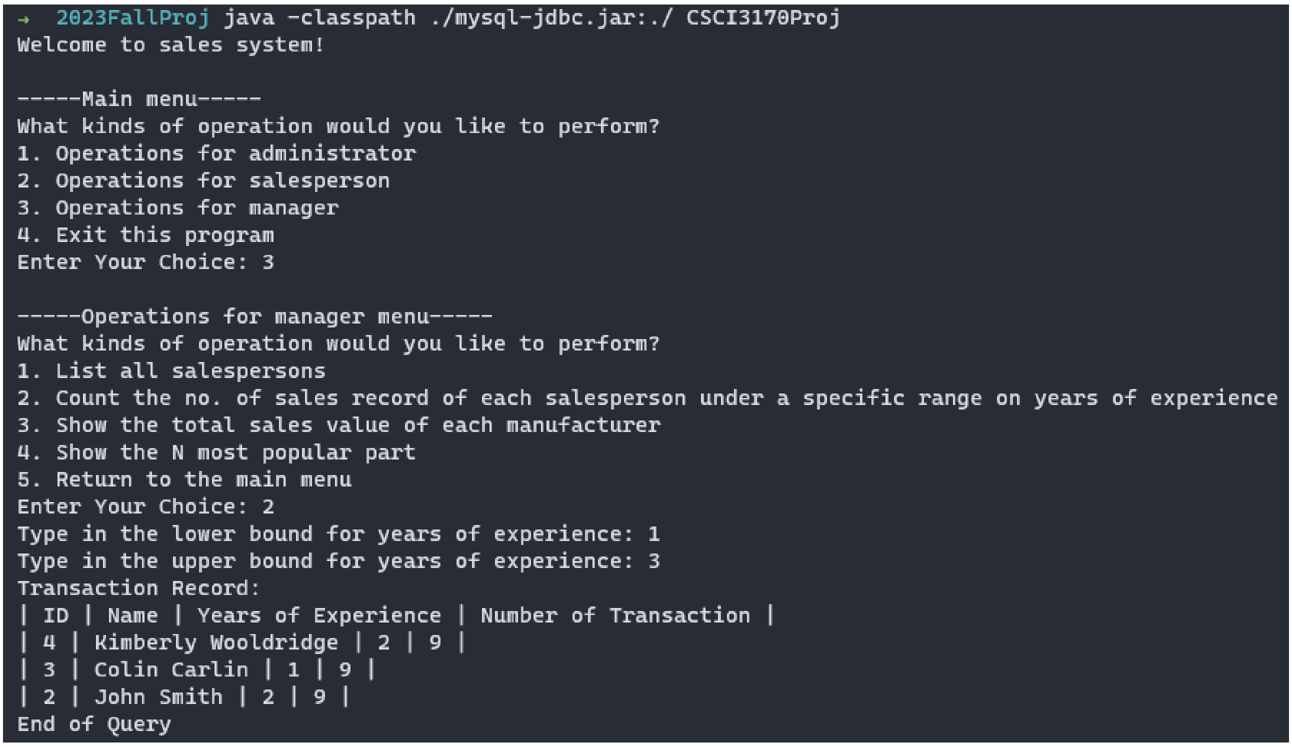
- **List all salespersons in ascending or descending order of years of experience:** The system needs to provide a method for the manager to list all salespersons in either ascending or descending order of their years of experiences. After he/she specifies the output order, the program will perform the query and return the ID, name, phone number and years of experience of each salesperson as follows:



```
→  2023FallProj java -classpath ./mysql-jdbc.jar:./ CSCI3170Proj
Welcome to sales system!

-----Main menu-----
What kinds of operation would you like to perform?
1. Operations for administrator
2. Operations for salesperson
3. Operations for manager
4. Exit this program
Enter Your Choice: 3

-----Operations for manager menu-----
What kinds of operation would you like to perform?
1. List all salespersons
2. Count the no. of sales record of each salesperson under a specific range on years of experience
3. Show the total sales value of each manufacturer
4. Show the N most popular part
5. Return to the main menu
Enter Your Choice: 1
Choose ordering:
1. By ascending order
2. By descending order
Choose the list ordering: 1
| ID | Name | Mobile Phone | Years of Experience |
| 3 | Colin Carlin | 27689679 | 1 |
| 2 | John Smith | 28592710 | 2 |
| 4 | Kimberly Wooldridge | 28366016 | 2 |
| 1 | Maria Fortner | 25037060 | 4 |
```

Figure 7: Expected interactive input and output while listing salespersons.

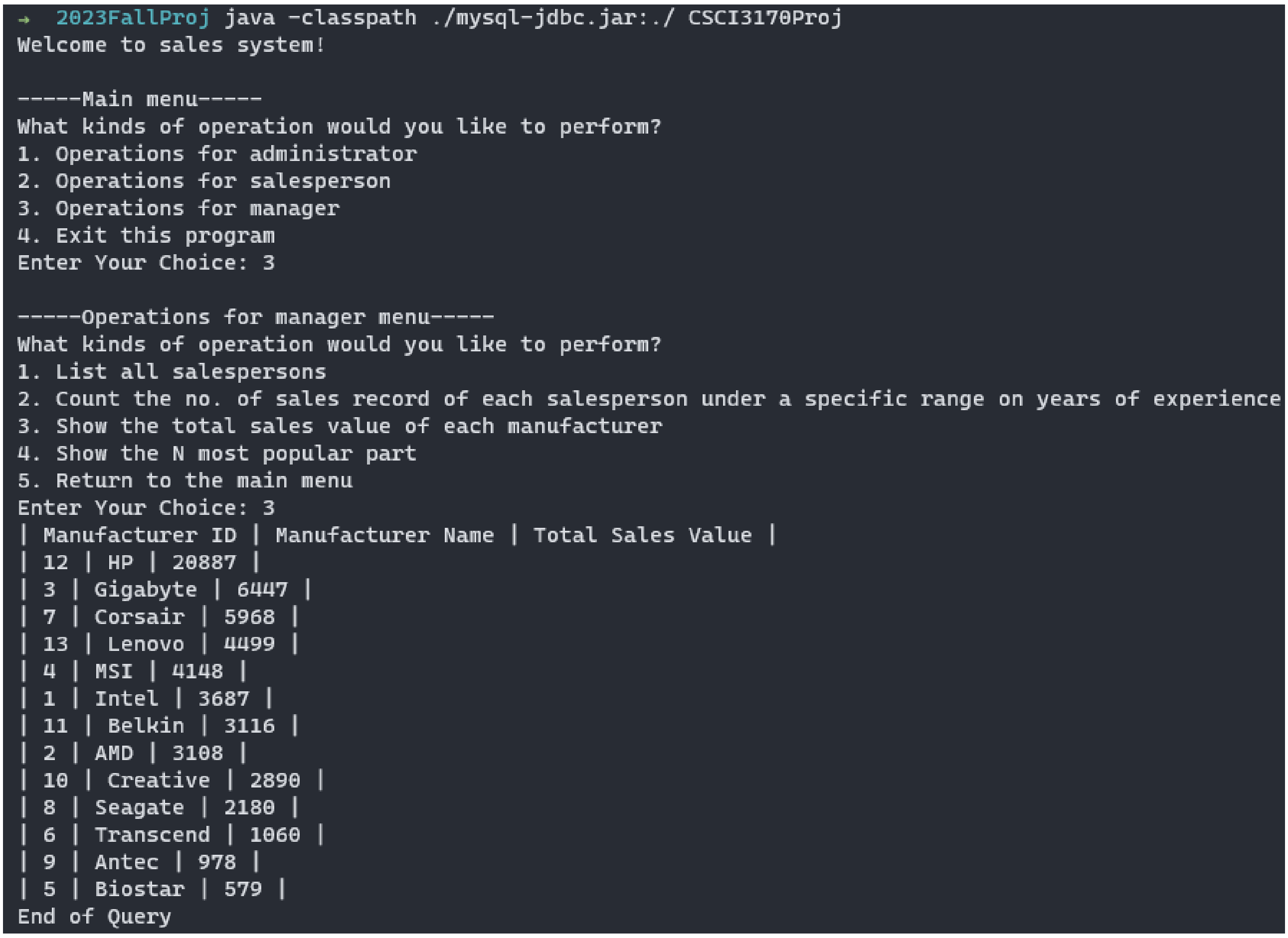
- **Count the number of transaction records of each salesperson within a given range on years of experience:**
  The system has to provide an interface to allow a manager to count the number of transaction records of each salesperson within a given range on years of experience (e.g. from 1 year to 3 years) inclusively. After he/she enters a *specific range on years of experience*, the program will perform the query and return the ID, name, years of experience and number of transaction records of each salesperson within the range on years of experience specified by the user inclusively. These transaction records should be sorted in descending order of *Salesperson ID* and outputted as a table as follows:



```
→  2023FallProj java -classpath ./mysql-jdbc.jar:./ CSCI3170Proj
Welcome to sales system!

-----Main menu-----
What kinds of operation would you like to perform?
1. Operations for administrator
2. Operations for salesperson
3. Operations for manager
4. Exit this program
Enter Your Choice: 3

-----Operations for manager menu-----
What kinds of operation would you like to perform?
1. List all salespersons
2. Count the no. of sales record of each salesperson under a specific range on years of experience
3. Show the total sales value of each manufacturer
4. Show the N most popular part
5. Return to the main menu
Enter Your Choice: 2
Type in the lower bound for years of experience: 1
Type in the upper bound for years of experience: 3
Transaction Record:
| ID | Name | Years of Experience | Number of Transaction |
| 4 | Kimberly Wooldridge | 2 | 9 |
| 3 | Colin Carlin | 1 | 9 |
| 2 | John Smith | 2 | 9 |
End of Query
```

Figure 8: Expected interactive input and output while counting the number of transaction records of each salesperson within a given range on years of experience (from 1 year to 3 years) inclusively.

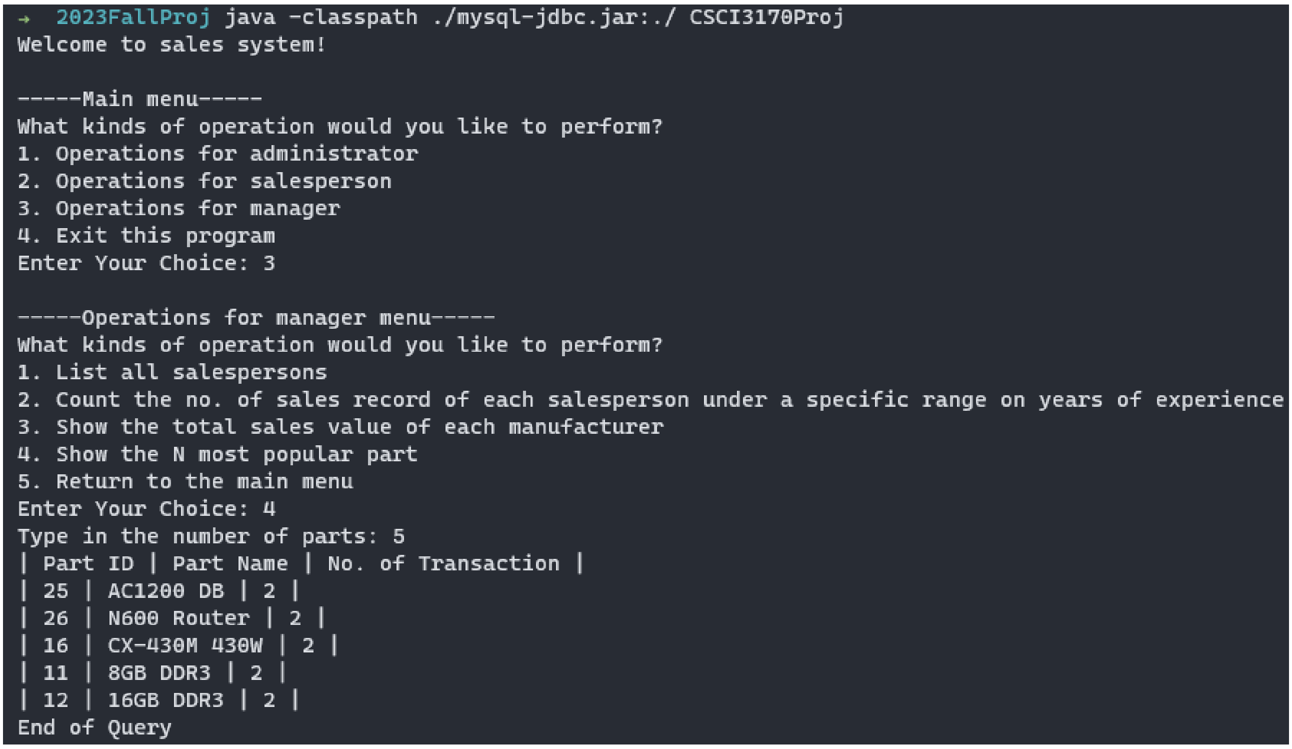
- **Sort and list the manufacturers in descending order of total sales value:** The system has to provide an interface to allow a manager to sort the manufacturers according to their total sale values. After the program performs the query, it returns the results in terms of *Manufacturer ID*, *Manufacturer Name* and *Total sales value* in descending order of *Total sales value* as a table as follows:



```
→  2023FallProj java -classpath ./mysql-jdbc.jar:./ CSCI3170Proj
Welcome to sales system!

-----Main menu-----
What kinds of operation would you like to perform?
1. Operations for administrator
2. Operations for salesperson
3. Operations for manager
4. Exit this program
Enter Your Choice: 3

-----Operations for manager menu-----
What kinds of operation would you like to perform?
1. List all salespersons
2. Count the no. of sales record of each salesperson under a specific range on years of experience
3. Show the total sales value of each manufacturer
4. Show the N most popular part
5. Return to the main menu
Enter Your Choice: 3
| Manufacturer ID | Manufacturer Name | Total Sales Value |
| 12 | HP | 20887 |
| 3 | Gigabyte | 6447 |
| 7 | Corsair | 5968 |
| 13 | Lenovo | 4499 |
| 4 | MSI | 4148 |
| 1 | Intel | 3687 |
| 11 | Belkin | 3116 |
| 2 | AMD | 3108 |
| 10 | Creative | 2890 |
| 8 | Seagate | 2180 |
| 6 | Transcend | 1060 |
| 9 | Antec | 978 |
| 5 | Biostar | 579 |
End of Query
```

Figure 9: Expected interactive input and output while showing all manufacturers in descending order of total sales value.

- **Show the N most popular parts:** The system has to provide an interface to allow a manager to show the N parts that are most popular. After the manager enters the number of parts (N) that he/she wants to list, the program will perform the query and return the N parts that are most popular in terms of *Part ID*, *Part Name* and *Total Number of Transaction* in descending order of *Total Number of Transaction* as a table as follows.



```
→  2023FallProj java -classpath ./mysql-jdbc.jar:./ CSCI3170Proj
Welcome to sales system!

-----Main menu-----
What kinds of operation would you like to perform?
1. Operations for administrator
2. Operations for salesperson
3. Operations for manager
4. Exit this program
Enter Your Choice: 3

-----Operations for manager menu-----
What kinds of operation would you like to perform?
1. List all salespersons
2. Count the no. of sales record of each salesperson under a specific range on years of experience
3. Show the total sales value of each manufacturer
4. Show the N most popular part
5. Return to the main menu
Enter Your Choice: 4
Type in the number of parts: 5
| Part ID | Part Name | No. of Transaction |
| 25 | AC1200 DB | 2 |
| 26 | N600 Router | 2 |
| 16 | CX-430M 430W | 2 |
| 11 | 8GB DDR3 | 2 |
| 12 | 16GB DDR3 | 2 |
End of Query
```

Figure 10: Expected interactive input and output while showing the N most popular parts.

(Note: N should be an integer larger than 0 and a part without any transaction record should not be shown in the table above.)

6 Grading Policy

The marks are distributed as follows:

Phase	Content	Mark Distribution
1	ER-diagram	10%
	Relational schema (based on your ER-diagram)	10%
2	Java application	80%

- There will be a mark deduction if your application is terminated unexpectedly in the demonstration video.
- All members in the same group will receive the same marks for the project. In order to encourage every student to participate in the project, a question about this project may be asked in the final examination.

7 Demonstration

- All groups need to record demonstration videos for their phase 2 implementations. The detailed instructions will be posted on Blackboard later.
- The dataset used in the demonstration video will be different from the dataset provided.

8 Submission Methods

8.1 Phase 1

- Submit a PDF file (one copy for each group) to the collection box at eLearning platform.
- The PDF file should consist of your groups ER diagram, relational schema, the group number, the names and the student IDs of all group members of your group.

8.2 Phase 2

- Submit a ZIP file (one copy for each group) to the collection box on Blackboard. The ZIP file should consist of all your source codes, your demonstration video, and a README file, which contains:
  - The group number of your group.
  - The name and the student ID of each group members of your group.
  - List of files with description.
  - Methods of compilation and execution.