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UNIVERSITI TEKNOLOGI MALAYSIA

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SECJ - DATA STRUCTURE AND ALGORITHMS

ASSIGNMENT 1

Group Name: Center Point

Topics: Inventory Management System

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If user choose the sorting option, they will be provided several criteria to sort the inventory list including **code**, **name**, **type**, **quantity** and **price**. Then user is asked to choose whether the sorting should be sort in ascending or descending order. The system will then automatically sort the inventory list based on the chosen criteria.

```
<<< Sorting Process >>>
[1] By Inventory Code
[2] By Inventory Name
[3] By Inventory Type
[4] By Quantity
[5] By Price
Option: |
```

Below is the example output of sorting by **Quantity** in **ascending order**:

```
::Sort By Quantity in Ascending Order

:::Inventory List:::
```

Inventory Code	Inventory Name	Inventory Type	Quantity	Price
I002	Story Book	Book	10	100.00
I003	Novel	Book WE	20	120.30
I001	Laptop	Computer	20	23.00
I004	Key Pad	Computer	22	77.70
I005	Mouse	Computer	30	19.80

Below is the example output of sorting by **inventory type** in **descending order**:

```
::Sort By Inventory Type in Descending Order

:::Inventory List:::
```

Inventory Code	Inventory Name	Inventory Type	Quantity	Price
I001	Laptop	Computer	20	23.00
I004	Key Pad	Computer	22	77.70
I005	Mouse	Computer	30	19.80
I003	Novel	Book WE	20	120.30
I002	Story Book	Book	10	100.00

Other than that, if the user select the searching option, They will be presented with 2 choices, whether they want to search by **code** or **name**. Following this, the user then enter the desired code or the name they want to search for. The system will display the relevant information for the specific inventory item to user.

```
<<< Searching Process >>>
[1] By Inventory Code
[2] By Inventory Name
Option: |
```

Below is the example output of searching by **code** “I003” :

```
Enter your search key: I003
::Search By Inventory Code

::::::::::Inventory List::::::::::
-----
Inventory Code      Inventory Name      Inventory Type      Quantity      Price
-----
I003                Novel              Book WE             20            120.30
```

Below is the example output of searching by **name** “Story Book” :

```
Enter your search key: Story Book
::Search By Inventory Name

::::::::::Inventory List::::::::::
-----
Inventory Code      Inventory Name      Inventory Type      Quantity      Price
-----
I002                Story Book          Book                10            100.00
```

* Note that the name entered is not case sensitive

If the user choose to exit the system, the system will display a goodbye message to user

```
Bye Bye!!!
```

3. System Design

3.1. Pseudocode

3.1.1 Main function

1. Start
2. Set counter = 0, loop = true, create Inventory class object array
3. Open input and output file
4. if(! input)
 - 4.1 Print "Cannot open the input file"
 - 4.2 End
5. while(!input.eof())
 - 5.1 read inventory data from file
 - 5.2 Update inventory data to inventory object array
6. Print inventory object array
7. while(loop)
 - 7.1 Print mainMenu
 - 7.2 Get mChoice from user
 - 7.3 if(mChoice==1)
 - 7.3.1 call sort function
 - 7.3.2 display inventory object array
 - 7.4 else if(mChoice==2)
 - 7.4.1 call search function
 - 7.5 else if(mChoice==3)
 - 7.5.1 print "Bye Bye!!!"
 - 7.5.2 loop = false
 - 7.6 else
 - 7.6.1 print "Please enter a valid choice! :) "
8. Store the inventory object array data into output file
9. Close input file and output file
10. End

3.1.2 sort function

1. Start
2. Print sort menu
3. Get sort choice from user + exception handling
4. Print order menu
5. Get order choice from user + exception handling
6. Set sorted=false
7. for(p=1;p<n&&!sorted;++p)
 - 7.1 sorted=true
 - 7.2 for(x=0;x<n-p;++x)
 - 7.2.1 if(sort choice ==1)

```

7.2.1.1 sortType=Inventory Code
7.2.1.2 if(oderChoice==1)
    7.2.1.2.1 if(data[x].getCode()>
        data[x+1].getCode())
        7.2.1.2.1.1 temp=data[x]
        7.2.1.2.1.2 data[x]=data[x+1]
        7.2.1.2.1.3 data[x+1] = temp
        7.2.1.2.1.4 sorted=false
7.2.1.3 else
    7.2.1.3.1 if(data[x].getCode()<
        data[x+1].getCode())
        7.2.1.3.1.1 temp=data[x]
        7.2.1.3.1.2 data[x]=data[x+1]
        7.2.1.3.1.3 data[x+1] = temp
        7.2.1.3.1.4 sorted=false
7.2.2 else if(sort choice ==2)
    7.2.2.1 sortType=Inventory Name
    7.2.2.2 if(oderChoice==1)
        7.2.2.2.1 if(data[x].getName()>
            data[x+1].getName())
            7.2.2.2.1.1 temp=data[x]
            7.2.2.2.1.2 data[x]=data[x+1]
            7.2.2.2.1.3 data[x+1] = temp
            7.2.2.2.1.4 sorted=false
    7.2.2.3 else
        7.2.2.3.1 if(data[x].getName()<
            data[x+1].getName())
            7.2.2.3.1.1 temp=data[x]
            7.2.2.3.1.2 data[x]=data[x+1]
            7.2.2.3.1.3 data[x+1] = temp
            7.2.2.3.1.4 sorted=false
7.2.3 else if(sort choice ==3)
    7.2.3.1 sortType=Inventory Type
    7.2.3.2 if(oderChoice==1)
        7.2.3.2.1 if(data[x].getType()>
            data[x+1].getType())
            7.2.3.2.1.1 temp=data[x]
            7.2.3.2.1.2 data[x]=data[x+1]
            7.2.3.2.1.3 data[x+1] = temp
            7.2.3.2.1.4 sorted=false
    7.2.3.3 else
        7.2.3.3.1 if(data[x].getType()<
            data[x+1].getName())
            7.2.3.3.1.1 temp=data[x]

```

```

7.2.3.3.1.2 data[x]=data[x+1]
7.2.3.3.1.3 data[x+1] = temp
7.2.3.3.1.4 sorted=false
7.2.4 else if(sort choice ==4)
7.2.4.1 sortType=Quantity
7.2.4.2 if(oderChoice==1)
7.2.4.2.1 if(data[x].getQuantity()>
data[x+1].getQuantity())
7.2.4.2.1.1 temp=data[x]
7.2.4.2.1.2 data[x]=data[x+1]
7.2.4.2.1.3 data[x+1] = temp
7.2.4.2.1.4 sorted=false
7.2.4.3 else
7.2.4.3.1 if(data[x].getQuantity()<
data[x+1].getQuantity())
7.2.4.3.1.1 temp=data[x]
7.2.4.3.1.2 data[x]=data[x+1]
7.2.4.3.1.3 data[x+1] = temp
7.2.4.3.1.4 sorted=false
7.2.5 else
7.2.5.1 sortType=Price
7.2.5.2 if(oderChoice==1)
7.2.5.2.1 if(data[x].getPrice()>
data[x+1].getPrice())
7.2.5.2.1.1 temp=data[x]
7.2.5.2.1.2 data[x]=data[x+1]
7.2.5.2.1.3 data[x+1] = temp
7.2.5.2.1.4 sorted=false
7.2.5.3 else
7.2.5.3.1 if(data[x].getPrice()<
data[x+1].getPrice())
7.2.5.3.1.1 temp=data[x]
7.2.5.3.1.2 data[x]=data[x+1]
7.2.5.3.1.3 data[x+1] = temp
7.2.5.3.1.4 sorted=false

```

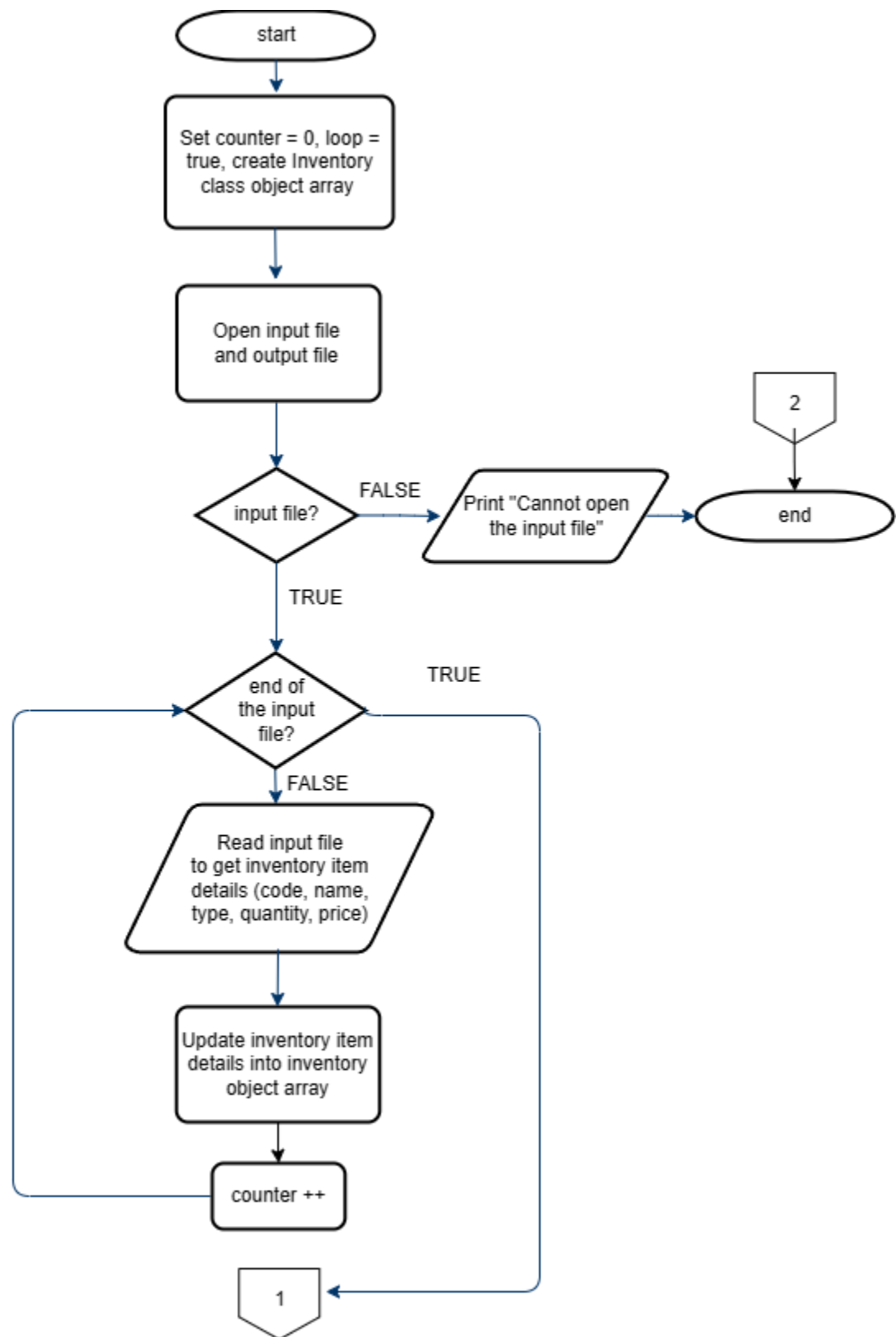
8. End

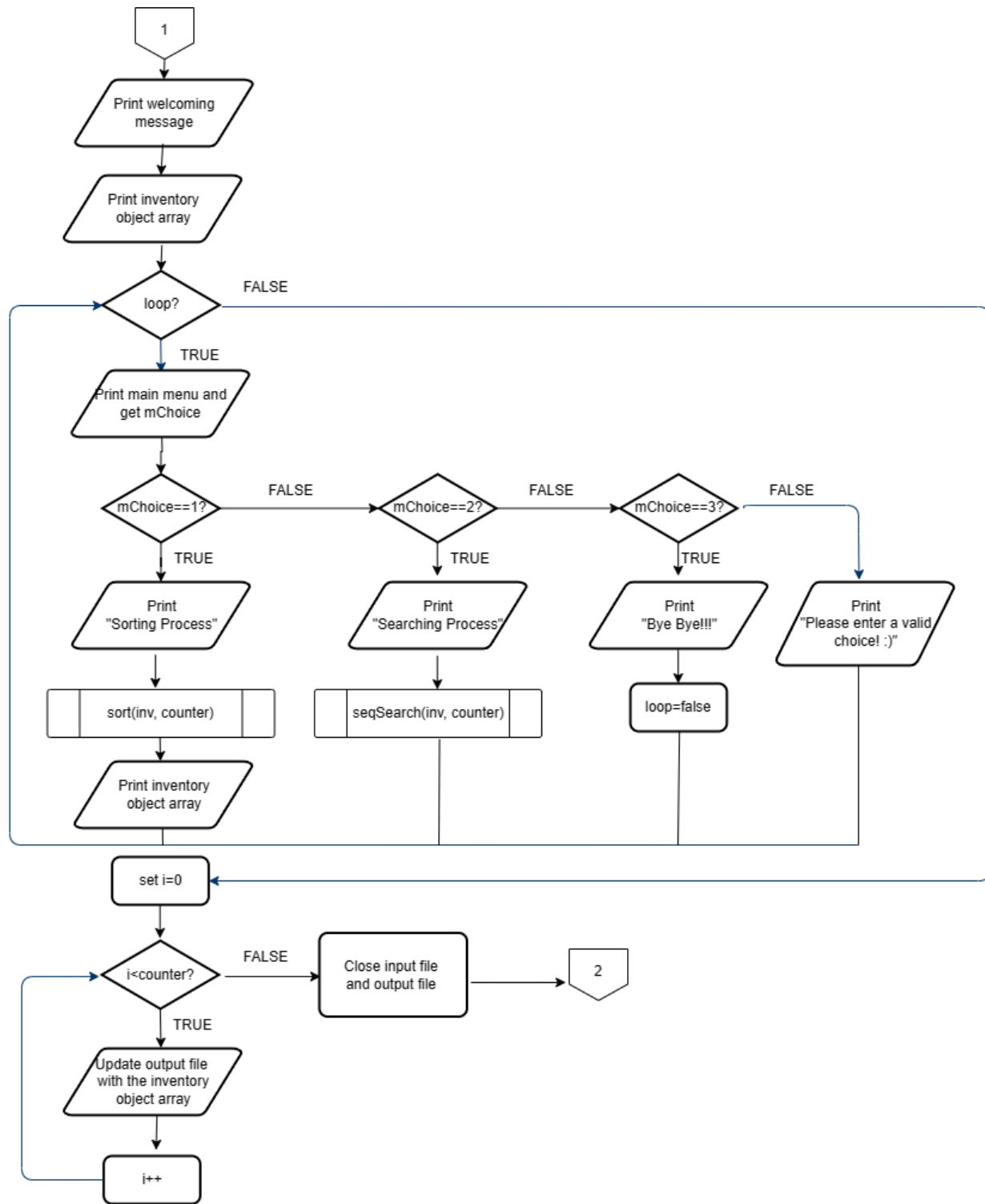
3.1.2 search function

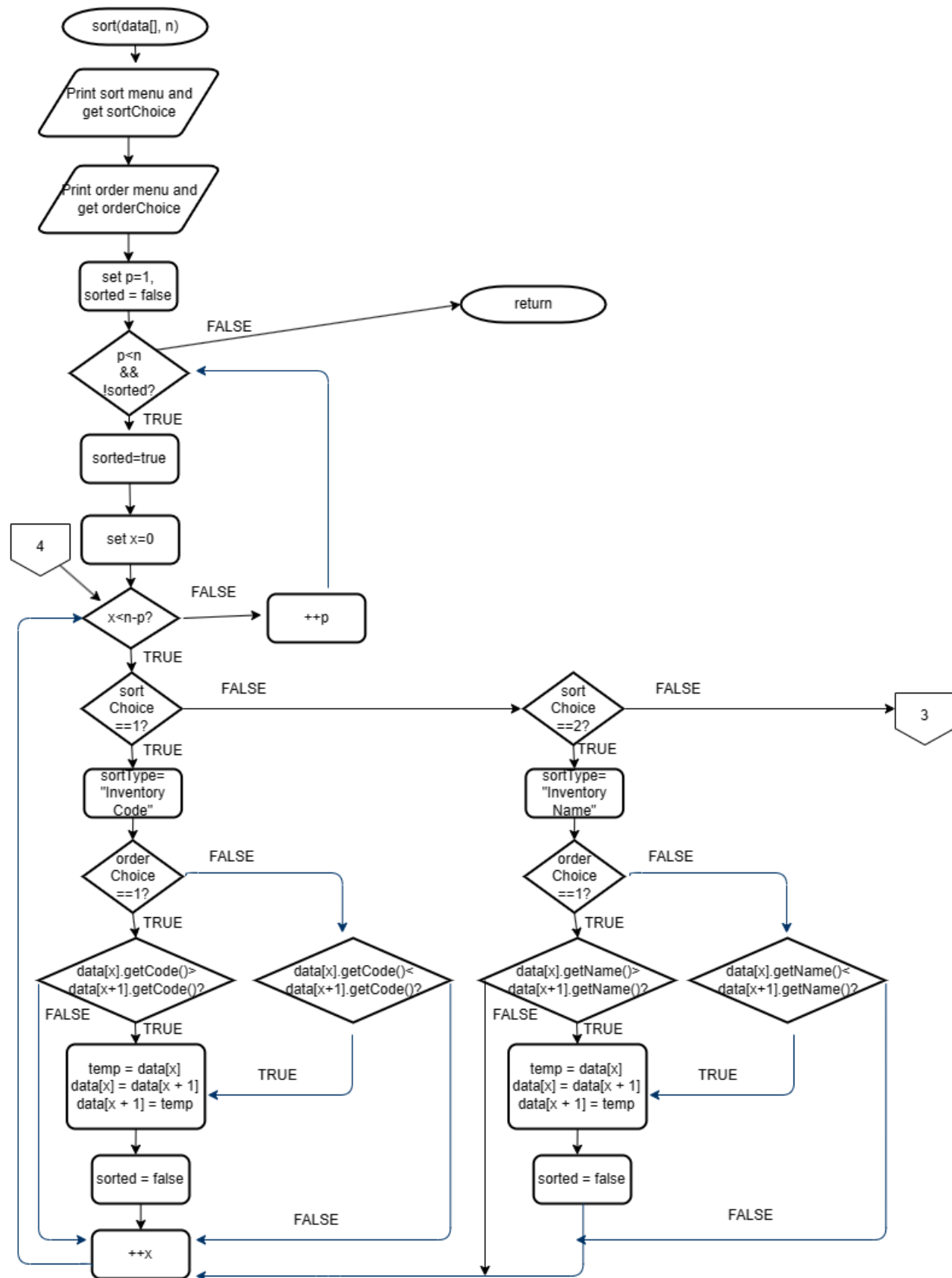
1. Start
2. set found = false, index=-1
3. Print search menu
4. Get search choice from user + exception handling
5. Get search key from user
6. if(search choice ==1)

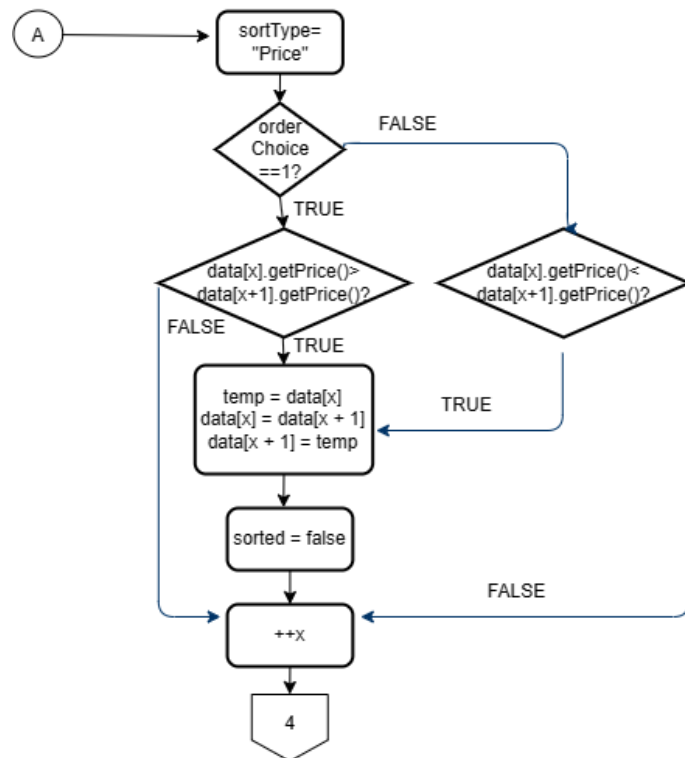
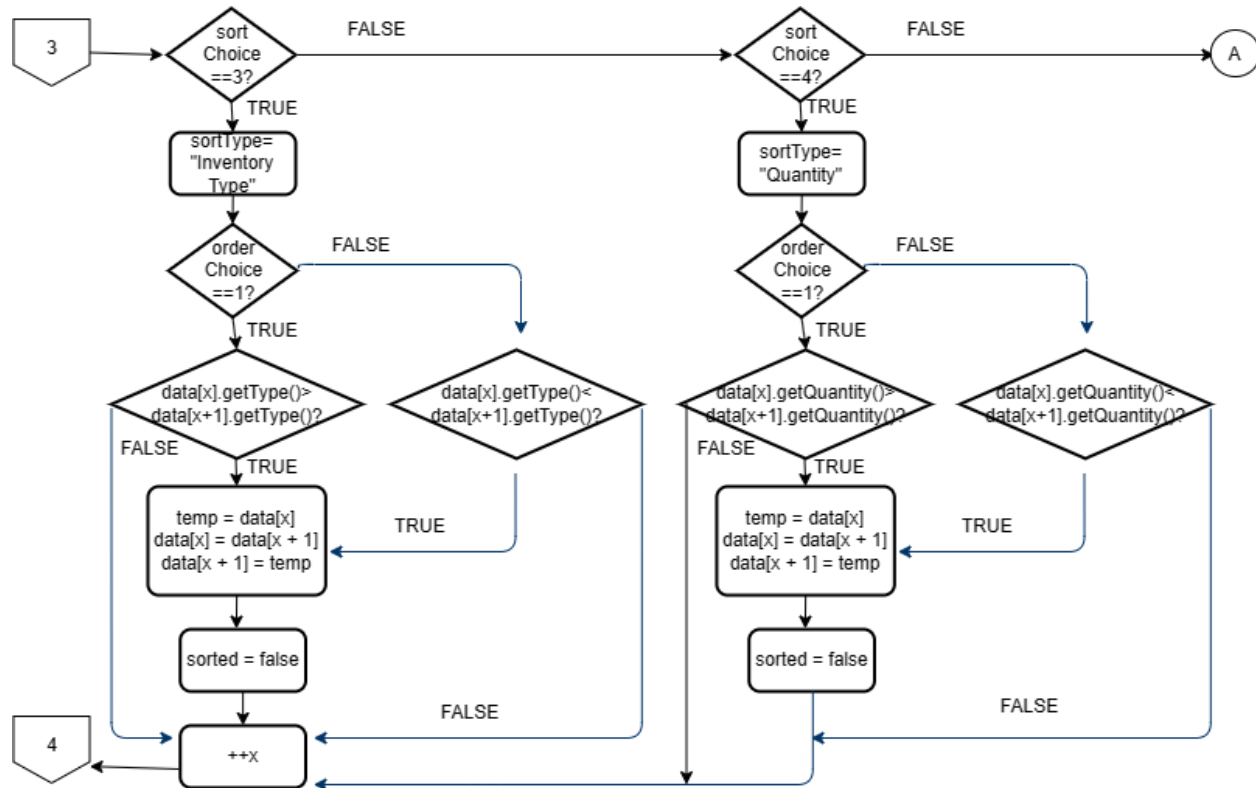

```
6.1 searchType=Inventory Code
6.2 for(i=0;i<n;i++)
    6.2.1 if data[i].getCode()== searchKey
        6.2.2 index=i
        6.2.3 found=true
7. Else
    7.1 searchType=Inventory Name
    7.2 for(i=0;i<n;i++)
        7.2.1 if data[i].getName()== searchKey
            7.2.2 index=i
            7.2.3 found=true
8. If(found)
    8.1 Print data[index]
9. Else
    9.1 Print "Cannot Find!!!"
10. End
```

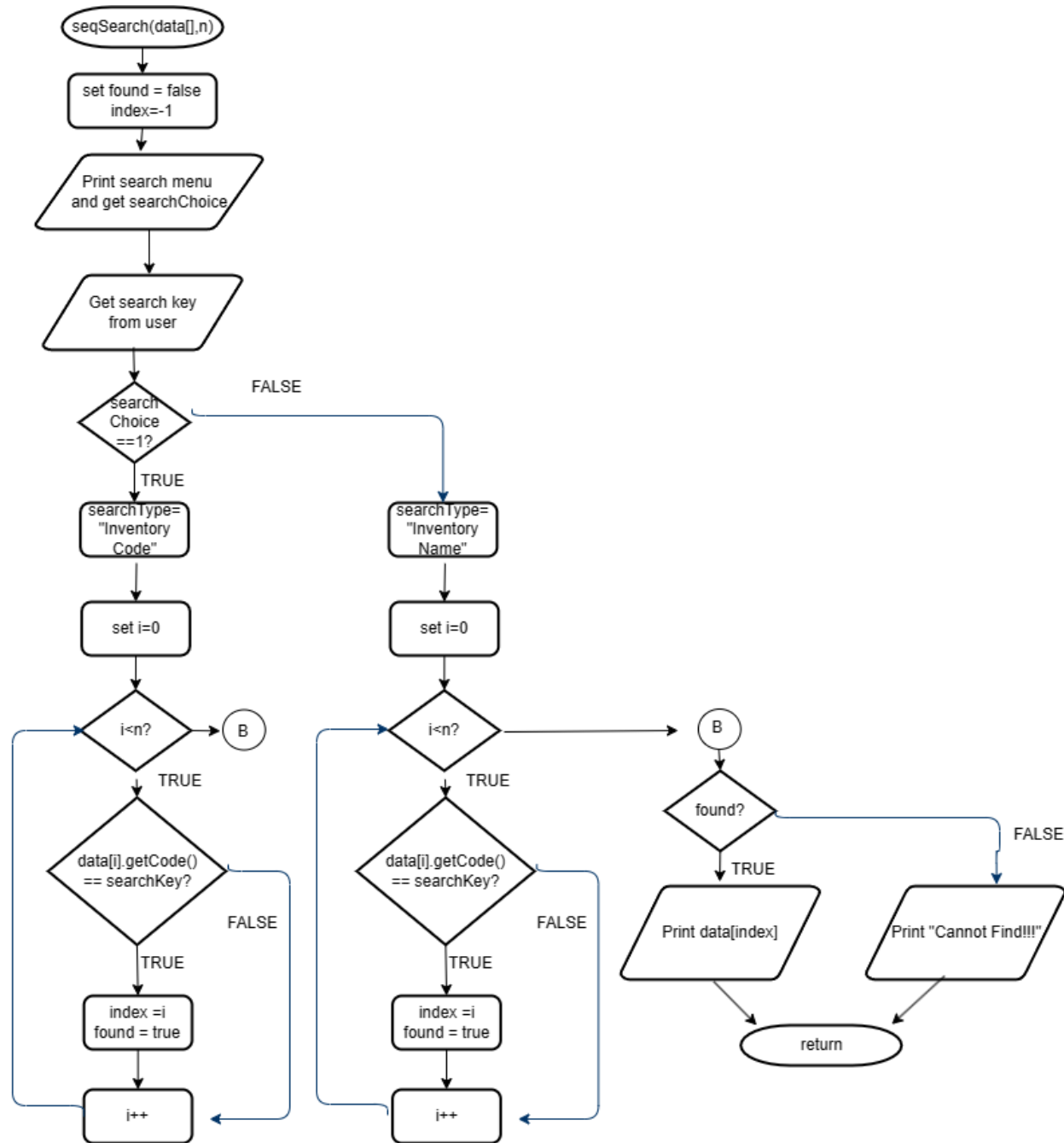
3.2. Flow Chart



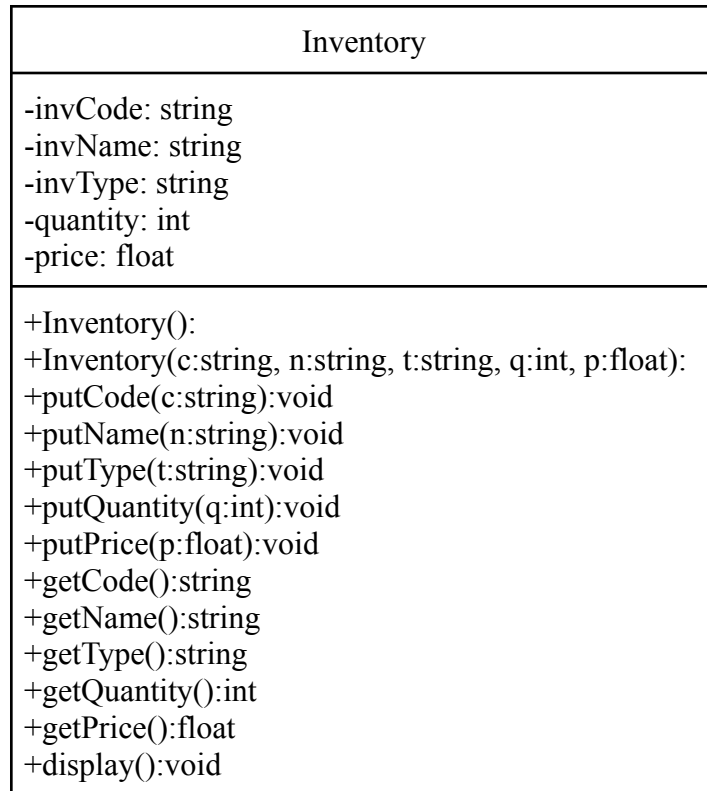








3.3. Class Diagram



4. Data Structure Operation Description

4.1 Sorting

In implementing our inventory management system, we use **improved bubble sort** technique to sort our inventory.

Improved bubble sort is an enhanced sorting technique from bubble sort (to minimize unnecessary iteration). The improved bubble sort is used to iteratively compare and swap the adjacent elements until the entire array is sorted. The sorting is based on user chosen criteria such as inventory code, name, type, quantity, or price. The sorting order can be ascending or descending. The function “**sort**” consists of 4 important parts (function, data, loops). I will briefly describe the data structure operation that happened in this function.

void sort(Inventory data[], int n)

The “sort” function receives an array of Inventory objects (data) and the number of elements in the array (n) as parameters.

int sortChoice = menu();

int orderChoice = sortMenu();

Inside the sort function, the sortChoice and orderChoice receive the value of the user chosen type of sorting (inventory code, name, type, quantity, or price) and the order (ascending or descending).

for (int p = 1; (p < n) && !sorted; ++p)

This is an external loop which to check whether the list is sorted in order to improve the efficiency of the bubble sort. The sorting process continues until the array is sorted or no swaps are made during the pass.

for (int x = 0; x < n - p; ++x)

This is the internal loop, which is used to control the swap if they are not in order. As it finished its execution, the largest/smallest in the array will be moved at the top (depending on the order chosen).

In addition, inside the internal loop, there are several switch case that refer to the sortChoice data. The specific section of the switch statement is executed depending on the sortChoice value (user's choice of sorting criteria).


```

switch (sortChoice)
{
case 1:
    sortType = "Inventory Code";
    if (orderChoice == 1)
    {
        if (data[x].getCode() > data[x + 1].getCode())
        {
            Inventory temp = data[x];
            data[x] = data[x + 1];
            data[x + 1] = temp;
            sorted = false;
        }
    }
}

```

As shown in figure above, the “if” statement in case 1 *if (data[x].getCode() > data[x + 1].getCode())* is used to compare the adjacent elements.

4.2 Searching

In implementing our inventory management system, we use **sequential search** technique to search the information of our inventory.

In sequential search, every element in the array will be checked until the search key is found or the process reached the last element. In inventory management system, the user is prompt to enter their desire searching criteria whether by inventory code or inventory name. This means every element in the selected list will be check by the system using the user entered key (name or code). If the corresponding keyword is found, the system will display the information of the inventory item.

In the implementation of our inventory management system, **void seqSearch(Inventory data[], int n)** is used as a function to perform sequential sort. The function receives an array of Inventory objects (data) and the number of elements in the array (n) as parameters.

int searchChoice = menuSearch();

searchChoice data is used to acknowledge the number searching type entered by the user. The system then prompt the user to enter the searching key.

Initially the index is set to -1 , found is set to false.

```
switch (searchChoice)
{
case 1:
    searchType = "Inventory Code";
    for (int i = 0; i < n; i++)
    {
        if (data[i].getCode() == searchKey)
        {
            index = i;
            found = true;
        }
    }
    break;
```

if (data[i].getCode() == searchKey) is used to check the elements one by one inside the data array. If the key is matched, the sequential search is performed successfully since the found is now set to true.

```
if (found)
{
    data[index].display();
    cout << endl;
}
else
{
    cout << "Cannot Find!!!\n";
}
cout << endl;
```

Finally, the information of the array will be displayed based on the index found.

5. Conclusion

Sorting and searching technique are both the technique that implemented in the inventory management system so that the informations in the system are more organised and easy to find. Finding a suitable approach to implement in an inventory management system is important because it can improve the productivity of an organization.

By completing this assignment, our team has gained much knowledge and practical experience regarding how to implement sorting and searching functions in an inventory management system. Starting from design, implementation of codes, until we get the output of the system, we truly gained a deeper understanding on how algorithms work in our real life system.