UNIVERSITY OF TECHNOLOGY, JAMAICA
School of Computing and Information Technology (SCIT)
PROGRAMMING II

PROJECT (GROUPWORK) GROUP: BSc.
DATE GIVEN: Week of March 4, 2024
DATE DUE: April 12, 2024 at 11:59 pm

Group size: 4 - 5 members.

Project Purpose

- Encourage research and self-study as some concepts will not be covered in detail.
- Encourage team cohesion which is necessary in software development.
- Foster personal growth and experience necessary for real-world problem-solving.

System Overview and Requirements

Stateline is a self-serve gas station and lubricants outlet that began operations in 2021. The business offers petrol: E10-87, E10-90, and diesel fuel. It also offers four different grades of lubricants. Each fuel type is sold at a specific price per litre and each grade of lubricant also has its own price per bottle. The station caters to two types of customers: cash and charge. A shop clerk manages all customer transactions and processes the transactions before the customers serve themselves the fuel they need. The owner faces a significant challenge and has sent out requests for service advertisements. The issues are trouble maintaining accurate customer records, customer transactions, product inventory, and fuel reports. These issues are hampering productivity, efficiency, and proper accounting, and therefore need experienced knowledge and attention.

For ease of planning and the purposes of this assignment, assume that each fuel type is at its full tank's capacity. From this information and the details provided below, use the concepts you learned in the Programming II course to implement the solution to this problem. First create a pseudocode or flowchart outlining your proposed system, then proceed to the program implementation.

Note: 1 US Gallon = 3.785 litres. All prices are quoted in Jamaican Dollars.

Table 1. Fuel capacity and prices.

Fuel Type	Max Capacity (Litres)	Price Per Litre ($)
E10-87	75708.23	184.90
E10-90	113562.35	193.60
Diesel	94635.29	182.30

Table 2. Lubricant prices.

Lubricant Type	Price ($)
5W-30	2900.00
5W-40	3500.00
15W-40	3600.00
SAE-40	2100.00

System Functionality

1. Serve Customer
2. Add Charge Customer
3. Update Charge Customer
4. Delete Charge Customer
5. Make Payment to Charge Account
6. Refuel Tank
7. Generate Report
8. Exit

System Behavior

Serve Customer:
This feature allows the user to select the type of customer being processed. The process varies based on whether the customer is a '**Cash on Delivery (COD)**' customer or a '**Charge**' customer. After a customer has been processed, a receipt should be generated.

For COD Customers:

1. Fuel Type: Retrieve the type of fuel being purchased.
2. Fuel Amount: Retrieve the amount of fuel needed.
3. Lubricant Request: The system should generate a random response to this request ('Y' for Yes or 'N' for No) of whether the customer needs lubricants.
    a. If 'Y', retrieve the lubricant quantity.
4. Payment Type: Retrieve the payment option the customer selected: cash or card.
    a. The minimum purchase is two litres for cash payments.
        b. The minimum amount is $1000 for card transactions.

For Charge Customers:

1. Identification: Retrieve either the customer's ID number (e.g., 1, 2, 3 etc.) or business name (e.g., Tank Weld, Leading Edge).
2. License Plate Number(s): Retrieve valid license plate number(s) of the representative(s). Refer to the 'Add Charge Customer' section below for validation details.
3. Fuel Type and Amount: Retrieve the fuel type and the amount being purchased.
4. Lubricant Request: Same as COD customers. Retrieve the quantity if 'Y'.
5. Deposit Monitoring: The system should ensure that the customer's deposit amount or litres is not exceeded.

Receipt Generation:

Upon successful processing of the customer, the system should generate a formatted receipt containing the following details:

- Date of transaction.
- Type of Customer (COD or Charge).
- Item(s) purchased.
- GCT amount (calculated at 16% for all lubricants).
- Total amount (including GCT).
- Cash tendered or charge amount (as applicable).
- Change given (if applicable).

Add Charge Customer:
This feature allows the user to add new 'Charge Customers' to the system.

Input Requirements for New Charge Customers:

1. Customer ID Number: The system should assign consecutive auto-generated numbers to each customer.
2. Customer Name: This should be the customer's business name.
3. Number of Representatives: The system should ensure this value is at least one but not more than five.
4. Vehicle License Plate Number: The system should ensure a valid and unique license plate number is provided for each customer (e.g., 5786KW).
5. Preference (Deposit or Maximum Litres): The system should generate a random choice between these two options.
    a. If 'Deposit' is chosen, the minimum deposit amount is $10,000 or fifty litres.
    b. If 'Maximum Litres' is chosen, the limit is set to 3785.41 litres or one thousand gallons.
    c. Other Constraints:
        i. For customers who choose 'Deposit', their fuel issuance is capped at their deposit amount.
        ii. For customers who select 'Maximum Litres', their fuel issuance cannot exceed their initial gallon amount or the system's maximum allowed gallons.
        iii. System Capacity: There is no specified limit to the number of customers that can be added to the system.

Existing Charge Customers:
The following stored information from tables 3 and 4 should be presented to the user.

Table 3. Current charge customers.

Customer ID	Customer Name	Number Of Representative	Preference	Amount ($)	Litre
1	TANKWELD LTD	3	Deposit	100000	N/A
2	LEADING EDGE LTD	2	Maximum Litres	N/A	50
3	DERRIMON TRADING LTD	1	Deposit	50000	N/A

Table 4. List of representatives (license plate numbers) for each charge customer.

Customer ID	Rep #1	Rep #2	Rep #3	Rep #4	Rep #5
1	5786KW	0578PQ	7777TY		
2	6588HH	5436RK			
3	3378JQ				

Update Charge Customer:
This functionality allows an admin user to update any charge customer details in the system. The user must first enter an authorization password. If successful, a valid id number for the customer must then be entered. If the id number is found, the following data can be edited.

- Customer name
- Number of representatives
- Preference

The user may choose to update a single field or all fields (remember the preference field should always be randomly generated).

Delete Charge Customer:
This functionality allows an admin user to delete a customer account from the system. The user must first enter an authorization password, and if successful, be prompted for the customer id number before all fields associated with the id number are removed.

Make Payment to Charge Account:
This functionality allows the user to accept payments from charge customers. The user must first enter the customer id number. Once the account is found payments are accepted in the following forms: cash, card (minimum amount is $1000), and cheque (minimum amount is $5000). Payments can take the form of either deposits where the customer increases their deposit amount or renews it. Please note that renewal of deposit can only take effect if the initial deposit amount is reached. Similarly, customers can increase their litres at any time or renew the amount once the initial litres amount is reached. As reminder, litres cannot exceed 1000 gallons, and neither can their deposit be less than $10000 (respectively).

Refuel Tank:
This functionality allows an admin user to re-order fuel for any of the tanks at any time. The user must first enter an authorization password before being granted access to refuel any of the tanks shown below:

Table 5. Cost per gallon for each type of fuel.

Fuel Type	Cost Per Gallon ($)
E10 – 87	165.64
E10 – 90	171.74
Diesel	159.38

Note: Re-order amount cannot exceed tank's capacity.

Generate Report:
This functionality allows the admin user to view reports from different categories. The user must first enter the authorization password before being granted access to the following reports:

1. Sales report which includes:
    a. Total cash customers.
    b. Total charge customers.
    c. Cash amount.
    d. Charge amount.
    e. Grand total.
2. Charge customers report which includes:
    a. Customer ID.
    b. Customer name.
    c. Initial deposit amount.
    d. Balance remaining.
    e. Initial litres amount.
    f. Litres remaining.
    g. Amount owed.
    h. Amount paid.
    i. Balance remaining.
3. Fuel report which includes:

a. E10-87 sales.
b. E10-90 sales.
c. Diesel sales.
d. Total litres purchased.

Exit:
This functionality lets the user terminate the program at any time while **maintaining data integrity for retrieval.**

BONUS (extra 5%):
Show total profits made from selling fuel including the breakdown profits made for each type.

*Please note that the system should be **user-friendly** and **use error-messaging** to display all validation and other errors. The system may also store data other than those explicitly stated above.*

Submission Requirements

1. Submit all required project documents to the appropriate **Moodle upload link**, not your tutor's email. **NOTE, franchised students will be guided by their tutor on how to submit their project.**
2. Submit a cover sheet indicating the names and identification numbers of all group members, along with a detailed report outlining each component (e.g., function, struct, et cetera) of the project implemented by each group member.
3. Submit a signed copy (one by each group member) of the "Declaration of Authorship" form.
4. Submit the following items:
5. Pseudocode or flowchart.
6. C source code and executable – each should have authors' id number, name, lab tutor's name, and occurrence.

Login information should be clearly indicated for the tutor to access the system.

Rubric

Criteria	Description	Score
Documentation	A well organized and comprehensive documentation of code with clear explanation including pseudocode or flowchart	15
Programming II Concepts	The project demonstrates an effective use of control structures, functions, arrays, pointers, random numbers, files, structures, enums, unions, and macros	15
Serve Customer	This feature correctly and efficiently implements customer selection, inputs and validation checks for cash and charge customers, and appropriate and attractive receipts for each	10
Add Charge Customer	This feature correctly and efficiently implements customer id number generation, customer name, number of representatives, vehicle license number(s), randomly generated preference, deposit and maximum litres limits, and system capacity	10

Update Charge Customer	This feature correctly and efficiently implements authorized access, ID number verification, editable fields (single or multiple), and preference	10
Delete Charge Customer	This feature correctly and efficiently implements authorized access, id number verification, and record deletion	10
Make Payment to Charge Account	This feature correctly and efficiently implements id number verification, payment options (cash, card, and cheque), minimum payments for cards and cheque, payments only applied according to the situation for: deposit and renewal, litres managed according to situation for either increase or renewal, and maximum and minimum amounts	10
Refuel Tank	This feature correctly and efficiently implements fuel re-ordering for all three fuel types	5
Generate Report	This feature correctly and efficiently implements reports for sales, charge, and fuel	10
Exit	This feature correctly and efficiently implements termination of the program while maintaining data integrity	5
Bonus	This feature correctly and efficiently implements profits made from selling fuel including the breakdown profits made for each type	5
Total		**105**

Marks may be deducted for the following:

- Unauthorized late submission – 10% per day. **After three days the assignment will not be accepted.**
- Identical assignments. Please read your Student Handbook for the University's Policy on Academic Misconduct.
- Lack of neatness, organization and documentation.