UNIVERSITY OF TECHNOLOGY, JAMAICA
School of Computing and Information Technology
Object-Oriented Programming Project

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Group Assignment (3-5 persons per group)

Given Date: October 7, 2024, Due Date: November 30, 2024

Instructions:

This group project is designed to allow students to employ key Object-Oriented Programming (OOP) concepts in analysing, designing, and implementing a real-world application using C++ or Java. Students should use the following OOP concepts in their solutions:

- composition,
- inheritance,
- polymorphism,
- dynamic binding,
- encapsulation,
- data abstraction,
- Graphic User Interface (GUI),
- persistence through file handling, and
- defensive programming using exception-handling techniques.

The scenario for this project is as follows:

Based on the concerns about the persistently high rates of motor vehicle traffic deaths on Jamaican roads according to a National Road Safety Council (NRSC) review meeting in Kingston on January 11, 2024, PAHO, (2024). Another concern for this solution is the consistently high number of applications received yearly for Public Passenger Vehicle (PPV) licenses and the high rate of unpaid tickets by PPV operators. Your group is asked to create software solutions that will automate the approval of applications for PPV licenses based on specific criteria. Create another solution that will be used by the Jamaica Constabulary Force (JCF) to issue tickets to road traffic offenders, record road accidents and store police records.

The solution will link the two systems using OOP principles that were taught in the module along with your research to implement a robust software solution. The new systems will allow the JCF to know the verified address of the driver/owner, and the location of the vehicle through a mandatory tracking system that all PPV owners must install and give access to the Red Plate Licensing System (RPLS). When implemented it is the hope that the robust solution should reduce the high traffic-related deaths by keeping serial offenders, criminals and other unapproved drivers from obtaining an opportunity to operate a Public Passenger Vehicle (PPV). The system should be able to produce as a report the name of the current and last driver, the current and last owner of the vehicle, and the total tickets outstanding for the applicant and current driver.

System 1: Red Plate Licensing System (RPLS)

The requirements of the system are as follows:

1. The processing officer can check the status of an applicant, through the Ticketing Issuing and Offender Checking System (TIOCS) and can do the following:
   a. Create an application
   b. Update an application.
   c. Delete an application.
   d. Reject an application.
2. The processing officer using the applicant's TRN can see if an applicant has any outstanding tickets.
3. The processing officer can indicate that outstanding tickets must be paid before the application is processed.

When an owner applies for a red plate license the system will ask the following questions to ensure that the applicant is qualified to receive a red plate permit:

1. Did the driver cause any accident(s) within the last two years?
2. Does the driver have a negative police record?
3. Does the driver have any outstanding tickets?

Once any of the 3 conditions above is "Yes", the applicant will have to change the proposed driver within 5 to 10 business days, otherwise, the application will be denied. However, if none of the conditions are "Yes" then, the permit will be issued to the applicant. The applicant should be provided with a report of the status of their application regardless of the outcome.

The applicant's Tax Registration Number (TRN) should be used as the search key when searching for the applicant's information. The output should include the following:

- The application's full name, date of birth, TRN, current address, email address and contact number.
- the number of tickets outstanding, the amount for each ticket and the overall amount owing.
- the reason the police record check was denied or approved.
- the reason the driver was denied and the following statement, "Application Denied based on the disqualification of the proposed driver, you have 5 to 10 business days to provide another driver". The application is therefore denied pending the change of driver and/or the full payment of the outstanding fees.

Drivers should be able to log on to the system using their TRN and be able to do the following:

1. Check for all their past tickets, which will show output in ascending alphabetical order based on all their issued date. The report should show the following information:
    a. Ticket Issue Date
    b. Payment Due Date
    c. Ticket Number
    d. Offence Code
    e. Offence Description
    f. Fine Amount
    g. Ticket Status Description (i.e. paid, unpaid, warrant outstanding)
    h. Court Date
    i. Court Location
    j. Total unpaid tickets
    k. Total fine amount
2. Make online payments for tickets that are issued but not passed due.
3. Check for past-due tickets. Tickets which have passed the 21 days for payment will reflect a court location, date and time that the offender should appear in court to answer his/her charges.
4. View ticket(s) payments that have not passed due based on their TRN.
5. Check where there is a warrant issued for their arrest for not appearing in court, and it should show which police station they should turn themselves in.

<u>System 2: Ticketing Issuing and Offender Checking System (TIOCS)</u>

This system should have the following basic details as defined below however, additional options can be added based on the group's creativity. The system should be designed to be used by the Jamaica Constabulary Force (JCF) Officers to manage drivers on the roadways of Jamaica by using the law to issue cautions. JCF Officers can use the system to both add information for an offender and/or be able to check a driver's information in RPLTS for any outstanding tickets, or warrants. The JCF officer can Add a new ticket, check for any outstanding tickets, and delete a ticket that was added to the system based on their discretion. The Offender's Driver's License is used to do all processing. A driver's license number is the same number that is used for TRN.

1. Add: This allows the JCF officer to add a new ticket for an offender. An offender might be an existing or a first-time offender.
    i. The new ticket will have the following data:
        a) Ticket number
        b) Ticket Issue Date
        c) Ticket Offence code
        d) Ticket Offence description
        e) Fine amount for the Ticket (The Fine should be automatically assigned based on the fine class)
        f) Vehicle License Plate Number
        g) Drivers TRN
        h) Driver's Full Name
        i) Driver's Date of Birth
        j) Driver's Address
        k) Driver's Contact Number
        l) JCF Officer's Badge Number

m) JCF Officer’s Full Name
n) JCF Officer’s Assigned police station

ii. A JCF Officer should be able to view the current ticketing information that was added and verified with the driver before the final submission.

iii. Check: This allows a JCF Officer to check the status of a driver in the system.
    a) To verify if the driver has any unpaid tickets that have passed the 21-day stipulation.
    b) Can view all offenders who have outstanding tickets pending including their address and TRN.
    c) Should be able to view all the outstanding tickets in a specific parish.

iv. View All: This allows a JCF Officer to view all outstanding tickets sorted by parish.
    a) This allows the JCF Officer to view all the outstanding tickets in a specific parish. The system should be able to show who has the most outstanding tickets and produce a report showing each offender’s full name, address, TRN, contact information, gender, and ticketing information (which includes each ticket number, date issued, whether it is paid or unpaid, and whether a warrant has been issued for an arrest).
    b) The JCF Officer will have the option to update the current information that they are viewing. The information can be updated because information is missing or incomplete. The information can be both new information or old information that may include, the result of a police report, and any convictions etc.

2. The Driver/Offender can use the RPLTS to check for the following:
    i. any outstanding tickets,
    ii. any outstanding warrants.
    iii. due date for payment of outstanding tickets.
    iv. view passed paid tickets.
    v. pay for tickets that are not passed due online.

3. The online ticket payment system will accept the following information and process the ticket:
    i. Driver TRN
    ii. Ticket Number
    iii. Ticket amount

4. When the exit option is selected the application should close.

5. All committed changes made during the execution of the program should be stored and used to update the relevant files when the application terminates.

Program Requirements:

1. Perform an Object-Oriented Analysis (OOA) on both proposed solutions, that is the RPLTS and the TIOCS described above. The OOAs should clearly show the steps used to identify potential classes, attributes and methods. Based on the OOAs, create Object-Oriented Designs (OOD) using the Unified Modelling Language (UML) for the classes that were identified in the OOAs. The OOD should show appropriate UML diagrams for all classes and the class relationship diagrams, showing all existing relationships between the classes.

2. Using C++ or Java, implement both systems and allow them to be able to interact with each other as your group project.

Users are placed into the following categories:
    a. Processing Officer
    b. Users
        i. JCF Officers
        ii. Drivers

3. The Processing Officer (PO) maintain the overall system to include the Red Plate Licensing and Ticketing System (RPLTS). The PO is responsible for adding the PPV

driver to the system and making their information available to the Ticketing System. The PO can do the following functions:

i. Add: This allows the PO to add a new driver to the system.
ii. Update: This allows the PO to update an existing driver's information.
iii. View: This allows the PO to view a driver's driving record.
iv. View All: This allows the PO to view all drivers with a PPV license badge per parish with each driver badge's issued date and expiration date.
v. Delete: This allows the PO to delete a Driver's record.

Deliverables should be:

1. Source code (upload to the desired locations based on your practical lecturer's instructions).
2. Provide an executable application.
3. Provide a user manual for the executable application.
4. Provide a group report of each member's contribution.
5. Provide a PowerPoint presentation with snapshots of the running program.
6. Present the PowerPoint presentation with each group member presenting as part of the presentation.
7. Demonstrate a working group project and be able to answer questions (interview) about the overall project.

No.	**Section/Objective**	**Max. Mark(s)**	**Act. Mark(s)**
1.	**DOCUMENTATION**		
1.1	Signed Authorship forms (i.e. one per group member)	2	
1.2	Group Report (Outlining contribution of each group member)	3	
1.3	Object-Oriented Analysis and Design of System	10	
1.4	User Manual (Outline of how the program works including instructions on how to setup the program. This should be properly done to resemble a program already on the market)	5	
	NB: Missing Authorship Forms and Group Report will result in a loss of 15 marks.		
	DOCUMENTATION SECTION TOTAL	**20**	
2.	**SOURCE CODE**		
2.1	Comments		
2.1.1	Each File(class) should have details for the students who wrote the file.	1	
2.1.2	Practice the use of self-commenting files (i.e. proper variable and method naming convention taught in the module)	1	
2.1.3	Proper use of inline and method comments where necessary	1	
2.2	Naming Convention		
2.2.1	Pascal Case should be used for naming classes	2	
2.2.2	Camel Case should be used for variable and method naming	4	
2.2.3	Ensure class Files are named appropriately as per instructions	1	
2.3	Object-Oriented Programming Techniques		
2.3.1	Implementation of Inheritance in the program	3	
2.3.2	Implementation of Composition in the program	3	
2.3.3	Implementation of Method Overriding and Overloading in the program	6	
2.3.4	Implementation of Polymorphism in the program	3	
2.4.	Persistence using Files		
2.4.1	Proper Implementation of appropriate file management in the program	5	
	SOURCE CODE SECTION TOTAL	**30**	
3.	**FUNCTIONALITY**		
3.1	Robustness of Program		
3.1.1	User Input validation checks should be seen where required	2	
3.1.2	Implementation of Error Checks/ Exception Handling in the program	3	
3.1.3	Clearly show how the Program Navigates (using consistent menus throughout)	2	
3.2	Graphical User Interface		
3.2.1	Ease of User Interaction	6	
3.2.2	Appropriate Notifications (i.e. error and information messages)	4	
3.3	System Functionality Implementation		
3.3.1	Maintain Red Plate Licensing System	10	
3.3.2	Maintain Ticket Issuing System	15	
3.3.3	Process Driver/Owner's Application with approved/or Deny for Public Passenger License	8	
	FUNCTIONALITY SECTION TOTAL	**50**	
	FINAL PROJECT MARK	**100**	

Extra Marks (10 marks):
A project that satisfies the program's functional requirements can gain additional marks up to a maximum of 10 marks by implementing the additional requirements as follows:

Bonus Option:
Each PPV operator gets demerit points depending on the type of road traffic offence they commit. Any PPV driver who has 5 or fewer accidents in the last 5 years will automatically receive a 15% discount on their PPV renewal cost. All drivers who are issued a ticket lose points based on the level of offence. After 15 months if a driver has accumulated demerit points that are less than those required for a suspension of license, then the points will expire and the driver's record clear. Please find a way to implement this section with the rest of the proposed solution for 10 additional marks.

The system should keep track of demerit points based on the following information that will be collected, stored and calculated based on the following:

- Demerit Code
- Description of offence
- Demerit points
- Demerit Fine Query (bool or Boolean)
- Fine

Ticket Lookup should have the following; however, additional options can be added based on the group's creativity:

- Driver's License Number
- Date of Birth of the driver
- Original issue date of driver's license
- driver's license control number