

Your name:	SE Department
Class: Student ID: No :	

FINAL EXAM 20202 – PART 2 (6.5 points)

Object-Oriented Programming

Object-Oriented Language and Theory

(Duration: 60 minutes – Due time: 20:05)

(All types of documents are not allowed. Any exam cheater will be given a grade of zero.)

Read carefully the following description about a simulation software for a part of a ticket vending machine installed at each station of a railroad line, and then complete tasks below.

The railroad line comprising four **stations** A, B, C, and D, with A serving as the starting point and D as the terminal point. A fare on the line is decided based on the **distance** between stations. The fare for up to 5 kilometers is USD 1.9 (this is called the base fare). An amount of USD 0.4 is added for each additional 2 kilometers. Any additional distance less than 2 kilometers is rounded up to 2 kilometers. For instance, for a distance of 7.3 kilometers, the fare is USD 2.7.

In a ticket vending machine, passengers can choose to **buy** a type of traveling certificates in the menu: one-way ticket, twenty-four-hour ticket or prepaid card. Passengers can buy multiple tickets or cards in one order, but **only one type in one order**.

For a one-way ticket, passengers need to choose the start and end stations. Note that the end station cannot be the same as the start one. The system then calculates the **fare** and display to them. For the twenty-four-hour tickets, the system displays the price of this type (i.e. **USD 8.5**) to passengers.

Prepaid cards can be bought in the vending machine with a deposit of USD 16. The default **balance** of USD 5 is then displayed in screen. Passengers can **increase** this balance for the prepaid card. The minimum balance when buying the card is USD 2.5. Hence you need at least USD 18.5 to buy a prepaid card, including USD 2.5 for its balance. The balance of a prepaid cards should be at least USD 0 during usage.

Passengers finally enter the **number of tickets/cards** that they want to buy and confirm to buy in a confirmation screen with all necessary **information** about tickets/cards, i.e. price, quantity, amount and total amount. The buying process terminates after the confirmation of the passengers. For simplicity, the payment and further processings are not taken into account.

- a. (1.0 point) Please draw use case diagram for the above program.
- b. (3.0 points) Please design for the above program with a class diagram with detailed attributes and methods. Be careful to provide classes with appropriate getter/setter methods and necessary constructors.
- c. (2.5 points) Let x is the remainder after dividing the number comprising the last four digits in your Student ID by 3. Please write source code for classes for buying travelling certificates depending on x :
 - $x = 0$: Buy one-way ticket and prepaid card
 - $x = 1$: Buy prepaid card and twenty-four hour ticket

- $x = 2$: Buy one-way ticket and twenty-four hour ticket

For simplicity, you don't need to write any GUI classes. You only need to write a class with a main method, which creates and works with travelling certificates for simulating the above buying process.

Hints: Please think about object-oriented techniques for designing and implementing the problem, e.g. method overloading, inheritance, overriding, runtime polymorphism.

----- THE END -----

LƯU Ý:

1. Thời gian làm bài:

- Đề thi gồm 2 phần, Phần 1 làm trong 30 phút, Phần 2 làm trong 60 phút. Mỗi phần có 5 phút nộp bài, và thêm 10 phút nộp muộn.
- Phần 1 sẽ mở sớm 5 phút để các em đọc đề, tức là từ 18:25 (các em có lợi 5 phút đó). Phần 1 hết giờ lúc 19:05, đóng lúc 19:15 (không được nộp nữa).
- Phần 2 sẽ tính tiếp nối từ 19:05 nhưng sẽ được mở sớm từ 18:45. Phần 2 hết giờ lúc 20:10, đóng lúc 20:20.
- Nộp muộn sẽ bị trừ điểm (tối đa được nộp muộn 10 phút).

2. Cách làm bài và nộp bài:

- Viết bài làm ra giấy thi, ghi rõ họ tên, MSSV, lớp trên tất cả các mặt giấy
- Chụp ảnh/scan bài một cách rõ nét ngay khi hết giờ (trong vòng 5 phút, nộp muộn sẽ bị trừ điểm)
- Nộp file pdf hoặc file word, trong đó chứa toàn bộ các hình ảnh bài thi theo đúng thứ tự. Có thể nộp thêm file ảnh rời backup trong trường hợp file chính bị lỗi/mờ
- Cách thức đặt tên file chính (pdf/word) như sau: StudentID_FullName_Part_1, StudentID_FullName_Part_2. Nếu nộp thêm các file rời thì thêm số thứ tự phía sau, VD: StudentID_FullName_Part_1-1, StudentID_FullName_Part_1-2...
- Trong trường hợp bất khả kháng, nếu sinh viên không nộp được 1 file pdf/word, có thể nộp file rời nhưng chú ý cách đặt tên và đánh số thứ tự (không ưu tiên cách này).
- Trong lúc nộp bài (tối đa 5 phút), nếu sinh viên tắt camera điện thoại để chụp ảnh thì cần bật camera máy tính lên.