CS132: Software Engineering

HW1: UML Practice

In this homework we will use UML to describe the functionality of a system and specify its interactions with users. When drawing UML diagrams, please use software recommended in class (Visio /Visual Paradigm/ draw.io). Please try to answer all the questions in English and submit a .pdf report on Blackboard. The deadline for submission is Mar 14th.

1 Class diagram (20pt)

A company called Warm-Up has several departments. Each department is managed by a head, who is also a staff. Each department carries out at least one project and has at least one staff. The department head is responsible for issuing policies and evaluating other staffs. Staffs must be assigned to one, but possibly more departments. Each staff takes part in at least one project, but each project may involve many different employees. The staffs have the right to get the salary and requesting for leave.
In addition to the above description, we know the department names, the staff names, the staff ids, the project names, and the department head ids.
Please draw a **Class diagram** using the information given above.

2 Use Case diagram (20pt)

Yaya Di is a staff member of this company. He oversees the company's cashier and accounting operations, and often needs to operate ATM machines. Draw a **Use Case diagram** to illustrate what he can do with the ATM system.
(Hint: You only need to consider basic but essential functions of the ATM machine)

3 Activity diagram (20pt)

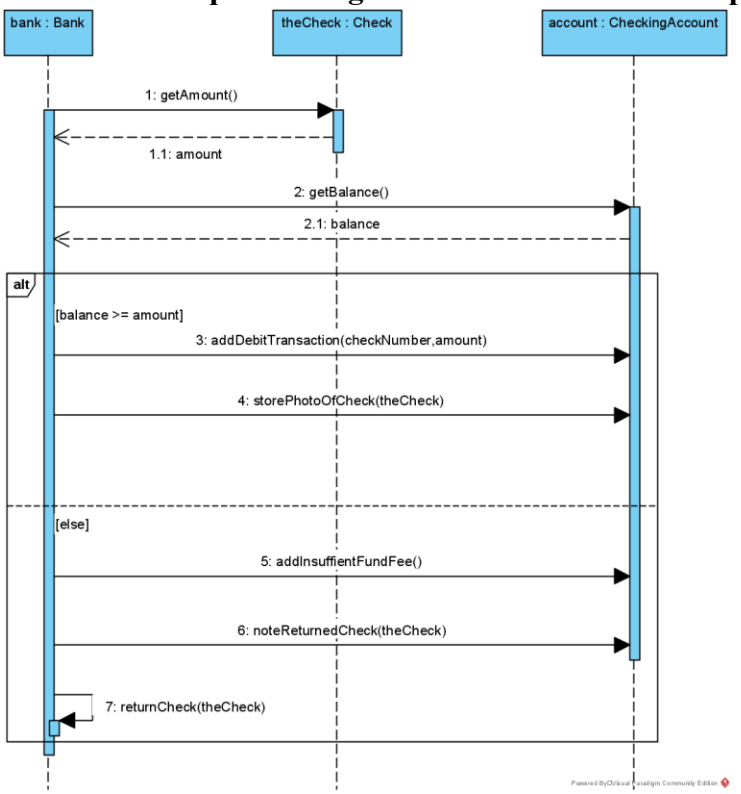
Draw an **activity diagram** to illustrate the process for Yaya Di using the ATM to transfer money. Make sure to use **Swim Lane** to group activities for different roles. (Hint: You should at least consider the case of incorrect PIN and insufficient balance/invalid transactions)

4 State Machine diagram (20pt)

Draw a state machine diagram to demonstrate the operation of a heater bought by Yaya Di using the money he withdrew from the ATM. Initially, the heater stays in an idle state. When it is too hot, it enters the startup state as a part of the cooling. Once the compressor is running, the heater enters the ready state. It then transits into the running state as fans are up. However, it is possible that the cooling process failed to run. If it runs successfully, it returns to the idle state. In the other case, the heater will enter the failure state while giving an alarm. Then it returns to the idle state. Meanwhile, when it is too cool, the heater will transit to the heating state, which may or may not fail to operate as well.
Please draw a **State Machine diagram** using the information given above.

5 Sequence diagram

Observe the sequence diagram and answer the corresponding questions.



5.1 Determine whether the following statements are correct (9pt)

getAmount() is an asynchronous message.

True **False**

The execution order of getAmount() and getBalance() is not guaranteed unless “strict” operator is added.

True **False**

An opt fragment cannot be enclosed in other combined fragments such as strict. or par, while alt can be enclosed in such fragments.

True **False**

5.2 Drawing Practice (11pt)

Now, according to the known sequence diagram and the template given below, let us change the **alt** operator to the **opt** operator, so that the two diagrams are equivalent.