***OO Modeling***

I. This is a student registration system. There are full-time and part-time students. Each class has a set of scheduled times and a number of credit hours. When a user tries to register for a class, the system checks their schedule for time-conflicts. If there is a conflict, an error is returned. If there is no error, then the system checks to see if the total number of hours including this class is no more than the maximum number of hours for a full-time student. If so, then the system returns an error. If no problems are found, the system registers the student for the class, and informs the user of success.

1) Write down all candidate objects and candidate actions in the following usage scenario (10 points)

2) Produce a class diagram to model the system. (Make sure to include all objects and actions that you will need for the sequence diagram you will produce in part 3 below.) (15 points )

3) Produce a sequence diagram to model the success-case of this scenario (i.e. the sequence of actions performed when there are no errors.) Please label everything with meaningful names, or include a description of each label. (15 points)

II. Pet Store

The following scenario is for a pet store. Each pet store has up to 20 furry(毛皮的) friends and 10 birds. Each pet has a vaccination（疫苗） history. Furry friends are either dogs or cats. Each furry friend has a microchip（微型芯片） implant for identification. Each microchip has a unique id number. (10 points)

III.POS System

Suppose you are asked for developing a point of sale (POS) system using OOA/D technologies. A POS system is a computerized application used to record sales and handle payments and it is typically used in a retail store. Processing sale would be one of the key functions that the system has to perform. Please model the key function via the methodology of object-oriented analyze and design.

Suppose the simplified context of processing sale is under-consideration: a customer arrives at a checkout of a retail store with items to purchase. The cashier uses register of the POS system to record each purchased item. Each of the items is described a product specification, which belongs to a product catalogue. The system presents a running total and line-item details. The customer enters payment information, which the system validates and records. The system updates inventory (inventory: The quantity of goods in stock. ). The customer receives a receipt from the system and then leaves with the items and the sale is logged on a ledger with which the manager can checked the information for a period of time.

1. Draw a UML use case diagram for the system including their relationships (Score 5).
2. Give the class diagram with the analysis classes representing business entities involved in the system (names and brief descriptions only – no attributes or operations), along with their relationships and multiplicities (Score 10).
3. Give the boundary classes、control classes and entity classes involved in the system to bear responsibility of “process sale” in the case of J2EE (names and brief descriptions with UML class stereotypes only – no attributes or operations) (Score 5).
4. Draw a UML sequence diagram to model the use case of “process sale” in the case of J2EE (Score 10).

IV. Campus Card

The **Campus Card(**校园卡**)** Web System is a new system that amalgamates(合并) a number of Campus Card related services/functions into a single system. Through the Web Card Centre, you can:

1. Request your Campus Card for new student or new staff/faculty.
2. Check your transaction history. When you reissues a new campus card, the transaction of the new card and the old card will be linked
3. Check your balance.
4. Deposit funds.

(1). Online Deposit

Students, parents, staff and faculty alike can add funds to a Campus Card using

Online Deposit Service! The deposit service is available 24/7 and accepts WEXIN PAY(微信支付), ALIPAY(支付宝), Credit Card and debit card from most banks as payment method

(2).Payroll Deduction (工资自动转账)

Staff and faculty can take advantage of the payroll deduction Service! Each pay period, an amount you set will be deducted from your payroll account and automatically deposited onto your Campus Card, saving you from having to manually deposit funds. You can change or cancel the amount transferred at any time

(3). Manually deposit funds (only for retried staff/ faculty)

You can go to different Campus Card Office to manually deposit funds.

1. Use your campus card in any dining hall.
   1. The amount you spent cannot exceed the spending limits.
   2. Provide failover to local services when the remote services cannot be accessed. For example, if the campus card service can't be accessed, use a local cached card data. The campus card service should be tried first, and a local cached data second. When campus card service is accessible, update the card balance according to local cached data.
2. Report your card lost or stolen. After the campus card is reported as lost, the campus card will be suspended. If the loss report is not cancelled within 7 days, the campus card will be automatically invalidated, otherwise this card will return to normal status.
3. Set your Campus Card PIN number (sometimes required for SSO services authentication(SSO 单点登录)).
4. Set spending limits for your campus card.
5. Set notifications:
   1. Activity from Library system (undergraduate only).
   2. Instant and Daily Alerts
6. Return Card if you do not require a Campus Card. After graduation, the campus card will automatically expire.
7. Manage your family card (staff/faculty only).

**Considering the problem statements above, please answer the Questions below:**

1. Identify primary use cases and related actors, also show the relationships between the use cases

(if applicable). Draw the results in a UML use case diagram.

1. Draw the domain model of Campus Card Web System. Be sure to include multiplicities on the ends of the associations.
2. Design the use case realization of Using Card. (Tips: Using the GOF Proxy Pattern)

4. Please draw a State Machine Diagram for the Campus Card. Be sure to label the transition with the event, guard condition or the action (if applicable).