

Fall 2009 Midterm Exam Sample Solutions

CS 319 Object-Oriented Software Engineering

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Reminders

- *Time: 120 minutes (2 Hours)*
- *Write your name and sign only in the last page as indicated.*
- *Show your work and reasoning clearly and write legibly, only within the space provided for each question. Feel free to use the scratch sheets provided; do not detach them.*
- *For diagrams and programs, clarity is important; if your diagrams or programs are sloppy and hard to read, you will lose points. Correct syntax also makes some difference.*
- *From the time you receive your exam script, you will have 30 minutes to read all questions and make sure you understand what is expected from you. During this time you may ask your instructor any questions should you require any clarification. After that you may not seek any type of feedback from the instructor.*
- *Please stay seated if you finish during the last 10 minutes of the exam period.*

Q1	13	
Q2	10	
Q3	10	
Q4	67	
Total	100 pts	

Question 1: Fill in the blanks [13 pts]

Fill in the blanks below, with a word or more per blank, to form valid statements. When provided with options, choose one and cross others.

- The term **software engineering** was coined in 1968 as a response to the desolate state of the art of developing quality software on time and within budget.
- The UML stands for **Unified Modeling Language** and is visual language used during **several phases / most phases / analysis and design phase** of the software engineering process.
- Use cases are created as part of the **functional / use case** model, while class diagrams are part of the **object** model, and state charts are part of the **dynamic** model.
- The main activity during use case documentation is **writing (descriptions)**.
- Ideally, requirements analysis (**should / should not**) consider the implementation technology.
- The behavior of a single object is best modeled by a **state chart diagram**.
- Activity** diagrams can be a useful adjunct to writing use cases, especially for business use cases that describe complex workflows involving many parties and concurrent actions.
- A **role** defines a set of technical and managerial tasks that are expected from a participant or team.
- Any work product that is to be delivered to the client is called a **deliverable**. Work products are not visible to the client are called internal work products.
- Last but not least, my name is written only on the **last** page of this exam paper as instructed.

Question 2: OOA [10 pts]

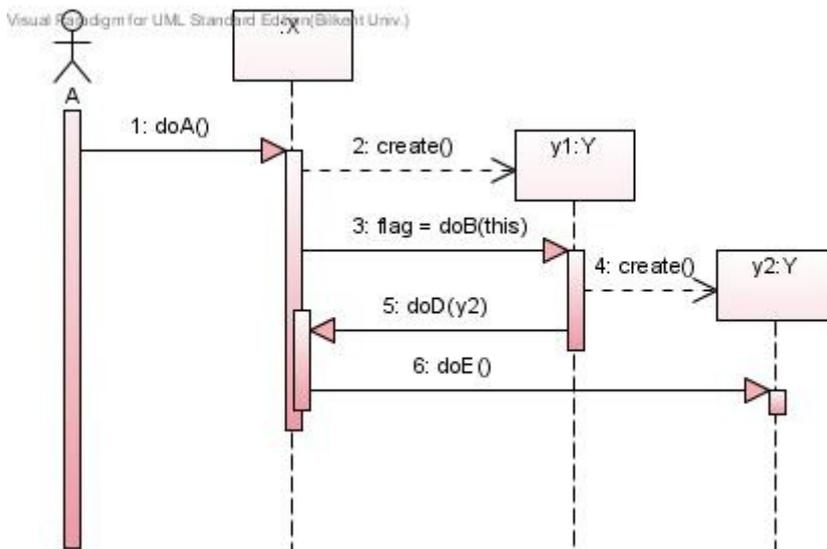
Please write your name **only** in the **last page**.

Briefly describe the activities performed and models constructed during the analysis phase of developing software. Make sure to specify any dependencies among these activities or models. Also specify the kind of UML diagrams used during construction of these models.

See the sketch at the back of the cover of the textbook.

Question 3: OOA/D and UML [10 pts]

Consider the following sequence diagram. Write skeletal code for any *non-boundary* objects (i.e., classes) involved in the below diagram. Specify only what is conveyed in the diagram.



```
public class Y {  
    ...  
    boolean doB(X x) {  
        Y y2 = new Y();  
        x.doD(y2);  
        ...  
        return flag;  
    }  
    void doE() {...}  
}
```

Question 4: OOA and UML [67 pts]

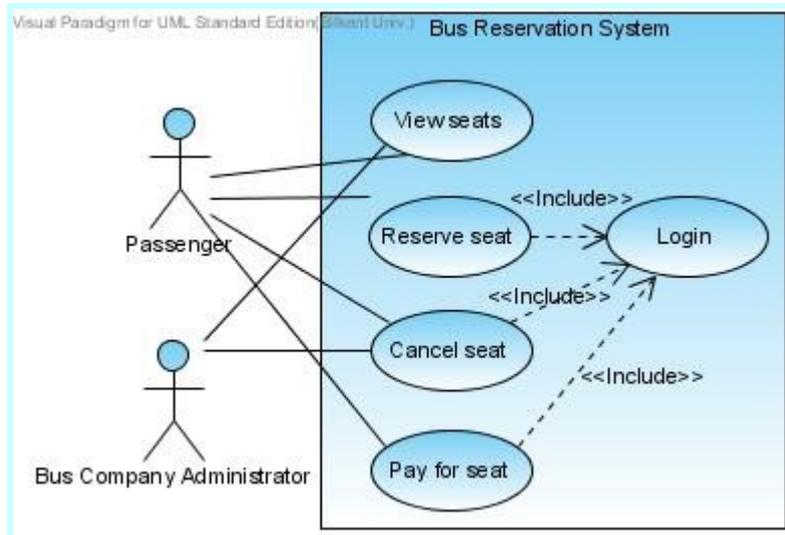
Consider the following problem description:

Consider an online reservation system for a bus company. The bus company includes several buses and realizes trips to different cities. Each bus is identified by its plate number and a separately assigned bus number. The trips are based on a predefined schedule and stop at predefined bus stations. Each bus can have only one trip per day. Each bus includes a driver and one hostess. For long trips, the bus will have breaks at service and rest areas. There are two types of trips, normal trips and express trips. Express trips do not stop at intermediate stations and get faster at the destination.

Please write your name **only** in the last page.

Seats can be reserved by customers on the web site of the bus company. The customer has the option to directly pay for the seat through the website. In that case, the seat cannot be cancelled (neither by the customer nor by the bus company). If the customer has not paid for the seat, the bus company can cancel the seat if the customer does not show up one hour before the trip. When the reservation is cancelled, the seat will become free and can be sold to another customer. Both the customer and the company staff must authenticate themselves for performing operations with the system.

a) [15 pts] Draw a use case diagram for describing the functional requirements of the above system.



b) [4 pts] Define a stakeholder which is not an actor in this use case diagram.

All the stakeholders who are not end-users including Company Manager, Project Manager, Customer (not an end-user), and Tester

c) [4 pts] List and justify three non-functional requirements that could be important for the above system.

- Time Performance: timely response by the system to the passengers is important.
- Cost: the new system should not be very expensive; otherwise the budget cannot be justified.
- Reuse: it'd be nice for the developer to reuse this system for other reservation systems.
- Other possible non-functional requirements include Adaptability and Security.

d) [4 pts] Give two examples of conflicting non-functional requirements. Explain how you would resolve the conflict.

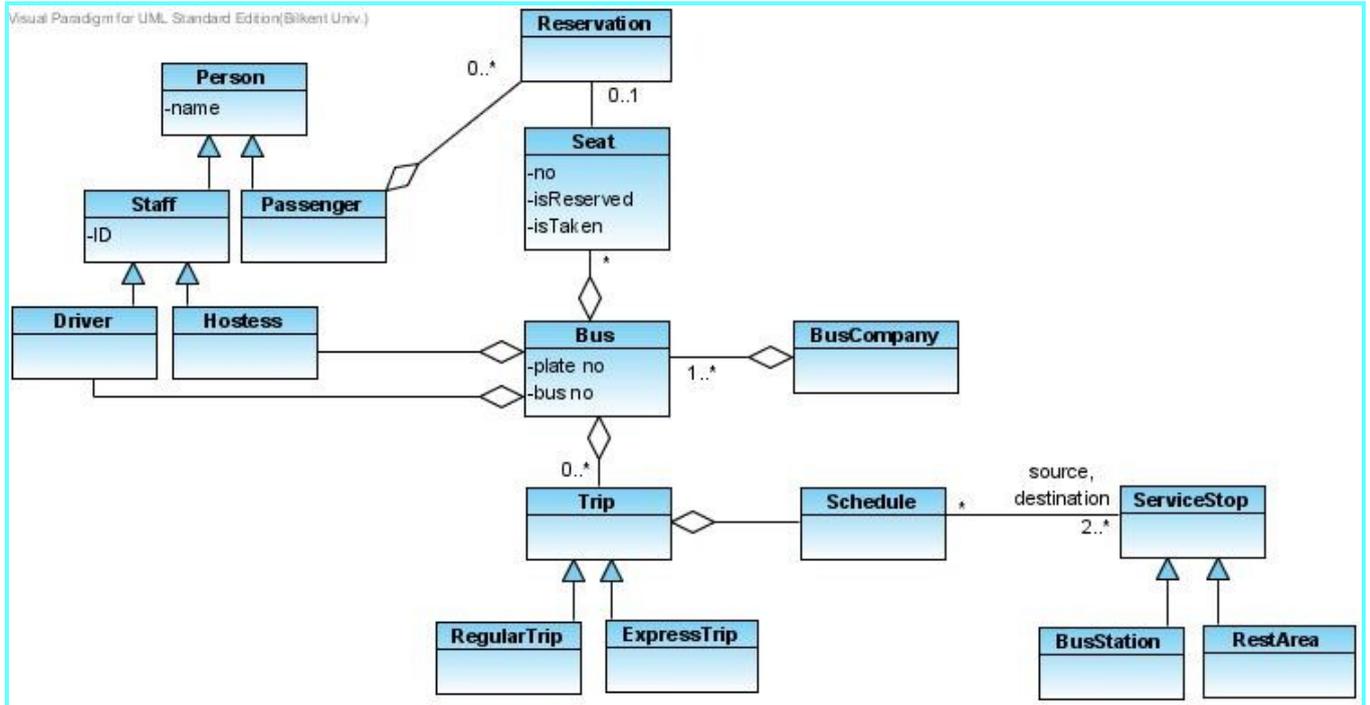
Performance vs. Adaptability or Adaptability vs. Cost or Security vs. Performance, etc.

Possible Resolution: Identify the stakeholders for which the non-functional concerns are required. Prioritize stakeholders and weight the non-functional concerns. Discuss with stakeholders to come to an agreement.

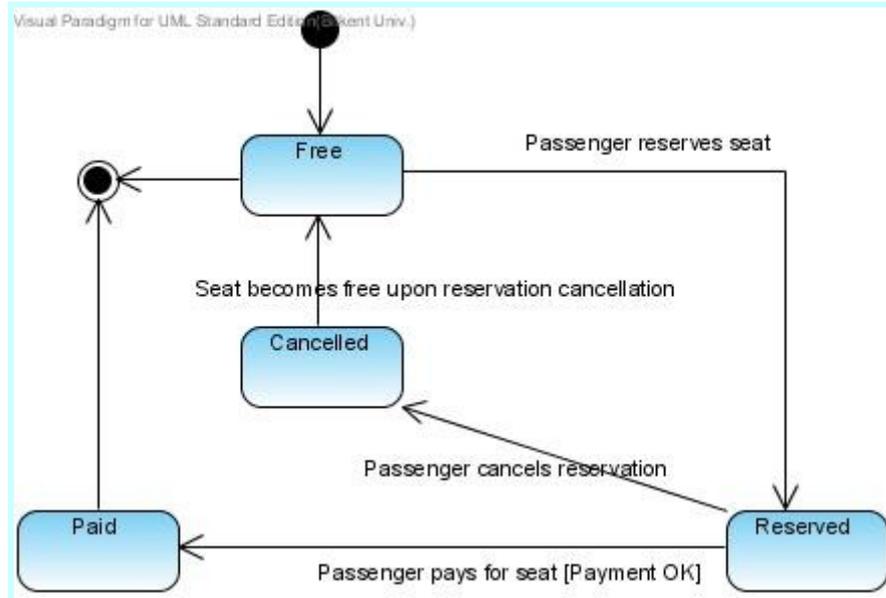
Another way to resolve the conflict is by looking at the design goals as they may dictate which criteria is more important.

Please write your name **only** in the last page.

e) [15 pts] Perform an analysis object (i.e. domain) modeling for the software system described above. You do not need to identify the operations of objects. You may simply show the resulting model without showing the individual steps.



f) [10 pts] Draw a state diagram for describing the details of the *Seat* object of the above system.



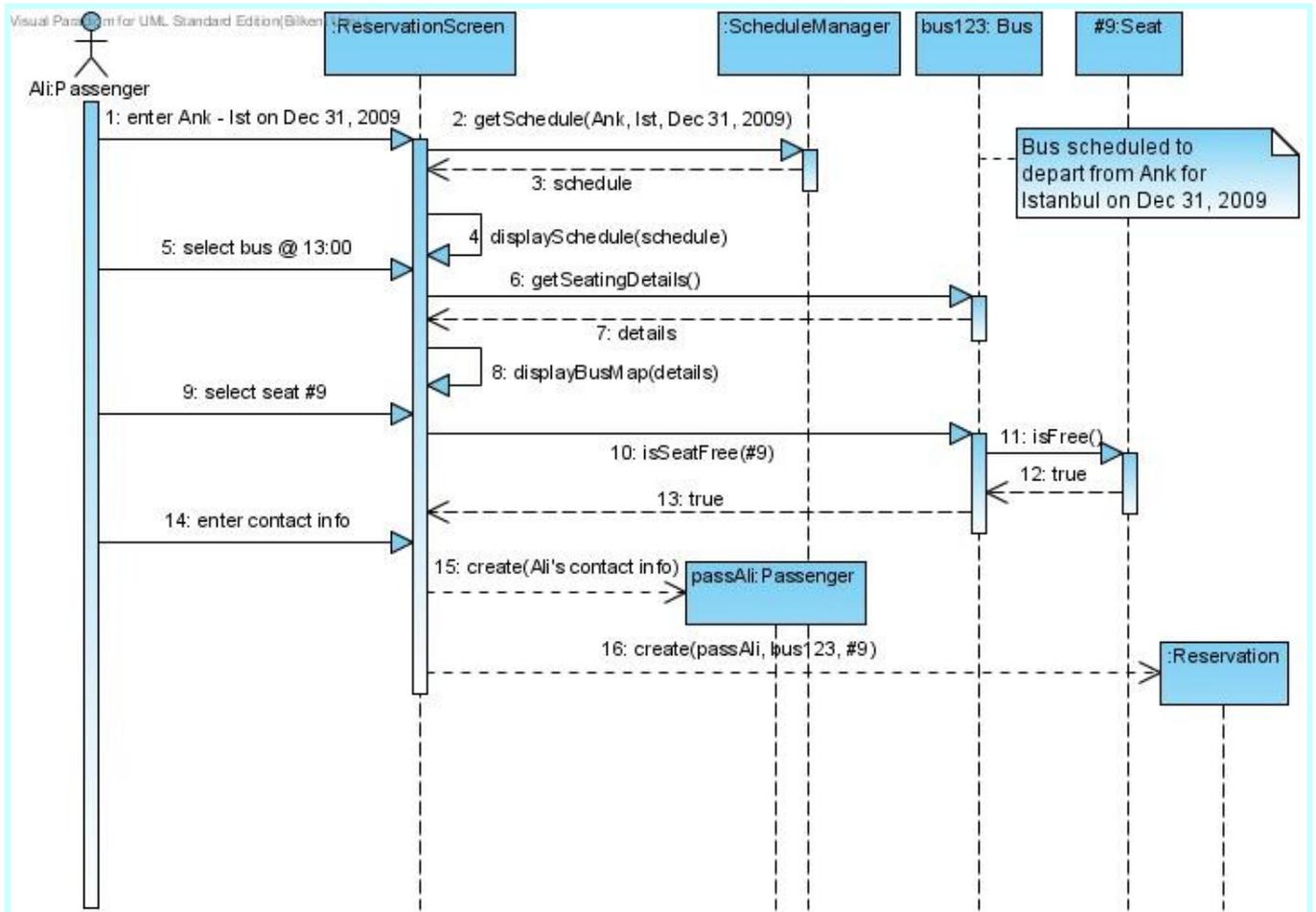
Please write your name **only** in the **last page**.

g) [15 pts] Describe a scenario associated with reservation of a seat, and construct a sequence diagram for this scenario. Show any boundary, control, and entity objects explicitly.

A common scenario for reserving a seat could be as follows:

Passenger Ali lists all scheduled busses from Ankara to Istanbul on December 31, 2009. He selects the one that departs at 13:00. The system displays all the seats with their status. Ali chooses seat numbered 9, which happens to be free. He completes the reservation by entering his contact information. We assume Ali had already logged on to the system prior to this scenario.

Following is the sequence diagram for this scenario:



Mini Dictionary:

to coin	deyim bulmak, bir söz icat etmek
conflict	çelişki, çakışma
to convey	to communicate
desolate	terkedilmiş
hostess	yardımcı, yardım eden
plate	plaka
to rest	dinlenmek
skeletal	iskelet gibi, çatısız
sloppy	yarım yamalak, baştan savma

Please write your name **only** in the **last page**.

staff	çalışan
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I hereby affirm that the work submitted in this examination is my own exclusively.

Name & Signature: *Kıvanç Dincer Uğur Doğrusöz Markus Schaal Bedir Tekinerdoğan*