



Q1. 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. [16 Marks]

- a) The term software engineering concerns with of developing quality software applications in limited resource and time.
- b) The UML stands for unified modeling language and is visual language used during analysis and design phase(s) of the software engineering process.
- c) Use cases are created as part of the interaction/Functional model, while class diagrams are part of the structural/internal representation model, and state charts are part of the behavioral model.
- d) The main activity during use case description is writing ping-pong/interactions between actors and system while during use case diagram is finding the actors and the actors main use cases/use cases.
- e) Ideally, requirements analysis (~~should~~ / should not) consider the implementation technology. The requirements analysis answer what the application will do while the design answers how the application will do it.
- f) The SRS document is produced/ written by the developer company.
- g) Class model describes the statics of the software application while sequence diagram describes the dynamics of the application.

Q2. Consider the following problem description:

A 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.

Seats can be reserved by customers either by phone or 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. 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) Draw a use case diagram for describing the functional requirements of the above system. [12 Marks]

actors: Admin, client, manager, driver, hostess, time

Admin: book, cancel_seat, add_trip, add_bus, add_driver, assign_bus_to_trip,
Manager: get_stastical_information

Client: book, pay, cancel, report_feedback

Driver: report_problem, provide_feedback_report

Hostess: report_problem

b) List and justify three non-functional requirements that could be important for the above system. [9 Marks]

security: privacy of the information for client and driver, hostess

safety: no loss for clients money or company money

usability: easy to use

c) Give two examples of conflicting non-functional requirements. Explain how you would resolve the conflict. [16 Marks]

security X usability : either to have complicated system or insecure when paying for example, → solution may be done using login and logout sessions, confirmation methods, passwords, access control

security x safety : when paying or canceling protecting the data like card numbers etc
solution : ciphering

d) develop a class model for the software system described above. You do not need to identify the operations of objects. [25 Marks]

main classes: trip, trip_category, bus, client, driver, hostess, station

trip has trip category trip has date and time

trip category has a schedule and linked with many stations

a bus, driver, hostess are assigned for each trip

the main classes should be known from the use case of booking, you book a seat in a trip with date and time, company assign bus to one trip of a given trip category.

Trips like flight occurrence like MS636 21-5-2015 8:00, trip category is like MS636 has source and destination

e) Draw a state transition diagram for describing the details of the Seat object of the above system. (the events are the use-cases or system functions)[12 Marks]

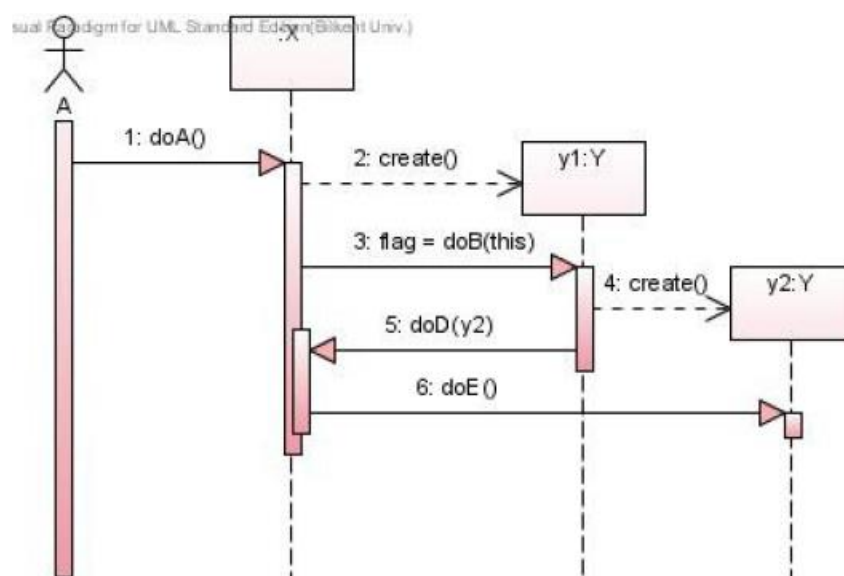
I would say a seat within a trip is either (free), (provisional booked), (confirmed booked)

(free)---client book by phone→ (provisional booked)---- pay ---→(confirmed booked)

(free)←-client did not show up-- (provisional booked)

(free)-----client phone and booked or pay directly-→ (confirmed booked)

Q3. Consider the following sequence diagram. Write template class code for class X and Y. Specify only what is conveyed in the diagram. [10 Marks]



Class X have two methods doA() and doD() ← takes one object as a parameter of type class Y

Flag is data member of class X and it is assignment takes place inside method doA()

Class X

```
{  
  
Private Boolean flag;  
  
Public doA()  
{y1 = new Y();  
flag =y1.doB(this) }  
  
Public doD(Y y )  
{y.doE()}  
}}
```

Class Y

```
{public doB(X x)  
{y2= new Y();  
x.doD(y2);}  
  
public doE()  
{}  
}
```