Université d'Ottawa · University of Ottawa

Faculté de génie
École d'ingénierie
et de technologie de l'information

Faculty of Engineering
School of Information
Technology and Engineering

SEG 3101

SOFTWARE REQUIREMENTS ANALYSIS

MIDTERM EXAM

Length of Examination: **90 min** October 23 2010, 9:00
Professors: Gregor v. Bochmann / Daniel Amyot

Closed book exam.
No calculators or other electronic devices.
If you do not understand a question, clearly state an assumption and proceed.
The last two pages may be detached.

Identification:

Name: _____

Student #: _____

Signature: _____

Good luck!

Question	Total marks	Marks obtained
1	18	
2	5	
3	9	
4	12	
5	6	
Total	**50**	

1. General Questions [18 marks]

Q 1.1 [3 points] : What are the stakeholders that should provide input to the requirements of a new system that manages bus schedules for *OC Transpo*, including scheduling of bus maintenance and providing information about schedules to the public? - Name six (6) relevant types of stakeholders.

Q 1.2 [5 points] : The analysis of existing systems and prototyping are two important techniques for requirement elicitation.

(a) Under what circumstances is the analysis of the existing system more appropriate than prototyping?

(b) Inversely?

(c) Mention two dangers associated with the analysis of existing systems.

Q 1.3 [2 points] : Name two important advantages of brainstorming over other common requirements elicitation techniques (interviews, prototypes, questionnaires, and analysis of existing systems).

Q 1.4 [6 points] : We consider the requirements for a course management system of a university that manages the course schedules and the registration of students for the courses offered.

(a) Give an example of an application domain requirement that would in general be independent of the particular university.

(b) Give an example of a business rule (application domain requirement that depends on the particular management rules defined by the university, e.g., by uOttawa).

(c) Give an example of a user requirement (also, identify the type of user in question).

Q 1.5 [2 points] : Why is it important to document *rationales* in software engineering? Give two reasons (briefly).

- **2. Requirements Classification [5 marks]**

Classify the following statements in requirements categories by completing the table. In the category column, mark *1, 2, 3, 4, 5* , 6, 7 according to the following (**choose the most appropriate category**)

1 – the corresponding statement is a performance requirement
2 – the corresponding statement is an efficiency requirement
3 – the corresponding statement is a security requirement
4 – the corresponding statement is a usability requirement
5 – the corresponding statement is an availability requirement
6 – the corresponding statement is a language requirement
7 – the corresponding statement is a portability requirement

Statement	*Category*
At most 5% of the source code shall be operating system specific	
Less than four mouse clicks shall be needed to access the contextual help on a given topic	
The system shall be able to run with all functionality enabled within 250M of internal memory and 2G of external memory	
In average, no more than 2 failures requiring a system restart shall happen within a month of operation	
An effort of less than 5 person-hours shall be needed to replace the relational database system	
The system shall ensure that all detected unauthorized access attempts are logged	
The system shall meet or exceed 99.999 % uptime	
The system shall be able to process 20 registrations per hour in peak load	
The mean time required by a user to correct an inconsistency in the database shall be less than 30 minutes	
After a 2 hours training period, a regular user shall be able to add a new customer using three different ways	

3. Writing Requirements [9 marks]

The following are requirements for a Meta-Search-Engine for Systematic Literature Reviews. Are these requirements correctly written? If not, explain why and suggest a better way to write them. Assume that all terms are defined properly in a glossary.

Q3.1 [3 marks] : The system must provide access to boolean operators and to the search history.

Q3.2 [3 marks] : The system should eliminate words that have no impact on the search, such as : the, a, this, etc.

Q3.3 [3 marks] : The system must be implemented in C in order to have a fast response for complex queries.

4. Use Cases Modeling [12 marks]

Derive a UML Use Case diagram based on the description given on the before-last page of this exam. You may detach that page. Please provide your answers on the following two pages.

For Section 5 of this exam, you find the problem description on the last page. You may detach that page. Please provide your answer on Page 8.

Q4.a [8 marks] - Answer : UML Use Case Diagram

Q4.b [4 marks] - Answer : Use case “Validate Candidate”

Q5 : [6 marks] - Answer : GRL Diagram

Q4. Description of the system for use case modeling [12 marks] *(this page may be detached)*

Suppose an o*nline election system* with *actors*: ***Elector***, ***Candidate***, ***Election Officer , Citizenship Office, Criminal Record Service*** and a *mis-actor*: ***Fraudster***. The use cases are:

a) *"**register to vote**"* initiated by actor ***Elector*** to register in order to vote,
b) "***register as candidate**"* initiated by actor ***Candidate*** to register as candidate for a ballot,
c) "***validate Elector***" initiated by actor ***Election Officer*** to check if registered Electors are allowed to vote. Actor ***Citizenship Office*** participates in the use case by providing information on the ***Electors'*** citizenship.
d) *"**validate Candidate**"* initiated by actor ***Election Officer*** to check if the registered Candidates are allowed as such. Actors ***Citizenship Office*** and ***Criminal Record Service*** participate in the use case by providing information on the ***Candidates*** citizenship and criminal record respectively.
e) "***perform vote***" initiated by actor ***Elector***
f) "***log in***" initiated by actors ***Elector*** and ***Candidate*** to identify themselves to the system,
g) "***log in Office***r" initiated by actor ***Election Officer*** to identify himself to the system,
h) "***encrypt information***" to encrypt all information exchanged,
i) "***guard database***" to prevent illegal access to the database,
j) "***steal login information***" a misuse case initiated by mis-actor ***Fraudster*** to obtain Electors' login information,
k) "***alter votes***" a misuse case initiated by mis-actor ***Fraudster*** to alter votes in the system in order to change the outcome of an election.

Additionally:

- Use case "***log in***" is performed as part of use cases *"**register to vote**", "**register as candidate**"* and *"**perform vote**"*
- *Use case "**log in Officer**"* is performed as part of use cases *"**validate Elector**"* and *"**validate Candidate**"*
- Use case "***log in Officer***" is a variation of use case "***log in***" with additional interactions
- Mis-use case "***steal login information***" harms the goals of use case "***log in***"
- Use case "***encrypt information***" is performed as part of "***log in***" to counter mis-use case "***steal login information***"
- Mis-use case "***alter votes***" harms the goals of use case "***perform vote***"
- **Use case "*guard database*" counters mis-use case "*alter votes*"**

Q4a [8 marks]: Based on the description above, write down a UML use case diagram identifying the actors, the use cases and all relevant relations. (Answer on Page 6)

Q4b [4 marks]: Describe in detail the use case "Validate Candidate" using a subset of the fields seen in the Lab: Title, Primary Actor, Participants, Pre-condition, successful Post-condition and the Steps (single column of text where each step is numbered). You should include at least one alternative. (Answer on Page 7)

5. Goal-Oriented Requirements Language : [6 marks] *(this page may be detached)*

You are asked to model the concerns of various stakeholders for a new Web application developed in C# which involves some technological choices. Create a GRL model that minimally covers the following concerns:

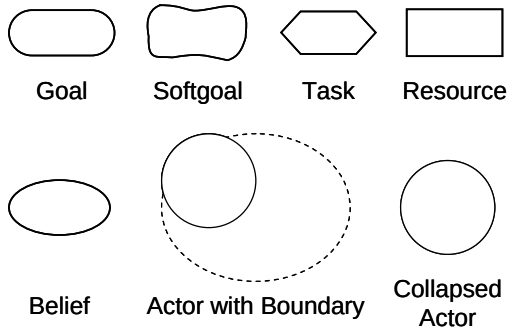
- The testers want to simplify testing.
- The developers want to shorten the development time, and also maximize the utilization of their past experience.

This system has two important functional objectives: to support the data entry forms, and to keep the data in persistent storage. Two alternatives are considered for the creation of the entry forms: MVC.Net (which facilitates the development, but is nearly impossible to test automatically) and ASP.NET (which slightly reduces development productivity, but for which good testing tools are available).
There are also two alternatives for keeping the persistence of the data entered: NPersist (which is not easy to test), and iBatis.Net (which is difficult to use during development, but for which the developers have received some training in the past). The developers have also used ASP.NET in two previous projects.

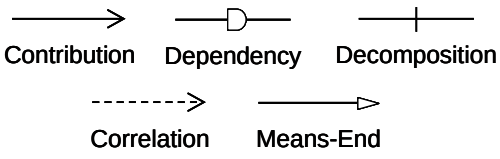
Ensure that you have used suitable actors with their intentional elements, suitable links, and at least one OR decomposition. Specify the contribution levels with **qualitative** labels.

Please answer on page 8. (Suggestion: make first a draft drawing …)

A summary of the GRL notation is given below.

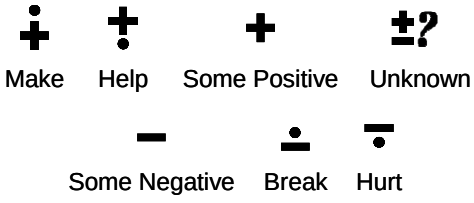


(a) GRL Elements

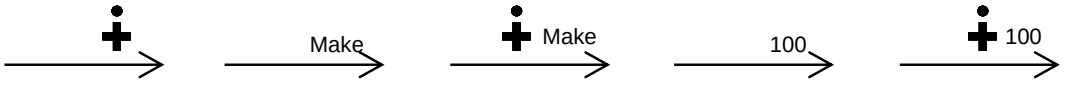


(b) GRL Links

(c) GRL Satisfaction Levels



(d) GRL Contributions Types



(e) Representations of Qualitative and Quantitative Contributions