UNIVERSITY OF OSLO

Faculty of Mathematics and Natural Sciences

Examination in:	IN219 — Software Engineering
Date of examination:	15 December 1999
Examination hours:	09.00 – 15.00
This exercise set consists of:	3 pages
Appendices:	None
Permitted aids:	Anything printed or written

Please make sure that your copy of the exercise set is complete before you attempt to answer anything

Exercise 1 (45 %)

Planning the shifts (who should cover which shifts) in a hospital is a time consuming task. Many hospitals therefore request computer support for this task. In this exercise you should assume that you are employed in a consulting company that is developing a computer supported staff scheduling system called SSS. The first version of SSS is developed in collaboration with a unit at a particular hospital. To begin with 9 employees of the unit will work according to a shift rotation plan of 9 weeks. From this unit you have been given the following requirements:

1. Using SSS the shift planner (usually the head of unit) should be able to generate shift rotation plans for the unit.
2. SSS must support addition and removal of nurses.
3. For a given day or week, SSS should give an overview of who should work on which shifts.
4. SSS should calculate the costs in terms of overtime pay and other costs for each generated rotation plan.
5. SSS must ensure that nobody works more than 54 hours a week.
6. SSS must ensure that no shifts are more than 10 hours.
7. The trade union/staff representative must know the rules that are implemented in the SSS and must be given a warning if work environment regulations or wage agreements are violated.
8. SSS should give all nurses an overview of their shifts.
9. The pay office should be provided information about the shifts of each nurse to calculate overtime pay and other extra costs.
10. SSS should differentiate the access to the system. Someone should be allowed write access; other only read access.

11. SSS should fetch personnel data including the scale of pay from the personnel administration system.
12. A user of SSS should perceive immediate response.
13. SSS should have a good user interface and should be learned to know within a one-day course.

In all the sub-exercises below you should make extra assumptions you if you find it necessary.

Exercise 1A Categorise the requirements given above into functional and non-functional requirements. Identify also the stakeholders. (You can refer to each requirement by their number.)

Exercise 1B Use the VORD method to sketch one or more viewpoint hierarchies including services for SSS.

Exercise 1C Make an UML Use Case model for SSS.

Exercise 1D Describe potential conflicts of interest among the different stakeholders. Describe potential conflicts in and among the different requirements given above. (In both questions the requirements should be considered both as they are stated explicitly and according to other matters that may have an influence, but that are not stated explicitly.)

Exercise 1E Make an object-oriented design for SSS using UML class diagrams. (You must judge yourself the extension of your design taken the time you have available into account.)

Exercise 1F Use Z to make a formal specification of requirement 2 in the requirement list given above.

Exercise 2 (30 %)

Assume that you still are employed in the consulting company described in exercise 1. Assume further that the company has good results regarding delivery on time, but that you experience problems with too many errors in the systems you have delivered. You have already lost customers due to this fact. The company has lost control over the kind of errors that occur and their frequency. The company pays little attention to quality in general, and error-identification in particular, in the processes, methods, techniques and tools you have been using so far in systems development.

Exercise 2 Write a letter to your manager where you describe the problems mentioned above. Propose initiatives to achieve a more systematic overview of which errors that occur and where in the software life cycle they are introduced.

Describe further initiatives to reduce errors of various categories considering process, method/technique and/or tool.

In addition to considering the positive effect of the initiatives to reduce errors, you should also consider the costs (negative effects) of your proposed initiatives.

Make yourself the assumptions that you find necessary.

Emphasise good structure of the letter to clearly state the important points. (Hint: first draft a structure.) Sign the letter with an invented name, for example G. Hansen – so that the person who will mark should not recognise you.

Exercise 3 (25 %)

In the project work (BasicTools) of IN219 you should give time estimates for and specify risks involved in the work with the deliverables.

Exercise 3A Describe to what extent those estimates deviated from what you experienced in the project. Describe also to what extent you underestimated the risks of the project.

If you experienced deviation or unexpected problems in the project (you should judge yourself whether this was the case), please do exercise 3B and 3C. If you did NOT experience deviation or unexpected problems, please do exercise 3D and 3E instead.

Exercise 3B Describe factors that might have been the cause of deviation of estimates or underestimated risks described in exercise 3A.

Exercise 3C Assume that you are responsible for the quality of the development processes in a fictitious company, X.

Assume also that the work of your group in the project of IN219 is representative for the carrying out of projects in X. Propose initiatives to improve the quality of estimation and risk analysis in X.

Exercise 3D (You should only do this exercise if you did not do 3B or 3C.)

Describe factors that you believe ensured that your group managed to carry out the project according to your own estimates and avoided unexpected problems.

Exercise 3E (You should only do this exercise if you did not do 3B or 3C.)

Assume that you are responsible for the quality of the development processes in a fictitious company, X.

Assume also that the work of your group in the project of IN219 is representative for the carrying out of projects in X. Propose initiatives to improve the quality of the development processes in X.

End of exercise set

Good luck!

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