

Write the following information in each paper you return: name, student number, course code and name, date, signature. Answer all questions. There are four questions, each worth 7.5 points.

1. Answer a, b, and c.
  - (a) Describe in short which things are represented/modeled in a use case diagram and how use case diagrams and use case descriptions relate to each other?
  - (b) Describe in short how use case diagrams and descriptions relate to an analysis level class diagram and software architecture design?
  - (c) You are a software designer and are supposed to review the use case description presented in Figure 1. Your tasks are to
    - record what mistakes and omissions there are in the description and
    - write an improved version of the description where these mistakes and omissions have been fixed.
2. Answer both a and b.
  - (a) What do single and static classification mean in the context of object modelling? Use a simple example to demonstrate, how single and static classification must be taken into account in modelling.
  - (b) Model the following on the analysis level using UML class diagram to the extent the information is sensible to present in a class diagram. Use single and static classification. Your model should be based on the description given below, not on how you think things are in reality. Use the point of view of an authority organising the elections in a country.

Elections are one of the key constituents of representative democracy. In each election, parties may nominate candidates. Further, the country is divided into one or more electoral districts. Each person may be a candidate in at most one electoral district in any given election; naturally, a person may be a candidate in multiple elections. There may be constraints on the maximum amount of candidates each party may nominate, and the maximum amount may vary across electoral districts and elections.

There are four kinds of elections: presidential elections, parliamentary elections, European elections (for electing the representatives to the European Parliament) and municipal election that are held every sixth, fourth, fifth and fourth year, respectively. The set of possible election kinds is not expected to change.

Electoral districts are further divided into voting districts, each with a single polling station identified by a name. Each person eligible to vote in an election is assigned a voting district. Note also that a person may simultaneously (in the same election) act as a candidate and as a person eligible to vote. Each person eligible to vote may vote at most once in an election.

Once all the votes have been cast, it is time to count the votes. The secrecy of the votes implies that it is not possible to say for whom a person voted. However, for various purposes, it is very important to know how many votes a candidate received in each voting district. Also, it is of interest to know whether a particular person eligible to vote actually voted or not. For statistical purposes, it is of interest to know how many votes were given to male and female candidates, as well as candidates in different age groups. Similarly, it is important to tell how actively males and females and people at different ages voted.

3. Benefits of using the Extended Use Case test design pattern.
  - (a) How does Extended Use Case extend a use case description from the testing viewpoint. What aspects of the system behavior and data are covered with extended use cases that use cases alone do not provide? Why is this information essential and how can testers utilize the information?
  - (b) How can applying this technique help to improve the actual use cases?
4. Figure 2 gives a part of an information flow diagram for a home assistance and health monitoring system for elderly. Consider the figure and answer the following:
  - (a) What aspect of the diagram you find good for describing and communicating the essential information flow in the system? Is something essential missing from the diagram? Describe your points briefly.
  - (b) In architecture design, the concerns of different stakeholders are important. Regarding the information (or data) handled by the system, such concerns may include: global distribution of data, backup and recovery strategies, the amount of data that needs to be processed per time unit, information life-cycle characteristics (e.g., how long information is kept, how it is archived), access rights, privacy, mapping of analysis model to database tables, and so on. List the three most important information related concerns for a real system and characterise them with two dimensions using the scale low-medium-high: importance to the system and risk of not achieving. Justify your answer.
  - (c) Take the most important of the three concerns (according to b) and describe briefly how you would model and present the concern and architectural decisions regarding it.

