

Specification of Information Systems (192330301) Examination

30th January, 2014

Problem	a	b	c	d	
1	6	3	3		12
2	6	3	3		12
3	6	6	6		18
4	6	6	6		18
5	6	6			12
6	3	3	6	6	18
					90

$$\text{Grade} = (10 + \text{points})/10$$

Explain your answers, but keep them precise: short and to the point.

- What is the difference between a subject domain and the context of the system as shown in a context diagram? Use an example to explain your answer.
 - The subject domain of a reactive system changes when we add functions to, or when we delete functions from the system. Explain this and give an example of each.
 - Can the subject domain of a company be the same as that of an information system owned by the company? Explain by means of an example.
- Figure 1 shows a point-of-sale-terminal (POST) connected to a radio, that connects wireless to another radio that is attached to a scanner, which is used to scan items.

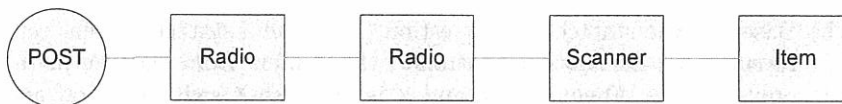


Figure 1: A context diagram.

- Give two reasons for dropping the two radio entities from the diagram.
- If an item is scanned, is this an action or an event? Motivate your answer.
- Scanning takes time. Should scanning be modelled as a process, a state, or an event? Motivate your answer.

3. Figure 2 shows two ways to model the relationship between a person and an employee.

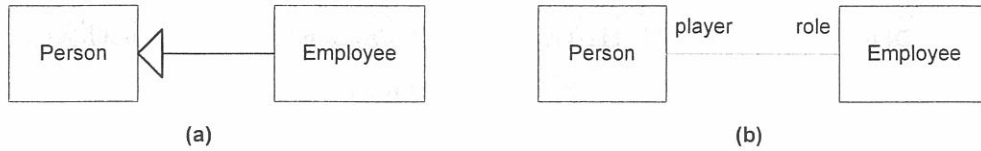


Figure 2: Two entity-relationship diagrams.

- The two diagrams also express existence dependencies. Which existence dependencies are expressed?
 - Each model has an implication for how we count entities. Explain this difference between the two models.
 - Add a cardinality property to diagram (b) to reduce this difference in meaning. After you have added this property to diagram (b), do the two diagrams still have the same implications for the way we count the entities? Explain your answer.
- 4.) Figure 3 shows a context diagram in which button-X can send a push-X event to a controller, and receive X-on and X-off actions from the controller; the effect of X-on is that the button lights up and the effect of X-off is that the button light switches off. Button-Y has a similar interface.

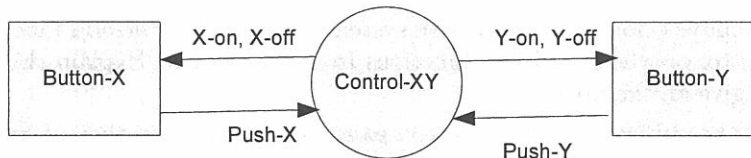


Figure 3: A context diagram.

- Make a statechart for the behavior of the controller using two parallel substates.
 - Based on the statechart of question (a), make a statechart that represents another controller, that differs from the one in (a) only in this: When X is on and Y is on, push-X switches X off and also switches Y off.
 - Represent the system of (a) by another statechart, that has no parallel substates but has only one state and uses local variables X and Y.
5. Suppose that in a DFD we represent material flows by bold arrows and material stores by bold parallel lines.
- Make a DFD in which you represent the processes, material, and data flows in the following situation:

A Dutch tourist on vacation gets sick and, upon his visit at the doctors office abroad, pays for the medical examination. He/she gets a receipt and when in the Netherlands, the tourist fills up a form to submit the receipt for reimbursement to the Menzis insurance company. The form and the receipt arrive at Menzis receipt collection department by ordinary mail. A Menzis clerk receives the tourists letter in her mailbox, enters the form data into the reimbursement system, and puts the tourists form and receipt on file. Upon successful data entry, a request for approval is generated to the Menzis account manager who two times daily reviews all incoming requests and approves them. Upon approval, money transfer is initiated between Menzis and the tourists bank account. A notification letter is generated when this transaction is completed successfully. A clerk prints this letter, signs it, and sends it via mail to the tourist.

– Extend the diagram to include this case (6 points):

When the Menzis account manager compares the paid amount on the tourist receipt with the maximum allowable amount that can be reimbursed abroad. If the amount on the receipt is less than or equal to the allowable amount, the tourist is reimbursed 100%. If the amount on the receipt is more than the allowable amount, the tourist is reimbursed only for the euro value that is allowable. In this case, a special letter is generated to clarify why the reimbursement only partially covers the doctors costs of the tourist.

6. Figure 4 shows a decomposition of an elevator controller. For ease of representation, the external entity Elevator doors is represented twice, as is the component *Arrival sensing*.

- (a) Draw a context diagram of the elevator controller.
- (b) The diagram shows data flows and event flows. What is the difference between the two?
- (c) A requirements-level architecture can be designed using the following guidelines:
 - G1 Functional decomposition
 - G2 Subject-oriented decomposition
 - G3 Event-oriented decomposition
 - G4 Device-oriented decomposition
 - G5 User-oriented decomposition
 - G6 Behavior-oriented decompositionExplain each of these guidelines.
- (d) Classify each of the components in figure 4 according to the above guidelines.

