Specification of Information Systems (233030) Examination

28th January, 2009

Explain your answers, yet keep your explanations precise. Long-winded answers are not appreciated.

1.   a. 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.

   b. The subject domain of a reactive system changes when we add functions to, or delete functions from the system. Explain this and give an example of each.

   c. Can the subject domain of a company be the same as that of an information system owned by the company? Explain by means of examples.

2. 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.

   (a) Give two reasons for dropping the two radio entities from the diagram.

   (b) If an item is scanned, is this an action or an event? Why?

   (c) Scanning takes time. Should scanning be modelled as a process, a state, or an event? Why?

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

   (a) Each model has an implication for how we count entities. Explain this difference between the two models.

   (b) 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.
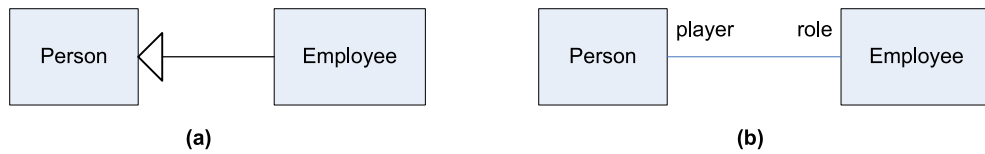
Figure 2: Two entity-relationship diagrams.

(c) The two diagrams also express existence dependencies. Which existence dependencies are expressed?

4.) Figure 3 shows a context diagram in which a 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.
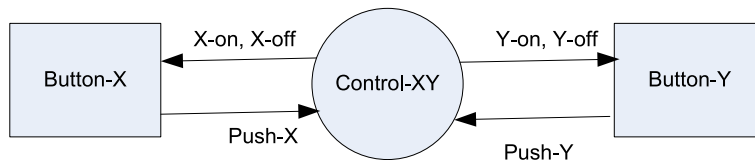

Figure 3: A context diagram.

(a) Make a statechart for the behavior of the controller using two parallel substates.

(b) Based on the statechart of question (a), make a statechart that represents another another controller, that allows X to light on only when Y is off; if Y is on, pushing X must have no effect.

(c) Represent the system of (b) by another statechart, that has no parallel substates but has only one state and uses local variables X and Y.

5. 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
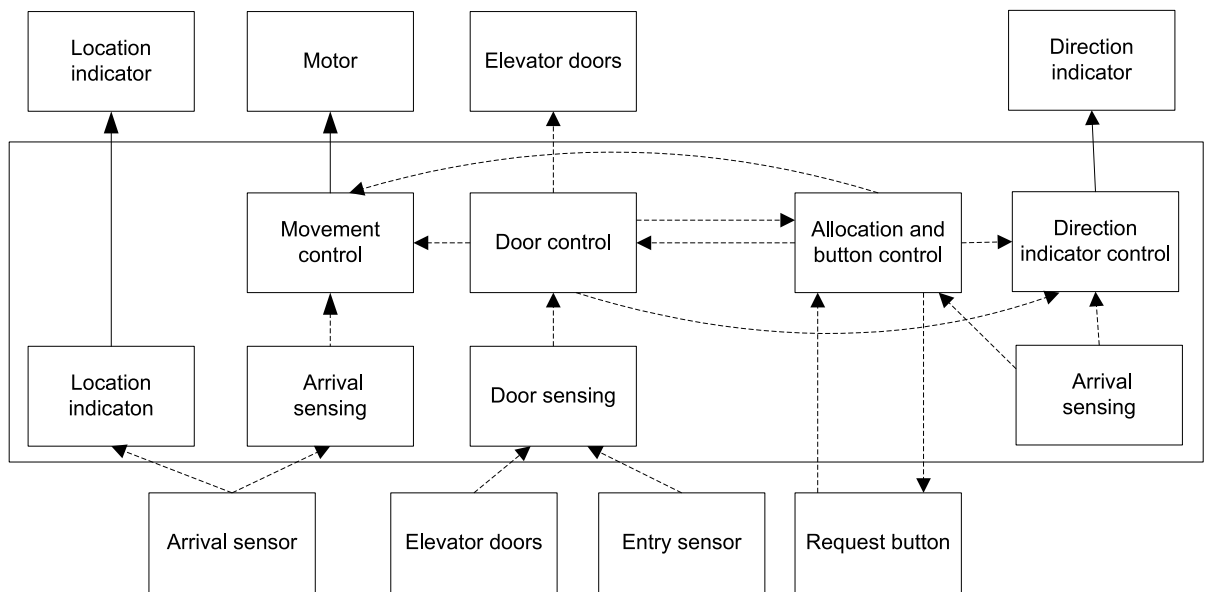
Figure 4: A decomposition of an elevator controller.

G6 Behavior-oriented decomposition

Explain each of these guidelines.

(d) Classify each of the components in figure 4 according to the above guidelines.

Problem	a	b	c	d	
1	6	4	4		14
2	6	4	4		14
3	6	6	6		18
4	8	8	8		124
5	4	4	6	6	26
					90

Grade = (10 + points)/10