

your name: \_\_\_\_\_ your person number: \_\_\_\_\_ - \_\_\_\_\_

**Grading Scheme for Exam in  
2D1359 & 2D1360 Objektorienterad modellering programmering  
och analys  
Tuesday, 23th October 2001, 14:00-19:00**

Grade 3, 4, and 5 require 22, 26 and 30 out of 38 points

**Theoretical part:**

Question 1: (1) f = 1 point, all others 0

Question 2: (1) c = 1 point, all others 0

Question 3: (1) b = 1 point, all others 0

Question 4: (1) b or f = 1 point, all others 0

Question 5: (1) g = 1 point, all others 0

Question 6: (1) g = 1 point, all others 0

Question 7: (4) Correct answer: 1-h, 2-e, 3-i, 4-k, 5-c, 6-d, 7-g, 8-b, 9-f, 10-l,

Subtract 0.5 points for each wrong answer

Question 8: (2) Describe in two sentences what is the difference between object oriented analysis and design.

Correct answer: OO analysis is

-finding and describing objects or concepts in the problem domain. OO analysis =

-what needs to be done., do the right thing

-defining the problem/requirements

1 point if sentence matches or is identical in meaning to the statements above

OO design is

-defining software objects and how they collaborate

-how a problem is solved, how it is done, do the thing right.

-conceiving a solution to the problem

1 point if sentence matches or is identical in meaning to the statements above

Question 9: (2) What is (usually) the multiplicity (1..\*, \*..\*, etc.) of the following associations?

Correct answer: a: \*-\*, b: 1..\*-2, c: 0,1-0,1, d:1-1 , e: \*-\* or -1..\*, f: \*-1 or \*-1..\*, g:1-1..\*, h: \*-\* or 0,1-\*

0.25 point for each correct answer (notice that \* counts as 0..\*, so for example

1-\* counts as a wrong answer to question g)

Question 10: (2) Describe in two sentences the roles of inception and elaboration within the unified process.

Answer: Inception is a feasibility study which envisions the product scope, approximate vision and business case. Elaboration generates a refined vision, iterative implementation of core architecture, resolution of high risks, identification of most requirements and scope. (see Larman pages 35 and 109).

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Wrong answer Inception=Requirements, Elaboration = Design!

1 point for elaboration and inception each if sentences matches or have identical meaning to the above descriptions.

Question 11: (1) In the unified process requirements are described by

Correct answer: c=1 point, all others 0

Question 12: (1) Extreme Programming advocates

Correct answer: e=1 point all others 0

### **Practical Part:**

Question 13: (8) A vending machine offers two different products A and B. Product A costs 4 SEK, product B 6 SEK. The customer inserts one coin at a time into the slot. The machine accepts coins in denominations of 1, 5 or 10 SEK. The machine displays the amount available for purchasing products. The machine has three buttons, button A to dispense product A, button B to dispense product B and button C to obtain change. At any time the customer can press button C to collect her change or amount paid, even if no purchase occurred previously. The customer can press buttons A and B at any time, but the machine only dispenses the corresponding product if the current amount paid is equal to or exceeds the product price. It is possible to make multiple purchases with one payment by using the remaining amount for another purchase (for example inserting a 10 SEK coin and purchasing product A twice and obtain 2 SEK change or for example inserting a 5 SEK coin, purchasing product A, inserting another 5 SEK coin and purchasing product B).

- a. Draw a state diagram for the vending machine.
- b. Draw a system sequence diagram for a scenario in which the customer inserts two 5 SEK coins, purchases product B and collects her change. Illustrate the information or product the vending machine shows or dispenses to the customer.

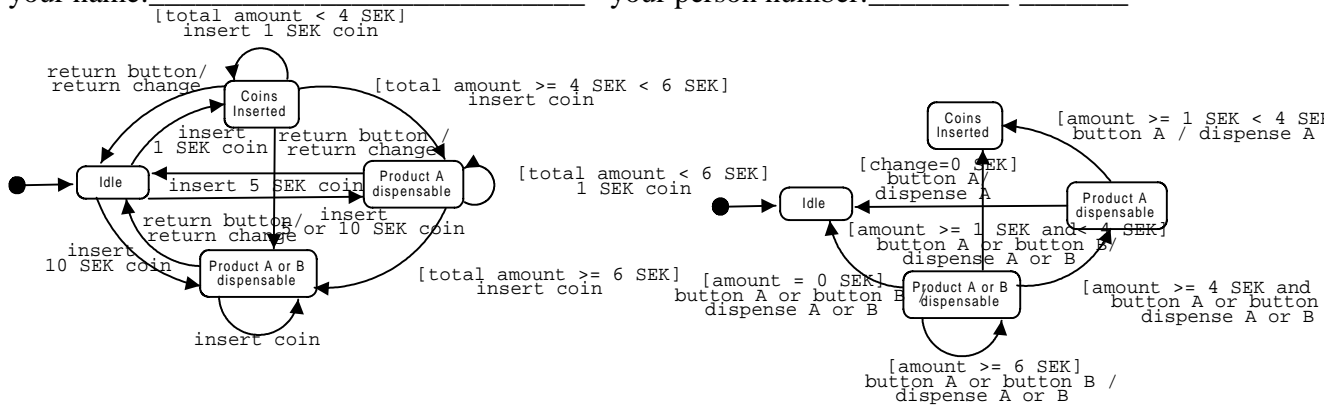
Draw the diagram on a separate sheet of paper with your name and person number. For the sake of clarity you can draw two copies of the state-chart diagram, that contain the same states but depict different types of events and transitions, for example for inserting coins, dispensing products and returning change.

Solution: States : idle (no money inserted), coins inserted (some money inserted but not enough to purchase any product, Product A dispensable (enough money to purchase product A but not B, Product A or B dispensable (enough money to purchase either A or B at least once)

Events (external based on what the customer does) : button A, button B, return button, insert coin

Actions : (internal, responses of the machine) : dispense product A, dispense product B, return change

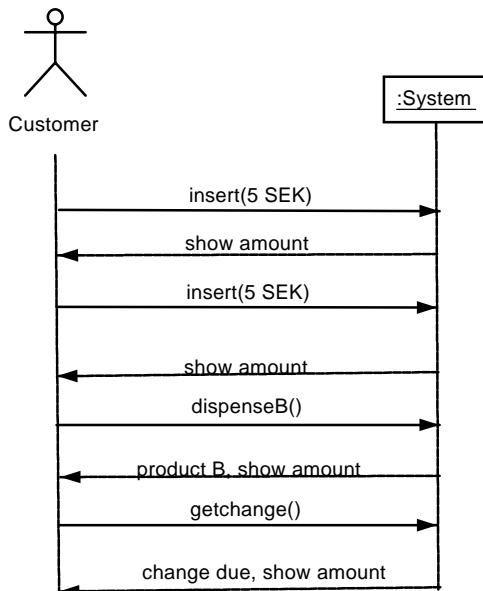
your name: \_\_\_\_\_ your person number: \_\_\_\_\_ - \_\_\_\_\_



Evaluation: part A is worth 5 points:

- Give 1 point if all states have been identified, 0.5 points if some states are correct
- Give 1 point if all events (insert coin, button A, button B, return button) have been at least identified, if some events have been identified 0.5 points
- Give 1 point if all actions (return change, dispense product A, product B) have been identified, 0.5 points if some actions have been identified, actions denoted as states do not count as actions (unless denoted with special action syntax in state e.g. /action)
- Give 1 point : if all conditions [amount > ...] have been identified, give 0.5 points if at least some conditions are correctly specified using correct notation []
- Give 0.5 points when start state has been identified (transition circle -> idle)
- Give 0.5 points if correct syntax for conditions [<condition>], events and actions /<action> has been used

solution b) System sequence diagram



Evaluation part b is worth 3 points

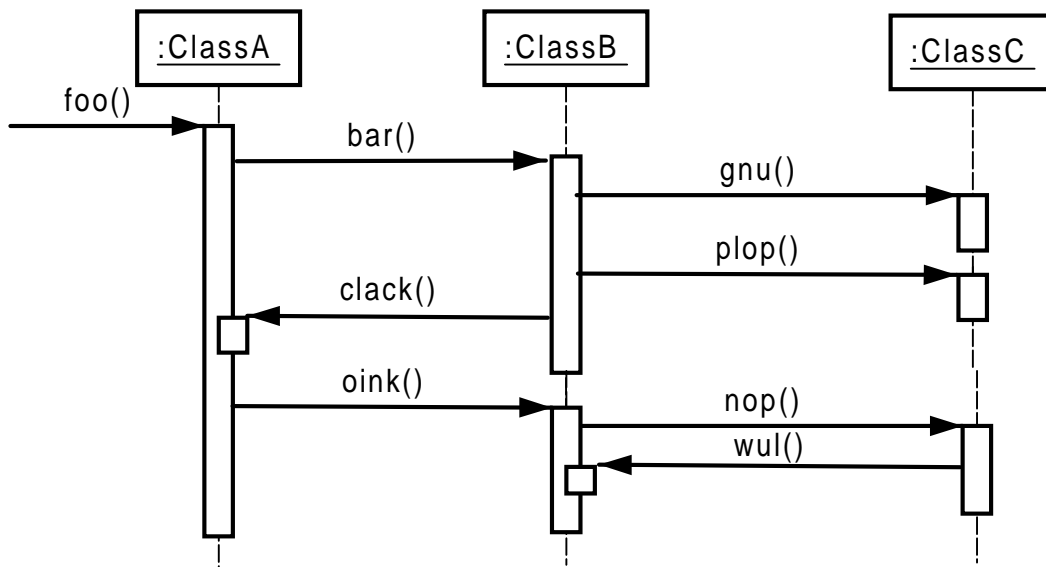
- give 1.5 point if all methods send to system are correct , complete and in correct order,
- 0.5-1.0 points if some are correct or if correct messages send between objects rather than between actor and system

your name: \_\_\_\_\_ your person number: \_\_\_\_\_ - \_\_\_\_\_

give 1.0 points if returns (display amount, dispense product, return change) from system to customer are correct, 0.5 points if some are correct

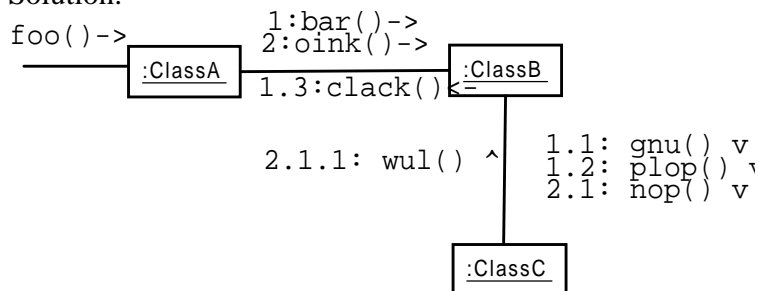
give 0.5 point for correct notation , e.g. drawing an SSD not an arbitrary SD, using method with () for messages from actor to system, actor symbol, arrows, naming system object

Question 14: (4) Draw the collaboration diagram that corresponds to the following sequence diagram



Draw the diagram on a separate sheet of paper with your name and person number.

Solution:



Evaluation:

Give 0.5 points if all objects (classA, classB, class C) occur once

Give 1.0 points if all messages occur and in correct order of enumeration even if wrongly enumerated, for example 1,2,3,4 etc.

Give 0.5 another points if enumeration up to second level of nesting is correct 1, 2, and 1.1, 1.2, 1.3, 2.1

Give 0.5 another points if foo() message is not enumerated

Give another 0.5 points if enumeration is completely correct , up to third level namely 2.1.1 for wul() instead of 2.2

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Give 0.5 points if messages contain direction error

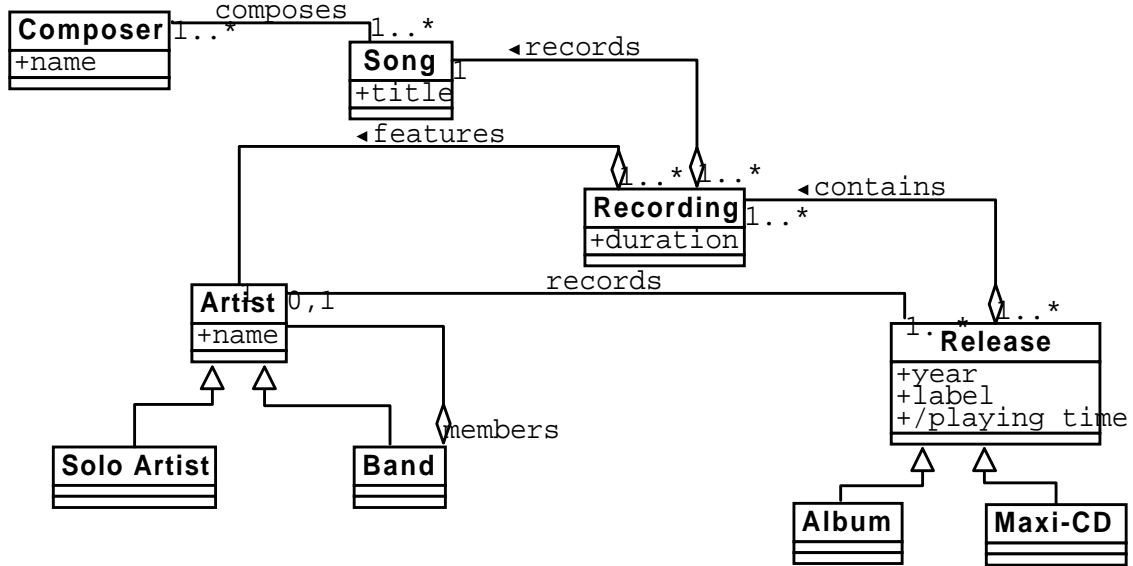
Give 0.5 points if links are correct (single link, no arrows on link, no multiple links between the same object)

Question 15: (8) Draw a domain model as a UML class diagram, containing concepts, generalizations, named associations with multiplicity (composition and aggregation where applicable) and attributes for the following domain. The task is to design a software that helps you keep track of your collection of audio CDs. One distinguishes between two different types of releases, namely maxi-CDs and album CDs. Each release (album or maxi-CD) contains one or several recordings, a recording is a particular song performed by a particular artist, for example the album "Hot Rocks" by the Rolling Stones contains recordings of the songs "Time is on my side", "Heart of Stone", "Play with Fire" etc. Each recording has a playing time, for example "Time is on my side" has a playing time of 5:23. The same recording might occur on different releases, for example the original studio album and a "best-of" album. The same or a different artist might perform the same song in different recordings, for example the song "American Pie" by Don Mc Lean and Madonna or "Sympathy for the Devil" in a live and a studio version by the Rolling Stones. One distinguishes between solo artists (e.g. Madonna) and bands composed of artists, for example Paul McCartney, John Lennon, Ringo Starr and George Harrison are members of the Beatles. An artist can occur on different recordings in different roles, either as a solo artist or a band member, for example Sting as a solo artist or as a member of the band Police. A song has a title and is composed by one or several composers, for example the song "Hey Jude" is composed by Paul Mc Cartney and John Lennon. Each release has a title, release date, music label and a playing time that is calculated as the accumulated playing time of the recordings on the release. A release is usually associated with one particular solo artist or band, for example the album "Abbey Road" with the Beatles. Still, this is not always the case for example in case of movie sound tracks or events such as Woodstock, which feature a number of different artists on the same release.

Draw the diagram on a separate sheet of paper with your name and person number.

Solution:

your name: \_\_\_\_\_ your person number: \_\_\_\_\_ - \_\_\_\_\_



Evaluation:

3 points if all concepts have identified, subtract 1 point for each missing concept (except solo artist, band, album, maxi CD see next item), subtract 0.5 points if Composer is not a separate concept but artist plays role of composer as well. Notice that song and recording/track are two separate concepts.

1 point. Correct generalization for artist, solo artist band and release (or CD) and album, maxi-CD, subtract 0.5 points for wrong or missing generalization

3 points for correct associations, subtract 0.25 points per association that is not named or named wrongly (e.g. by a noun) (but not more than 1 point in total), subtract 0.25 point per incorrect multiplicity (but not more than 1 point), subtract 0.5 points for any association that is missing

1 point for correct attributes, duration, title, release date (year), label, and derived attribute playing time, notice attribute name for artist and composer was not requested, subtract 0.25 points for each missing attribute or attributes wrongly assigned, e.g. playing time is not marked as a derived attribute