BLEKINGE INSTITUTE OF TECHNOLOGY

Written test in (subject): **PA1106 (Software Design)**

Date:__ **June the 7th, 2014** ___

Name: _____

Civic number: _____

Number of sheets handed in:_____

Mark the question(s) you have answered by putting a ring around the relevant number(s)

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Instructions

A student who cannot produce valid ID will not be permitted to take the examination.
No examination scripts will be accepted by the proctor during the first hour of the examination.
(Students arriving late will thus be permitted to take part in the examination).
Write your name and civic number on each sheet of paper you hand in.
Examination results are posted by e-mail no later than 10 working days after the date of the examination. Exceptions to this rule can occur. In this case, students will be informed by the teacher responsible for the course/program or by the examiner.
All blank answer sheets are to be handed in to the proctor.

(To be filled in by the proctor)

ID presented: _____

Proctor's sign.

Student union fee paid: _____

Proctor's sign.

Student union fee not paid: _____

Proctor's sign.

(To be filled in by the teacher)

Number of credits gained: ____ Grade:____ ECTS:____Examiner´s sign:_____

(To be filled in and signed by the student, after the correction of the examination)

I hereby sign my examination script. I am aware that by signing for my script, after correction, I waive my right to contest the examiner's comments and the credits or grade awarded.

Date_____ Signature:_____

Ludwik Kuzniarz
Blekinge Institute of Technology
School of Computing
Karlskrona

June the 7th, 2014

Course PA1106

Software Design

Exam

Points

Question 1	Question 2	Question 2.M	Total

Grade

BTH	ECTS

---------- Explanations ----------

Questions.

For the multiple choice questions your task is to indicate the following statements as *true* T or *false* F by placing the appropriate letter indicator in the [ ].

For instance

[T] John likes Mary

indicates that the statement is true, or more precisely you think it is true.

John is

[F] Swedish

[T] English

[F] 5 years old

indicates the John is not Swedish, he is English and he is not 5 years old,

If you know that John is German and 20 years old, you should made the following indications:

John is

[F] Swedish

[F] English

[F] 5 years old

For the problem questions your answers should be written in the predefined marked places

either labelled boxes 

or along labelled lines ....

Well structured answers will be appreciated.

Marking

Every question, just after the question number, has a number of points allocated for that question.

If all entries for the question are marked correctly you obtain that number of points. For any wrong answer for the question one point is subtracted from the number of allocated points but no negative points are generated. It means that if a question has 2 points allocated and has three places to mark T or F then when you make one error you get 1 point for that question, when you make two errors you get 0 points and when all the answers are wrong you also get 0 points.

Test is worth . 56.. points, 30 points is passed, 45 points – very good.

A remark on drawings

In the case of tasks that require producing drawings – conceptual models, state diagram, class diagram – please draw first your draft solutions on a spare paper and then redraw them on the marked area on the examination paper trying to arrange the elements (and especially connecting lines) of the picture so that the models were easy readable.

So, good luck!

1. Knowledge 24 p

1. 2 p

Sample Development Process presented and used on the course:

[ ] specifies the artefacts that must be developed

[ ] specifies the phases of development

[ ] is based on the iterative process model

[ ] is based on Model View Controller design pattern

2. 2 p

The tasks performed during the **Requirements Phase** include

[ ] identification of actors interacting with the system

[ ] describing process of using the system by actors

[ ] specifying non-functional properties of the system

[ ] planning of the development process

3. 2 p

Conceptual Model shows

[ ] possible states in which there can be the system under development

[ ] operations that can be performed by the objects representing the involved concepts

[ ] system operations

[ ] messages exchanged during the execution of the operations

4. 2 p

The purpose of producing **System Sequence Diagrams** is

[ ] to identify use cases

[ ] to identify system operations invoked during the realisation of a given use case

[ ] to illustrate realisation of the system operations inside the system,

[ ] to find out global attributes of the system

5. 2 p

Collaboration Diagram

[ ] presents objects, links and message sent between objects

[ ] can include classes and their attributes,

[ ] can be replaced by a sequence diagram,

[ ] can be used to illustrate realisation of system operations inside the system

6. 2 p

Two Layers design pattern is

[ ] used to ensure proper realization of system operations

[ ] used to ensure low cohesion

[ ] used to ensure high coupling

[ ] is used to separate basic user interface from application logic

7. 8 p

Consider a domain described by the model

Is the situation described bellow consistent with (allowed by) the above model?

[ ] There is only one Z2415:Course delivered at KTH:School,

[ ] Z2413:Course is delivered at KTH:School and MTH:School,

[ ] Game:School has two courses Best:Course and Good:Course,

[ ] Bad:Course belonging to Strange:School has no students,

[ ] Super:Course is not delivered at any school,

[ ] John:Person can move from Good:Course and study in Excelent:Course,

[ ] Lonely:Person does not take any Course

Are the following statements justified?

[ ] There must be at least one Person in every Course,

[ ] The same Course cannot belong to two different Schools,

[ ] The number of existing Schools may be greater then the number of existing Courses,

[ ] The number of Courses may not be greater than the number of Persons.

[ ] Every Person must take a Course.

2. Object-Oriented Design 32 P

2.1. Problem Description

A Drink Composer

From the Drink Composer you can obtain hot drinks: coffee and tea.
Instead of buying a ready drink, you compose a drink you want to have
by choosing the ingredients to be mixed up to produce the drink.
The drink is *composed* by choosing coffee or tea, and then possibly adding sugar and/or milk.
When the choice is completed the price is calculated and displayed.
After composing the drink, you should make a payment.
You can pay by cash or by credit card.

The drink is *made* by putting the selected tea or coffee, plus all requested ingredients into a plastic cup and filling the cup with hot water.
There is a special heater in the tank to keep the water at the boiling temperature.

The Drink Composer accepts the 1, 5 and 10 SEK coins.
The coins should be inserted to a special coin slot. After inserting each coin, the current inserted amount is reported.
The Drink Composer is always able to return even change (simplification).

At any time you can cancel the purchase and get the money back.

Payment by credit card is simplified to only checking whether the card is valid and deducing the money from the card. To do this the machine communicates with the bank service.

The Drink Composer is maintained by a service man, who periodically visits the machine, refills the ingredients for preparing drinks.
To be able to do the job, the service man should identify himself with a special code. When this sucessfuly done, the Drink Composer is set to the service mode.
After maintenance, the service man closes the machine, what restores its working mode.

The owner of the machine is responsible for collecting money from the machine and can also change the prices of drinks. He also has to identify himself to be able to do that.

In the machine there is a hot water tank and four containers: one for the tea, one for coffee and one for milk and one for sugar.

The Drink Composer is able to send a pager message to the service man informing about emergency situation such as: lack of ingredients and to the owner in case there is an overflow of cash or insufficient cash for change.

(N.B.
The above description is intentionally incomplete.
Your answers should be based only on the information provided in the above text.)

2.2. Your tasks

A.	Identify **actors**	1 p
B.	Identify **Use Cases**	1 p
C.	Draw **Use Case Diagram**	2 p
D.	**Evaluate** Use Cases and **allocate** them to the development process	1 p
E.	Write **extended** version of BuyDrink **Use Case**	3 p
F.	Draw **Conceptual Model**	6 p
G.	Draw **System Sequence Diagram** for BuyDrink Use Case	3 p
H.	Identify **System Operations** based on BuyDrink Use Case	3 p
I.	Write **Contract** for the prepareDrink System Operation from the BuyDrink Use Case	4 p
J.	Draw **Collaboration Diagram** for the prepareDrink System Operation	4 p
K.	Draw part of the **Design Class Diagram** including elements used in the answer for the point **J** (the previous points)	3 p
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		32 p

Remarks.

1. Consider structuring Use Cases

2. prepareDrink should "create" the drink based on the choice made by the Customer and also perform necessary updates in the used ingredients.

3. try to model/represent drink as a (composed) object

A. Actors

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B. Use cases

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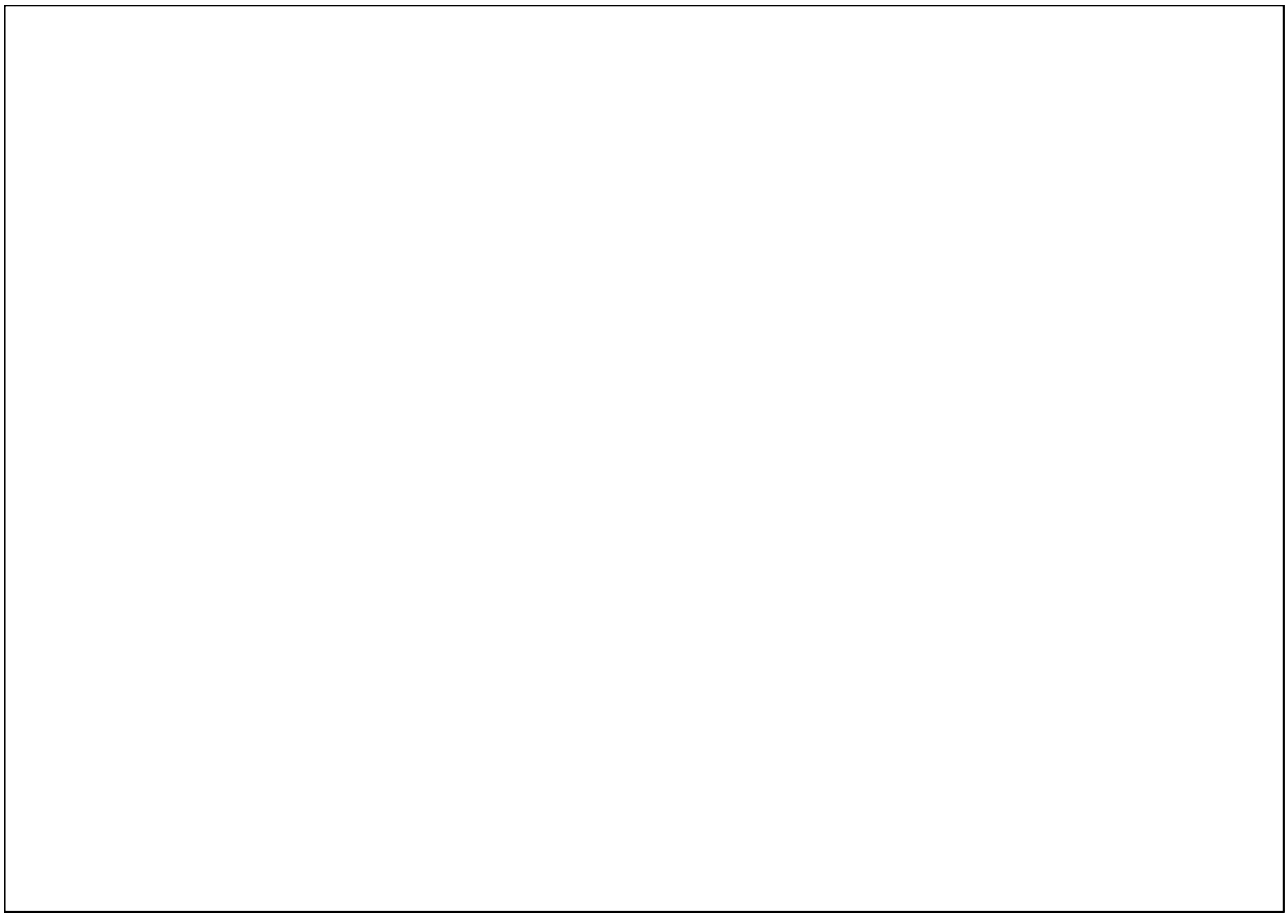
C. Use Case Diagram



D. Evaluation of Use Cases

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Allocation to the development process

E. Extended version of BuyDrink Use Case 3 p

(Use the Use Case Format introduced on the lectures, and skip the high level usecase description part)

F. Conceptual (Domain) Model 6 p

G. System Sequence Diagram for BuyDrink Use Case 2 p

H. System operations based on BuyDrink Use Case 3 p
(provide signatures for all identified operation in the use case;
Signature = Name of the operation,
full description of parameters – name and type,
possible returned value)

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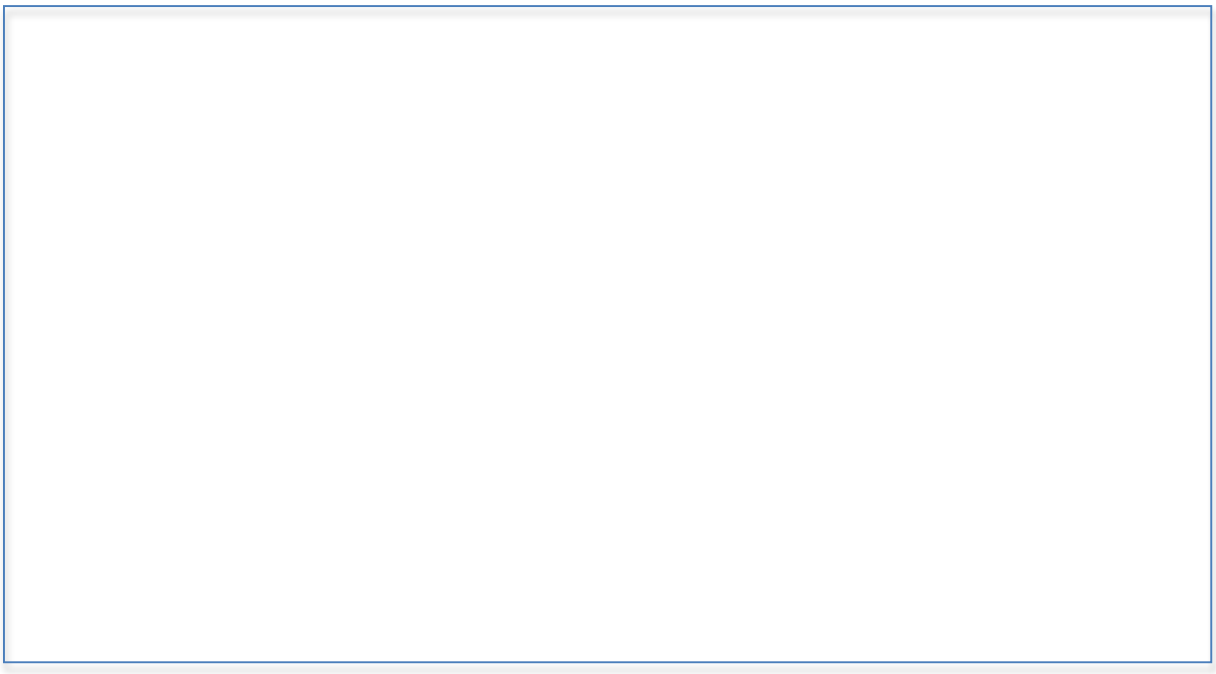
I. Contract for the prepareDrink system operation 5 p

I.1. Relevant fragment of the class diagram



I.2 Text

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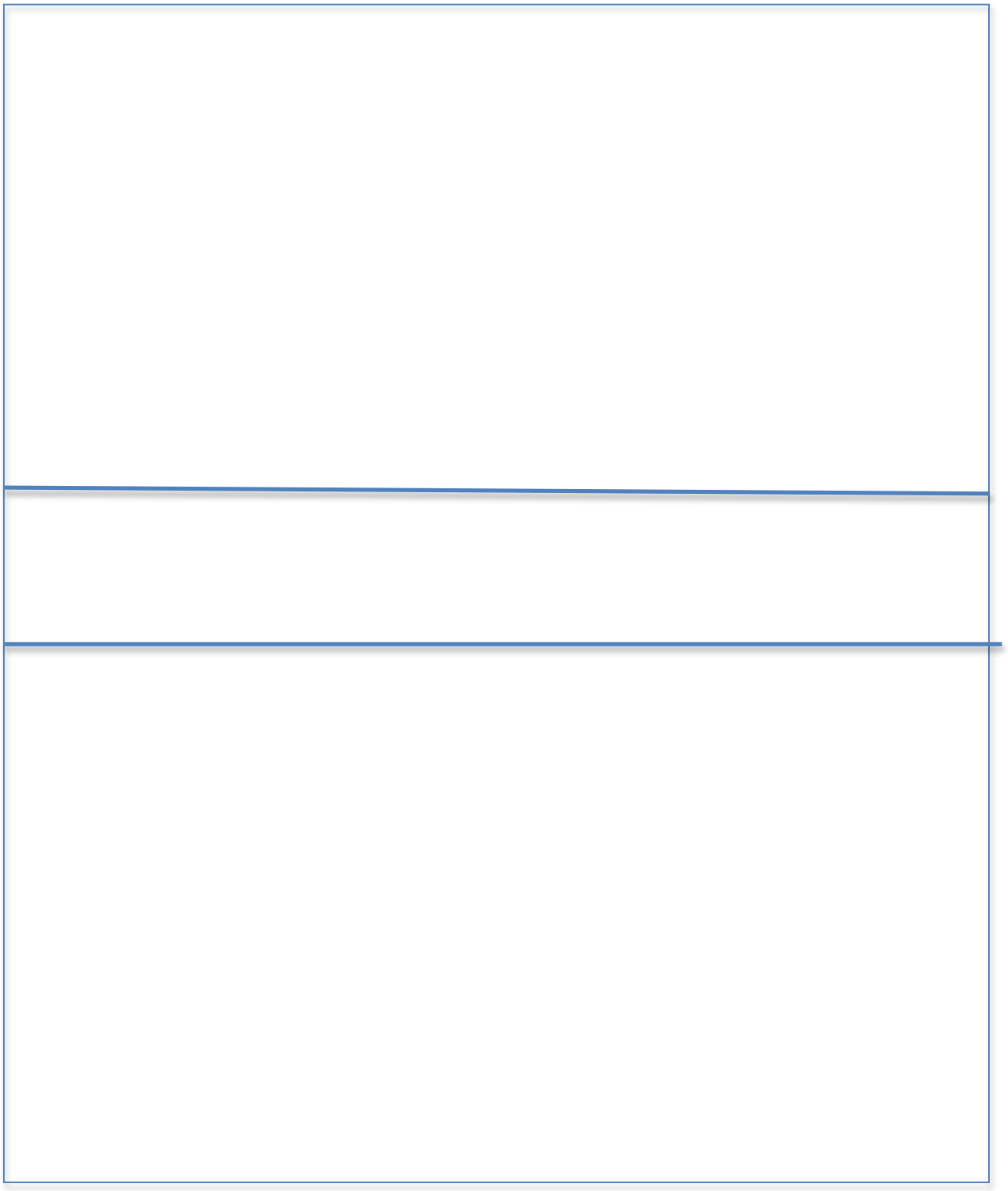
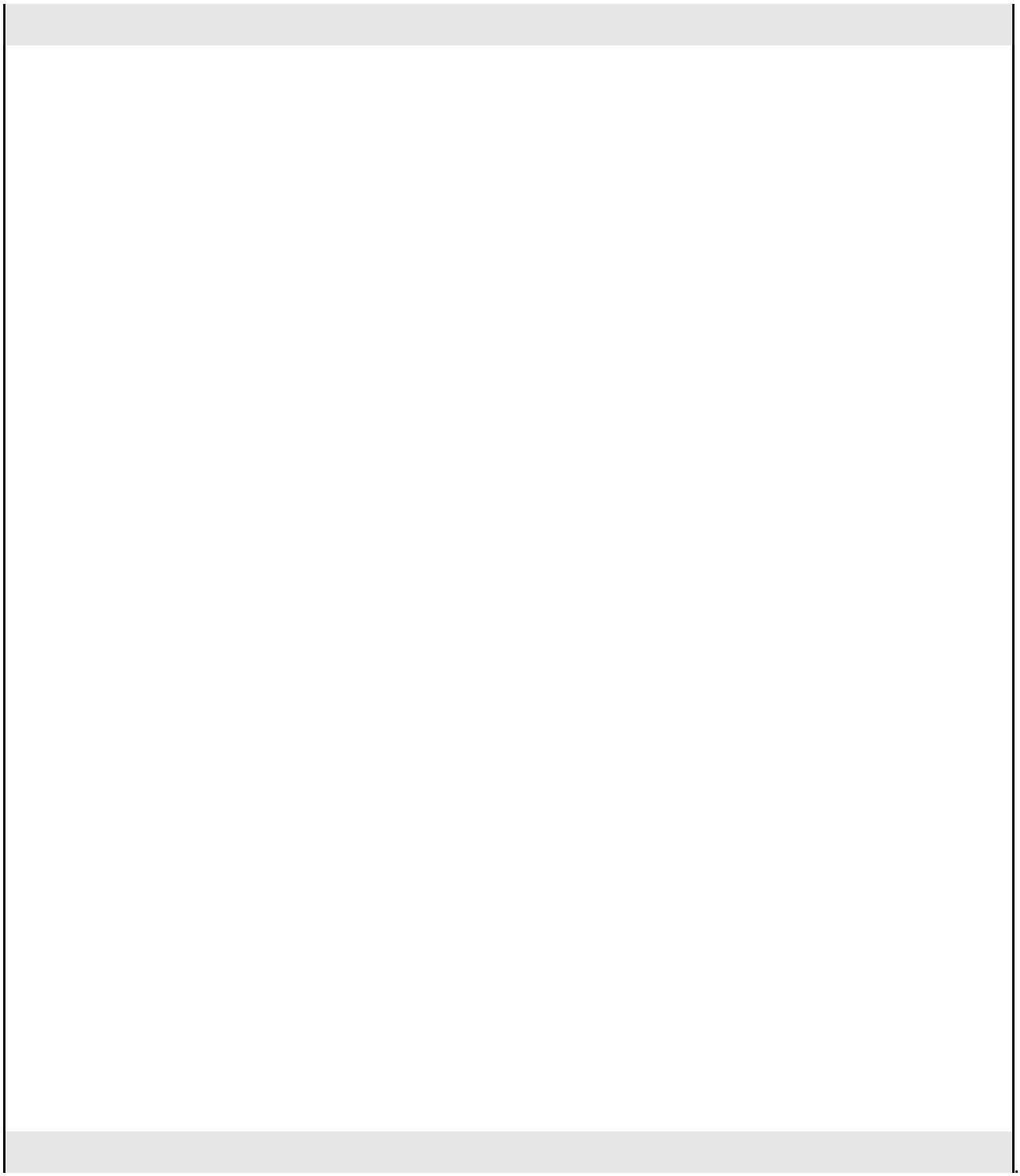
I.3. Scene-Curtin Metaphor



J. Collaboration / Sequence Diagram for prepareDrink ……..3 p



K. Part of the Design Class Diagram including only elements used in point .J 3 p

Design Class Diagram