UNIVERSITY
OF SKÖVDE

School of Informatics

WRITTEN EXAMINATION

Course: advanced programming

Sub-course

Course code: IT712A

Credits for written examination: 5,5 hp

Date: 2015-10-27

Examination time: 1415-1730 (3 h)

Examination responsible

Teachers concerned: Vicenc Torra

Aid at the exam/appendices

Other

Instructions

- ☐ Take a new sheet of paper for each teacher.
- ☐ Take a new sheet of paper when starting a new question.
- ☒ Write only on one side of the paper.
- ☒ Write your name and personal ID No. on all pages you hand in.
- ☒ Use page numbering.
- ☒ Don´t use a red pen.
- ☒ Mark answered questions with a cross on the cover sheet.

Grade points

Examination results should be made public within 18 working days

Good luck!

Total number of pages

Exam. Advanced Programming (Course code: IT712A)
The exam consists on 5 exercises.

Exercise 1. (20 points) Define a recursive version of the function `from(n,m)` with n and m integers. The function returns the list of integers from n to m. Assume $n \leq m$.

Exercise 2. (20 points) Define the method `from(vFrom,vTo,gen)` which generates a list of elements where the first one is `vFrom` and the last one is `vTo`. These two elements are of an arbitrary type. Then, `gen` is a function that given an element of this arbitrary type generates a new one.

For example,

```
from(2,10,(n:Int)=>(n+2))
```

should return

```
List[Int] = List(2, 4, 6, 8, 10)
```

To solve this exercise use recursion or high-order functions.

Exercise 3. (25 points) A time series can be represented as a sequence of data $x_1, x_2, x_3, \ldots$ for given times $t_1, t_2, t_3, \ldots$. Implement using higher-order functions the moving weighted average of order 3 defined by

$$x'_i = \frac{1}{4}x_{i-1} + \frac{1}{2}x_i + \frac{1}{4}x_{i+1}.$$

Note. You will need to define the first element of the sequence (when expressions for x'_i cannot be applied in an appropriate way).

Exercise 4. (25 points) Consider a polynomial of the following form

$$a_0x^0 + a_1x^1 + a_2x^2 + \cdots + a_nx^n$$

represented by means of a list of coefficients.

Implement a function that given such a polynomial returns its evaluation for a given value of x. Assume all elements are integers.

The function should be able to evaluate the following expression.

```
polynomialAt List(2,3,6,3) 2
```

Exercise 5. (10 points) Discuss briefly (maximumm 5-10 lines) tail-recursion and explain if any of the functions you have defined is tail-recursive.