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Written exam in the course

DD2325 Applied Programming and Computer Science

December, 15 2008 kl. 14 - 18

No means of help allowed.
This exam is for the grades D (11 p needed), C (15 p needed), B (19 p needed) and A (22 p needed). When you have passed the mandatory labbs you have passed the course with the grade E.

1. Fibonacci series (5 p)

The fibonacci series may be defined by:

$$f(n) = \begin{cases} 1, & n = 1 \\ 2, & n = 2 \\ f(n-1) + f(n-2) & otherwise \end{cases}$$

- Write a recursive function in C for calculating the n'th Fibonacci number.
- Show with an example and explain why the recursive solution is considered inefficient.
- Write a function which is efficient.

2. Queue (8 p)

The data type `queue` can be implemented with a `vector` of fixed size n in Matlab. The queue entries are real numbers.

- Write the basic queue operations `create`, `empty`, `full`, `enqueue` and `dequeue`.
- Write the function `printQueue`. The only allowed operations to handle the queue are the basic queue operations above.
- Discuss the advantages and disadvantages of hiding the internal data representation and the implementation of the queue to its users.

3. Hashing (2 p)

Describe the handling of collisions in hash tables.

4. Economy boost in China (5 p)

In the past decade the economy in China has grown tremendously (very much). This can be seen in the increasing number of millionaires over the years.

China yesterday.

A couple of years ago a survey was made in China to find out how many had a fortune over 1 million money. It turned out to be 50 persons.

To sort the 50 richest persons a n^2 sorting method is considered. Which one would you recommend?

China today.

Recently a similar survey was carried out but now the limit was 100 milion money and the result was 500 persons.

Recommend a sorting method to sort the 500 richest persons and motivate your answer.
Give an algorithm to the recommended sorting method.

5. Arithmetic expressions (5 p)

Arithmetic expressions can be represented with binary trees.

- How will the binary tree look like if the expression is $(5 * 3 - 2) * 7 + 8/4 - 9$?
- Give an algorithm for printing an arithmetic expression in a binary tree in postorder.
- How many nodes can a binary tree of height h at most have?