Institut for Matematik og Datalogi
Syddansk Universitet

Re-exam for Study Start Project
Computer Science 2014

This is the re-exam for your "studiestartsopgave", for those who did not pass the original "studiestartsopgave". This project is based on your courses DM549, DM550, and DM534, though most directly on DM534 since it overlaps with both of the other two. It covers stating algorithms precisely and being able to follow the execution of an algorithm (as is required in programming) and circuit design (Boolean algebra and logic). The project will be graded on a Pass/Fail basis.

The project is due at **23:59 on Friday, October 10**.

You may write it either in Danish or English. Write your full name, your section number (D1 or D2), and your "instruktor"'s name (Christian Kudahl or Magnus Gausdal Find) clearly on the first page of your project (on the top, if it is not a cover page). You should turn in your project as a PDF file (possibly scanned from your original) via Blackboard. The assignment/project hand-in is in the menu for the course DM534 and is called "SDU Assignment". Turn in using your correct section, D1 or D2. Keep the receipt it gives you proving that you turned your project in on time. **Blackboard will not allow you to turn in an assignment/project late.** (Ask for help early if you need help for submitting.)

Note that this is not the only part to your "studiestartsopgave". The "studietekniske opgaver" are handled through FF500. Check FF500 in Blackboard if you have to do that part.

Cheating on this project is viewed as cheating on an exam. You are allowed to talk about course material with your fellow students, but working together on this project is cheating. If you have questions about the project, come to Joan Boyar or your "instruktor" for DM534.

You will be able to pick up your graded project from Joan Boyar, in her office, during her office hours on October 20, if not before.

The Project

Do the following problems. Do not include the statements of the problems or other information not asked for in the problems. Write complete, clear,

concise answers.

1. Write down a clear, precise algorithm for getting from the university to your home via public transportation. Include any walking that is necessary.

2. Design and draw a circuit containing only AND, OR and NOT gates (each gate having at most two inputs) which takes three bits as input and outputs a 1 if the input is 100, 011, or 010, and a 0 otherwise.

3. Design and draw a circuit containing only AND, OR and NOT gates (each gate having at most two inputs) which takes four bits as input and outputs a 1 if the input is 1010, 0111, 1101 or 1110, and a 0 otherwise.

4. The version of Figure 0.2 from the textbook which was presented on the slides for DM534 is as follows:

GCD(M, N):
{ Input: two positive integers M, N }
{ Output: $\gcd(M, N)$ }

$\quad A \leftarrow \max(M, N)$
$\quad B \leftarrow \min(M, N)$

$\quad Q \leftarrow A \text{ div } B$
$\quad R \leftarrow A - (Q \cdot B)$
$\quad$**while** $R \neq 0$ **do**
$\quad\quad A \leftarrow B$
$\quad\quad B \leftarrow R$
$\quad\quad Q \leftarrow A \text{ div } B$
$\quad\quad R \leftarrow A - (Q \cdot B)$
$\quad$return(B)

(a) Suppose that as input to this is $M = 40$ and $N = 55$. Show the sequence of values for A and B that are computed by the algorithm and the result.

(b) Give an example of two inputs which will give the following sequence of values for Q during the execution: "$2, 2, 1$".