Institut for Matematik og Datalogi

Syddansk Universitet

Assignment 1 — Introduction to Computer Science 2014

This is your first assignment in DM534. The assignment is due at 8:15 on Tuesday, September 30. You may write this either in Danish or English. It must be made in LaTeX. Write your full name, your section number, and your "instruktor"s name (Magnus Gausdal Find or Christian Kudahl) clearly on the first page of your assignment (on the top, if it's not a cover page). You should turn it in as a PDF file via Blackboard through your DM534 course. The assignment hand-in is in the menu for the course and is called "SDU Assignment". Choose the correct one for your section number, D1 or D2. Keep the receipt it gives you proving that you turned your assignment in on time. Blackboard will not allow you to turn in an assignment late.

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

Please note that you must have this assignment approved in order to pass DM534. If it is not turned in on time, or if you do not get it approved, it will count as one of your two retries in the course, and you must have it approved on your single allowed retry for this assignment.

Assignment 1

Do the following problems and write your solutions in LaTeX. (Do not include the statements of the problems or other information not asked for in the problems, but show your work/calculations.)

1. Convert 10010101 from two's complement to its equivalent base ten form.

2. Decode 10101001 from the floating-point representation described in class (and on the notes for the lecture on September 3 — it is slightly different from what the textbook uses).

3. Encode 13.5 into the floating-point representation described in class (and on the notes for the lecture on September 3 — it is slightly different from what the textbook uses).

4. Write a program in the machine language from Appendix C which will read values stored in two memory cells D1 and D2, and then create a new value which is the same as the value in D2, except for the fifth, sixth and seventh bits (the least significant bit is the eighth bit) of the value which should be the complements of the third, fourth and fifth bits of D1:

   - the 5th bit in the result should be the complement of the 3rd bit in D1
   - the 6th bit in the result should be the complement of the 4th bit in D1
   - the 7th bit in the result should be the complement of the 5th bit in D1

   For example (note this is only an example — your code should work more generally, for any values), if 11011100 is in D1 and 01000101 is in D2, then the result should be 01001001.

   Your program should store the result in memory cell A1. Write the instructions in hexadecimal, and also write down the meaning of the opcodes. Comment your code. (Note that comments should tell more about what is happening than what one could just read from the instructions with their opcodes. They should make it easy for the reader to understand why those instructions work to do what you want.)

   Hint: Use masking.

5. Include your LaTeX code for this assignment at the end.