Computer Architecture and Programming Languages
Jacobs University Bremen
Dr. Kinga Lipskoch

Course: CO20-320241
September 9th, 2019

Homework 1 - Conversions and Logic Gates

- Template file for submitting the solutions:
  https://grader.eecs.jacobs-university.de/courses/320241/2019_2/lectures/template_hw.tex
- The TAs are grading solutions to the problems according to the following criteria:
  https://grader.eecs.jacobs-university.de/courses/320241/2019_2/Grading_Criteria_CAPL.pdf

Problem 1.1 *Convert to decimal* (1 point)

Convert the following values to their decimal equivalent. Do this manually (without a calculator), including the steps how you get there. You will receive points for intermediate results as well.

(a) 10100_2

(b) 11011011_2

(c) 001001001_2

(d) 111111111111_2

(e) 75077_8

(f) 12101_3

(g) 26601_7

(h) 431021_5

Problem 1.2 *More converting* (1 point)

Solve the exercises below manually (without a calculator), including the steps how you get there. You will receive points for intermediate results as well.

(a) Convert 4272_{10} to binary.

(b) Convert CBA_{16} to binary.

(c) Convert $B8C_{16}$ to decimal.

(d) Convert $29D8_{16}$ to decimal.

(e) Write down the next five hexadecimal numbers that follow $8CE_{16}$.

Problem 1.3 *BCD code and ASCII code* (1 point)

Write down your calculations for the following exercises:

(a) Convert 732_{10} to BCD.

(b) Write down all invalid BCD codes.

(c) Convert to decimal $1001\ 0101\ 0110_{BCD}$.

(d) The decimal $ASCII$ code of the uppercase letter `M` is 77. What is the binary and hexadecimal representation of this letter?

(e) The decimal $ASCII$ code of the lowercase letter `m` is 109. What is the binary and hexadecimal representation of this letter?

Problem 1.4 *Gates* (1 point)

(a) Which logic function provides a low output in response to one or more low inputs?

(i) OR
(ii) NOT
(iii) AND

(b) Which logic function provides a low output only when all inputs are low?

(i) OR
(ii) NOT
(iii) AND

Problem 1.5 *Truth table AND* (1 point)

Write down the truth table for an AND gate with three inputs.

Problem 1.6 *Truth table OR* (1 point)

Write down the truth table for an OR gate with four inputs.

How to submit your solutions

You can submit your solutions via *Grader* at **`https://grader.eecs.jacobs-university.de`** as a generated PDF file from the given template TEX file.
If there are problems with *Grader* (but only then), you can submit the file by sending mail to `k.lipskoch@jacobs-university.de` **with a subject line that starts with CO20-320241**.

Please note, that after the deadline it will not be possible to submit solutions. It is useless to send solutions by mail, because they will not be graded.

This homework is due by Monday, September 16$^{\text{th}}$, 23:00.