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Exercise Sheet 1

(16 Points)

Submission until Wednesday, 28th October 2015, 4:00 pm
Discussion begins on Tuesday, 3rd November 2015

Please see notes at the end of the document for the submission.

1.1 Conversion to Binary-, Decimal and Hexadecimal Representation (4 Points)

For the following subproblems please convert a given number in a representation with base 2,10 or 16 into a representation with a different base.

a. $(101111)_2$ should be converted into a representation with base 10.

b. $(1A4)_{16}$ should be converted into a representation with base 10.

c. $(10010011111)_2$ should be converted into a representation with base 16.

d. $(A22)_{16}$ should be converted into a representation with base 2.

1.2 Division-Method (4 Points)

a. Please use the Division-Method (Algorithm 1 on slide 47 on slides V_01_Einleitung from the lecture) to convert the decimal number 44 into a binary number. Please write down all the steps of the algorithm.

b. Please use the Division-Method to convert the decimal number 347 into a hexadecimal number. Please write down all the steps of the algorithm.

1.3 Conversions (4 Points)

a. Please convert the following 6-bit binary numbers into decimal numbers. The representation of the binary number is always given.

- Absolute value (Betragszahl): 001011
- Fixed-point absolute value (Festkomma-Betragszahl): 1011,11
- Signed absolute value (Vorzeichen-Betrag): 001011 und 101011
- Ones' complement (Einerkomplement): 001011 and 101011
- Two's complement (Zweierkomplement): 001011 and 101011
- Offset binary (Exzessdarstellung), Bias 20: 001011 und 101011

b. Please decipher the following two "secret" messages:

- 0 1010 010 0 1010 011 0 0110 001 0 0110 101 0 0110 001 0 0110 110
- 41 6C 61 6E 20 54 75 72 69 6E 67

1.4 Number Ordering (4 Points)

The following bit patterns are given: 0100, 0011, 1100, 1000. Please insert these bit patterns into the rows following table, ordered increasingly from left to right, according to the given representation for that row. You do not need to convert the numbers but can use the binary representation.

Representation	ordered bit pattern			
Ones' complement				
Two's complement				
Signed absolute value				
Offset binary with Bias 32				

Notes:
Submission until Wednesday, 28th October 2015, 4:00 pm in the mailbox number 46 at Otto-Hahn-Straße 12.

You can find the mailboxes in the first floor of the Otto-Hahn-Straße 12 near the transition to the ground floor of the Otto-Hahn-Straße 14. The mailboxes are labeled with "Rechnerstrukturen", the exercise group number and time/place of the exercise. The English exercise group is number 30 and the mailbox is number 46.

Please write your **name**, your **student registration number** and your **exercise group number** at the top right corner of your submission. You can make submissions in teams with up to two more students. To make a team submission put names, student registrations numbers and group numbers of all members of the team on the submission. Only one submission per team has to be made.

Tack you submission. Please do <u>not</u> fold your submission and do <u>not</u> put it into an envelope. Use the correct mailbox, you will need your exercise group number for that.

In total there are 12 exercises in 3 blocks (A, B, C). In each block you have to achieve at least 30 points of 64 possible ones to get access to the exam.