Name	Signature	Student Id Nr	*Points*

581305-6 Computer Organization I, miniexam 2, 19.11.2018 (12 p)

Write your answer on this exam paper in the space given. Please notice, that the exam paper is 2-sided.

a) [1 p] What are the 32-bit Little-Endian *sign-magnitude* representations for integer values +20 and -20?

b) [1 p] What are the 32-bit Big-Endian *twos complement* representations for integer values +20 and -20?

c) [1 p] What are the 8-bit *biased 127* representations for integer values +20 and -20?

d) [1 p] What two advantages do you get, when the bias is specifically 127 with 8-bit biased representation?

e) [2 p] What is the IEEE floating point standard normalized Big-Endian 32-bit representation of -8.25?

-- TURN --

f) [2 p] Teleprinter (telex) ASCII coding has 7-bit character codes. Telex is still used, but nowadays characters are stored into 8-bit bytes. One could use the extra bit for parity bit.

What advantage would this bring? How do you set the value for parity bit? How would one use the parity bit in this case? Who would set it, and how would one use it to check for data correctness?
What happens, if this system detects an error?

g) [4 p] ECC memory (Error-correcting code memory) stores data in 128-bit (16 bytes) blocks. Blocks are protected in memory with Hamming code that *fixes* all 1-bit errors and *finds* all 2-bit errors.

i. [1 p] How many extra bits are needed? Explain.

ii. [1 p] Who will set the extra bits and when? Who will check their values and when?

iii. [1 p] Is the Hamming code computation in this case done at hardware or software level? Explain.

iv. [1 p] Assume now, that some random elementary particle will flip (change) one bit in data while it is being stored in memory. How is this error located and fixed? Who will do it and when?