COE 205 : Computer Organization & Assembly Language
Quiz 1 Solution – Sunday, October 2, 2004

Q1. (4 pts) Briefly answer the following:

i. What is the instruction set architecture (ISA) of a computer?

ii. Give two advantages for programming in assembly language:

A1. i. Collection of the assembly/machine instructions together with the set of all registers and memory models visible to the programmer.

ii. Accessing hardware resources, which are not available in high-level programming language, and Writing very efficient (optimized) functions.

Q2. (3 pts) Represent the signed number -96 in sign-magnitude, 1's complement, and 2's complement representations using 8 bits.

A2. $\mathbf{-96 = (11100000)_{sign\text{-}magnitude} = (10011111)_{1's\ complement} = (10100000)_{2's\ complement}}$

Q3. (2 pts) Find the decimal value of the following numbers:
i. (7B.6)16
ii. (1101.0101)2

A3. i. 123 6/16 = 123.375
ii. 13 5/16 = 13.3125

Q4. (3 pts) Determine in both binary and decimal the range of values that can be represented in 10 bits for each of the following representations:
i. unsigned representation
ii. sign-magnitude representation
iii. 2's complement representation

A4. i. min = 0, max = 2^{10}-1 = 1023 **0000000000b to 1111111111b**
ii. min = -(2^9-1) = -511, max = 2^9-1 = 511 **1111111111b to 0111111111b**
iii. min = -2^9 = -512, max = 2^9-1 = 511 **1000000000b to 0111111111b**

Q5. (2 pts) Assuming even parity show the 8-bit representation for each of the following ASCII characters, where the parity bit is the most significant bit: (Note that the ASCII code of character 'A' is 41H and that of character '0' is 30H)

A5. 'D': **`01000100b = 44h`**
'3': **`00110011b = 33h`**

Q6. (6 pts) Show the following additions in binary assuming 8-bit 2's complement representation and indicate whether there is a carry and/or an overflow.

i. $(11111111)_2 + (10000001)_2$
ii. $(01111111)_2 + (00000001)_2$
iii. $(11111111)_2 + (01111111)_2$

A6.

1 1111111	1111111	1 1111111
11111111	01111111	11111111
+ 10000001	+ 00000001	+ 01111111
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1 10000000	1000000	1 01111110
Carry	NO Carry	Carry
NO Overflow	Overflow	NO Overflow