Name:

Quiz I

1. Briefly explain what a CPU is and its three main components, their purpose.

   A CPU is the main component for performing calculations in a computer. Consists of a number of registers where the operands are kept, a set of circuitry for various arithmetic and logic tasks and a control unit that activates these ALU's.

2. Perform the arithmetic operation 84 - 53 in 8-bit two's complement notation. What is the result of 84 + 53 and is it mathematically valid?

   84 - 53 is the same as 84 + (-53)

   84 is 64 + 16 + 4; it's binary representation is 1010100

   Its two's complement representation in a byte is 0101 0100.

   53 is 32 + 16 + 4 + 1. Its binary representation is 110101.

   The two's complement representation of 53 in 8 bits is 0011 0101.

   The two's complement representation of -53 in 8 bits requires taking the two's complement of 53 in bits, flipping the bits and adding 1.

   0011 0101 becomes 1100 1011.

   0101 0100 + 1100 1011 = 0001 1111 which is 31.

   A positive number added to another positive number must yield a positive result. The sum of 84 and 53 does result in a positive value, but when that value is stored in 8-bits, the most significant bit is misinterpreted as its sign and the value is erroneously considered as negative, which is not mathematically correct.

3. In a signed 32-bit representation, is **50B24E6F** a negative number or a positive number?

   The given value is a signed value, because the problem tells us so, and is the hex representation of 32 bits. Hence, the first bit indicates the sign. The equivalent of 5 in binary is 0101. Therefore the value is a positive one.

   If the first hex digit is greater or equal to 8, then the value would be negative.