CLA CS-101 (A1)

Introduction to Computers

Spring 1995

Homework # 6

Due on Thursday 4/27/95

1 Give the truth table for the 3-input "equivalence" circuit (also known as the "unanimous" circuit), which is defined as follows.. It accepts three inputs W, X, and Y and produces one output Z. The output of the circuit should be 1 only when W, X, and Y are the same (i.e. all three are 0 or all three are 1).

2 Using the truth table you obtained in the previous question, construct a logical circuit (using only `AND`, `OR`, and `NOT` gates) that implements the 3-input "equivalence" circuit. How many transistors would be needed to construct that circuit? (assume that CMOS technology is used).

3 Let `A` and `B` be two bytes, where `A = 01101010` and `B = 00111011`. What is the decimal value of `A`? What is the decimal value of `B`? Perform an addition of `A` and `B` in binary showing the sum and carry for each bit. What is the decimal value of the sum? Does it check with the sum of the decimal values of `A` and `B`?

4 Give the representation of the number $(117)_{10}$ in binary, in ternary (radix = 3), and in octal (radix = 8). How many digits would you need to represent the number 1234 in hexadecimal (radix = 16)?

5 An analog voice signal is to be digitized. The sampling rate is set at 22 Khz (i.e. 12,000 samples per second) where each sampled value is approximated to an integer between 0 and 255. How many bytes will be needed to store a 2-minute signal digitally on a computer?

6 What is the function of a computer "modem"? What does it mean that a modem operates at a baud rate of 4,800 bps? How long would it take to transfer a file consisting of 360 Kilo Bytes over a modem whose baud rate is 4,800 bps?

Good Luck!