**Name:** **Id#**

# COE 202, Term 102
# Fundamentals of Computer Engineering

## Quiz# 5 (Take Home)

Due date: Saturday, May 7, 2011

**Q.1.** It is required to design a 4-bit arithmetic and logic unit that has two 4-bit inputs $\mathbf{A=A_3A_2A_1A_0}$ and $\mathbf{B=B_3B_2B_1B_0}$ and one **6-bit output** $\mathbf{C= C_5C_4C_3C_2C_1C_0}$. The circuit implements the following functions based on the values of the four selection inputs S3, S2, S1 and S0.

| S3 S2 S1 S0 | Function |
|---|---|
| 0 0 0 0 | C = A + B |
| 0 0 0 1 | C = A – B |
| 0 0 1 0 | C = A+1 |
| 0 0 1 1 | C = A-1 |
| 0 1 0 0 | C = A+ 2 |
| 0 1 0 1 | C = A – 2 |
| 0 1 1 0 | C = B |
| 0 1 1 1 | C = -B |
| 1 0 0 0 | C = 2B |
| 1 0 0 1 | C = 3B |
| 1 0 1 0 | C = 4B |
| 1 0 1 1 | C = A and B |
| 1 1 0 0 | C = A or B |
| 1 1 0 1 | C = A xor B |
| 1 1 1 0 | C = A xnor B |
| 1 1 1 1 | C = not B |

**(i)** Show the block diagram design of your circuit using MSI components like Adder, Multiplexor, as needed.

**(ii)** Model your design in logic works.

**(iii)** Test your design and verify its correctness by simulation. Show snapshots of your simulation to demonstrate its correctness. For each function, test at least 4 input combinations of your choice to demonstrate correct functionality.

***Submit your solution as a word document along with the circuits in one zipped file.***