

**COE 202, Term 112**

**Digital Logic Design**

**Assignment# 3**

**Due date: Sat. April 21**

**Q.1.** It is required to design a 4-bit arithmetic and logic unit that has two 4-bit inputs  $A=A_3A_2A_1A_0$  and  $B=B_3B_2B_1B_0$  and one **5-bit output**  $C= C_4C_3C_2C_1C_0$ . The circuit implements the following functions based on the values of the three selection inputs  $S_2, S_1$  and  $S_0$ .

$S_2 S_1 S_0$	Function
0 0 0	$C = A + B$
0 0 1	$C = A - B$
0 1 0	$C = A+1$
0 1 1	$C = A-1$
1 0 0	$C = A \text{ and } B$
1 0 1	$C = A \text{ or } B$
1 1 0	$C = A \text{ xor } B$
1 1 1	$C = A \text{ xnor } B$

- (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 2 input combinations of your choice to demonstrate correct functionality.

***Save each part in a separate circuit file. Include snapshots of simulation output to illustrate the correctness of your circuit. Submit your solution as a word document along with the circuits in one zipped file.***