**Assignment 5**

***Question 1:***

1. Design a half adder using NAND gates only.
2. Design a quarter adder using NOR gate only (i.e. quarter adder that has only sum, no carry bit )
3. Design a 7 bit Adder-Subtractor for 1’s complement number system.

***Question 2:***  
Design a 16 people voting system where 0 means ‘No’ and 1 means ‘Yes’. It should show number of ‘Yes’ votes and then number of ‘No’ votes.

***Question 3:***

The adder–subtractor circuit has the following values for mode input M and

Data inputs A and B.

M A B

(a) 0 0111 0110

(b) 0 1000 1001

(c) 1 1100 1000

(d) 1 0101 1010

(e) 1 0000 0001

In each case, determine the values of the four SUM outputs, the carry C, and overflow V.

***Question 4:***

Design a 2 bit Magnitude comparator that performs operations such as less than, greater than and equal to between two 2 bit binary numbers. You need to show both equations and circuit diagram.

***Question 5:***

You are to design a 4-bit Excess-8 to 2’s complement converter. For example, 0010excess-8 represents the value –6, and hence its corresponding 2’s complement representation is 10102’s. The converter takes in a 4-bit Excess-8 representation ABCD and outputs a 4-bit 2’s complement representation WXYZ.

Supposed you are given only a 4-bit parallel adder and no other logic gate. Implement the converter using this parallel adder. Some of the inputs have been filled in for you, as shown below. Complete the diagram below. Note that the Cout is not used.

|  |  |
| --- | --- |
| Decimal | Excess 8 |
| -8 | 0000 |
| -7 | 0001 |
| -6 | 0010 |
| -5 | 0011 |
| -4 | 0100 |
| -3 | 0101 |
| -2 | 0110 |
| -1 | 0111 |
| 0 | 1000 |
| 1 | 1001 |
| 2 | 1010 |
| 3 | 1011 |
| 4 | 1100 |
| 5 | 1101 |
| 6 | 1110 |
| 7 | 1111 |

