Prelab

1. **Design a 4x16 decoder using a minimum number of 74138 and logic gates.**
2. **Design a logic sing a minimum of 74138s (3 x 8 decoders) to generate the minterms m_1, m_5 and m_9 based on the four switch inputs S3, S2,S1, S0. Then display the selected minterm numbers (1 or 5 or 9) on a seven segment display by generating a 4-bit input (W,X,Y,Z) for a BCD to seven-segment code converter. Turn an LED ON for all other minterms and blank the seven-segment display.**

Note that these four inputs (W,X,Y,Z) can be obtained from the selected output line (1 or 5 or 9) of the decoders that is generated by the four input switches (S3, S2, S1, S0). Use a minimum number of logic gates. Determine the truth table, and then draw a logic diagram.

LAB

Parts List: DIP switches, 74LS138 decoders (Two), One 74LS08, One 74LS32, One 74LS04, One 74LS47, seven-segment display, 1K & 330 Ohms.

Implement the above circuit using a minimum number of decoder and gates. Demonstrate the operations using switches and LED, Seven segments display (select from Data book) etc. as needed.

Postlab

Design a combinational circuit to generate the following:

$$F_0 = \text{SUM } (m(1,3,4))$$
$$F_1 = \text{SUM } (m(0,2,4,7))$$
$$F_2 = \text{SUM } (m(0,1,3,5,6))$$
$$F_3 = \text{SUM } (m(2,6))$$

Draw a logic diagram using a 74138 decoder and external gates.