CSE 234 Logic Circuits and Digital Design

Lab 2 – Combinational Circuit & Boolean Simplification

Lab Session (Exact Duration: 45min):

Design a circuit such that it will output 1, if the sum of the number's decimal digits is 5 or 7. The input is 5-bit numbers.

For instance, if the input is 14 or 25 the sum is 1 + 4 = 5 and 2 + 5 = 7, therefore the output is 1. For instance, if the input is 17, the sum is 1 + 7 = 8 so the output is 0.

a. First draw the truth table for this problem.
b. Then write down the Boolean expression for the output where each row is represented as a product term in sum of products form.
c. Then simplify the resultant Boolean expression. During simplification you have to use one XNOR gate where A XNOR B = A'B' + AB.
d. Design your resultant simplified circuit using Logisim.
e. Simulate your resultant circuit to be sure it works flawless.

Rules:

You have to make simplifications so that you use as few gates as possible.

You have to use only the inverters, 2-input and 3-input logic gates in your Logisim design.

DO NOT USE ANALYZE CIRCUIT PROPERTY OF LOGISIM. Otherwise you get a very low score.

Demo Session:

During demo, explain and simulate each step of your design. Do not forget you only have at most 4 minutes for that. Also you will answer any questions asked by the TA.