**CS375 Digital Systems Sample Test**

1. Simplify the following expression using Boolean algebra

$$\overbar{\overbar{\left(a+b\right)}\left(\overbar{\overbar{a}b}\right)}$$

1. Consider the function f(x1, x2, x3) = ∑m(0, 1,3,4,5,6)

Write the resulting sum of products and the equivalent product of sums. Draw a circuit for each using only nand gates or only nor gates.

1. Draw a Karnaugh map for the function in question #2. Identify the prime implicants and essential prime implicants. Write the resulting equation. Repeat the procedure for the product of sums.
2. Use Venn diagrams to show that the SOP and POS from question 3 are equivalent.
3. Draw the Karnaugh map identify prime and essential prime implicants, and produce the resulting algebraic expression for the function ∑m(0, 2, 8, 9, 10, 15) + Don’t Care values (1, 3, 6, 7)
4. Draw the Karnaugh map, identify prime and essential prime implicants, and produce the resulting algebraic expression for the function f(x1,x2,x3,x4,x5) = ∑m(0, 3,5,6,7,14,16,19,21,22,31)
5. Explain why it is always possible to implement a SOP expression using only NAND gates.