

## **CS2310: Foundations of Computer System Design Lab**

**August-November 2021 Semester**

### **Assignment 1**

**Date: 17<sup>th</sup> August, 2021**

**Deadline for Submission: 11.59PM on 23<sup>rd</sup> August, 2021**

Assume that only the NOT gate, and the 2-input AND, OR and NAND gates are available.

1. Consider the following Boolean function:

$$F(W, X, Y, Z) = \sum m(1, 3, 4, 7, 8, 10, 11) + \sum d(6, 12, 13, 14, 15)$$

Derive the minimal sum-of-products (MSOP) expression for  $F$ , and design the logic gate circuit for  $F$  using (a) AND, OR and NOT gates, and (b) NAND gates only. Test the circuit for all combinations of input variables.

2. 4-to-2 bit encoder: Inputs (1000, 0100, 0010, 0001) with expected outputs as (00, 01, 10, 11) respectively
3. 4-to-2 bit priority encoder: Inputs (1xxx, 01xx, 001x, 0001) with expected outputs as (00, 01, 10, 11) respectively. x can be 0 or 1.
4. 2-to-4 bit decoder: Inputs (00, 01, 10, 11) with expected outputs as (1000, 0100, 0010, 0001) respectively
5. 3-to-8 bit decoder: Inputs (000, 001, 010, 011, 100, 101, 110, 111) with expected outputs as (10000000, 01000000, 00100000, 00010000, 00001000, 00000100, 00000010, 00000001) respectively.