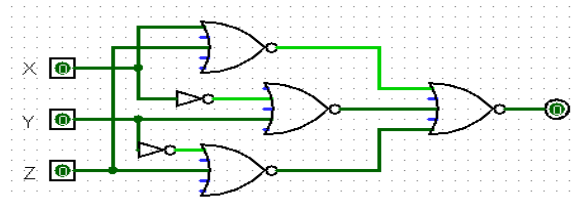LAB 1 WRITE UP

Title: CS1026 Lab 2 (NOR Gates)

Date: 26/10/2017

Aim: To design a circuit to implement F = (X + Z)(Y + Z)(X + Y + Z) using only NOR Gates and inverters.

Logic Diagram:

Analysis:

- I began by finding the complement of the original function F.
- Then, using DeMorgans Theorm I expanded the function to create a function containing 3 NOR's.
- Using various Boolean Algebra Simplification theorms I then further expended and simplified out the function until I reached a solution in the end with a single variable.
- Following this I then built and tested the circuit using Logisim to see if it was giving the desired output when the variable Z was set to 1.

Boolean Algebra:

$$F = (x+z)(y'+z)(x'+y+z)$$

$$F' = (x+z)'+(y'+z)'+(x'+y+z)'$$

$$F = [(x+z)'+(y'+z)'+(x'+y+z)']' \; \textit{DeMorgans}$$

$$F = [(x+z)'.(y'+z)'.(x'+y+z)']'$$

$$F = (x'zy' + x'z + yxz + yz + zyx' + zxy' + zx + zy' + z) \; \textit{Expanding}$$

$$F = z(\cancel{x'y'} + \cancel{xy} + \cancel{x'} + \cancel{x} + \cancel{y'} + \cancel{y} + \cancel{x'y} + \cancel{xy'} + z) \; \textit{Simplification}$$

$$F = z(z)$$

$$\mathbf{F = z}$$