Department of Computer Science
Forman Christian College
(A Chartered University)
Lahore

Lab 03

Digital Logic Design
COMP 206

DIGITAL LOGIC DESIGN
COMP 206
LAB 03- RUBRIX

DESCRIPTION	MARKS ALLOCATED
Attendance	5%
Proper handling of components, ICs and wiring	20%
Hardware wired completely(for all circuits)	30%
Data table 1	10%
Data Table 2	10%
Data Table 3	5%
Data Table 4	10%
End questions	10%

Marks will be deducted in case if students have not completely and correctly filled the data tables.
Note that these marks are max in each category. We may assign less than the given percentage of marks in case students have not successfully completed all the requirements.
This lab is time constrained. Please note that you must finish your work and submitted duly filled handout to the lab engineer within given time.

LAB 03
IMPLEMENTATION OF BOOLEAN EXPRESSION THROUGH LOGIC GATES & VERIFICATION OF DEMORGAN'S LAW

Name:

Roll Number:

Date:

1. Objectives
Having completed this experiment, you will be able to.
- Implement the Boolean Expression through Logic Gates
- Recognize the De Morgan's LAW in the light of Logic Gate's behavior.

2. Basic Information:
Boolean algebra is an algebra that deals with binary variables and logic operations. A Boolean function described by an algebraic expression consists of binary variables, the constants 0 and 1, and the logic operations symbols. For a given value of the binary variables, the function can be equal to either 1 or 0.

3. Experimental Work:
3.1.Material Required:
- Logic Trainer
- Connecting Wires
- Power Supply
- Components: 7408 , 7404 , 7432

Procedure:

PART 1: Implementation of Boolean Funtion

Consider as an example for the following Boolean function:

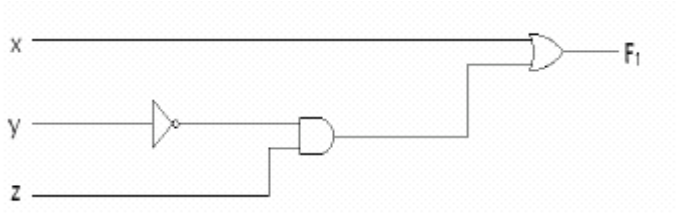
$$F1 = x + y'z$$

The function F1 is equal to 1 if x is equal to 1 or if both y' and z are equal to 1, F1 is equal to 0 otherwise. The complement operation dictates that when y'=1 then y=0. Therefore, we can say that F1=1 if x=1 or if y=0 and z=1. A Boolean function expresses the logical expression for all possible values of the variables.

A Boolean function can be represented in a truth table. A truth table is a lot of combinations of 1's and 0's assigned to the binary variables and a column that shows the value of the function for each binary combination. The number of rows in the truth table is 2n, where n is the number of variables in the function. The binary combinations for the truth table are obtained from binary numbers by counting from 0 through 2^n-1. Following table shows the truth table for the function F1.

Truth Table for F1

Input X	Input Y	Input Z	Output F1
0	0	0	
0	0	1	
0	1	0	
0	1	1	
1	0	0	
1	0	1	
1	1	0	
1	1	1	



Gate implementation of F1=x+y'z

PART 2: Verify Demorgan's Theorem

Demorgan's law can be stated in terms of logic terms, which is the 1st law states that,

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

Theorem 1

And the second law state that

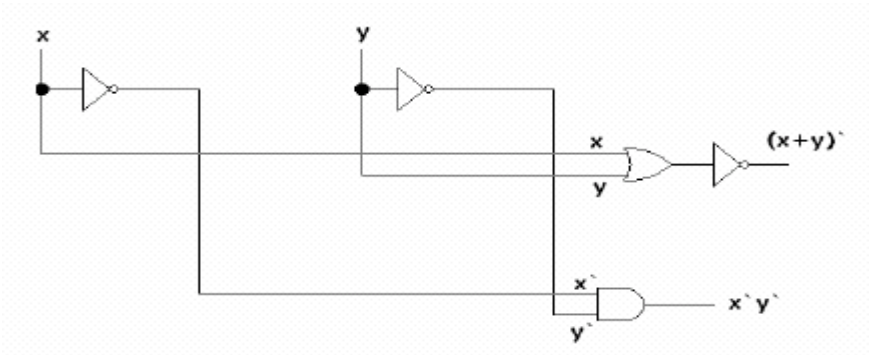
$$(xy)' = x' + y'$$

Theorem 2

Truth Table that verifies the above given Theorem 1,

Input X	Input Y	(x+y)'	X'Y'
0	0	1	1
0	1	0	0
1	0	0	0
1	1	0	0

a. Logic Diagram for 1st Demorgan's Law:

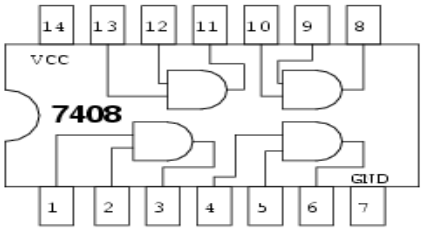


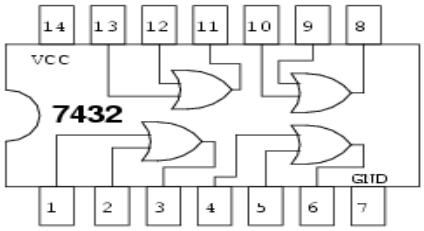
Truth Table that verifies the above given Theorem 2

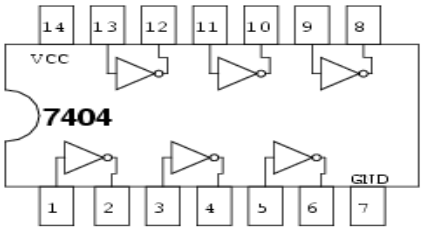
Input X	Input Y	(xy)'	X'+Y'

Implement the logic diagram for the 2nd Demorgan's Theorem:

Pin Configurations







Note: Online Students should submit simulation on Logisim.