Smt. Chandibai Himathmal Mansukhani College

Computer Organization and Design (USCS101)
Practical 1: Digital Electronics (Study of Logic Gates)

Learning Objectives

Students will be able to:
Content:
- ➢ How one can derive the Boolean expression from given logic gate
- ➢ How to design logic circuit using logisim software
- ➢ How to represent the logic gates on circuit diagram

Process:
- ➢ How to combine various inputs to achieve desired outputs with the help of logic gates
- ➢ Create truth tables from logic gates

Prior Knowledge :
- ➢ Recognize high/low,1/0 as two state logic levels

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1. To study the operation and verify the truth table of the basic logic gates such as AND, OR, NOT, NOR, NAND, EX-OR and EX-NOR using logisim

i. AND Gate

Circuit Symbol	Truth table			Boolean Expression
	A	B	C	

ii. NOT Gate

Circuit Symbol	Truth table		Boolean Expression
	A	B	

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iii. OR Gate

Circuit Symbol	Truth table			Boolean Expression
	A	B	C	

iv. NOR Gate

Circuit Symbol	Truth table			Boolean Expression
	A	B	C	

v. NAND Gate

Circuit Symbol	Truth table			Boolean Expression
	A	B	C	

vi. EX-OR Gate

Circuit Symbol	Truth table			Boolean Expression
	A	B	C	

vii. **EX-NOR Gate**

Circuit Symbol	Truth table			Boolean Expression
	A	B	C	

2. Realize the Basic gates with a universal gate (using NAND) by drawing the logic circuit

a) Implementing NOT using NAND Gate

b) Implementing AND using NAND Gate

c) Implementing OR using NAND Gate

3. Draw the circuit diagrams to show how a NOR gate can be made into a NOT gate

4. Construct a truth tables for each the following circuit of logic gates and also drive the corresponding Boolean expression for it

i.
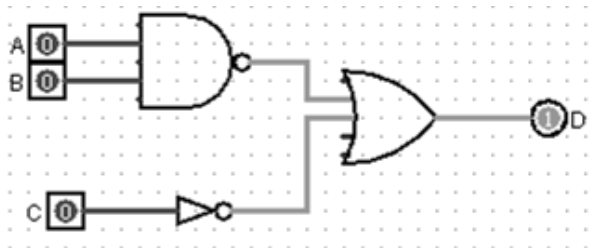
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Expression: _____

Truth Table:

A	B	(AB)'	C	C'	D=(AB)'+C'

ii.
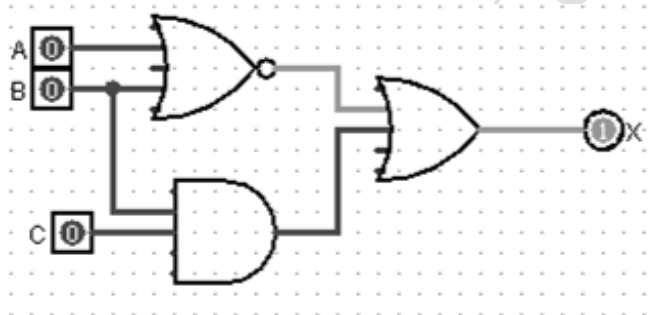
Expression: _____

Truth Table:

A	B	C	A+B	(A+B)'	BC	X=(A+B)'+BC

5. i) Assume you have an **AND gate** with two inputs, A and B. Determine the output, C, for the following cases.

PROCESS	INPUT		OUTPUT
	A	B	C
P1	1	0	
P2	0	1	
P3	0	0	
P4	1	1	

ii) Assume you have an **OR gate** with two inputs, A and B. Determine the output, C, for the following cases.

PROCESS	INPUT		OUTPUT
	A	B	C
P1	1	0	
P2	0	1	
P3	0	0	
P4	1	1	

6. Consider the following problem. A system used 3 switches A, B and C; a combination of switches determines whether an alarm, X, sounds: If switch A or switch B are in the ON position and if switch C is in the OFF position then a signal to sound an alarm, X is produced. Is it possible to convert this problem into a logic statement ? Justify.
Explanation:

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Logic Circuit:

Truth Table:

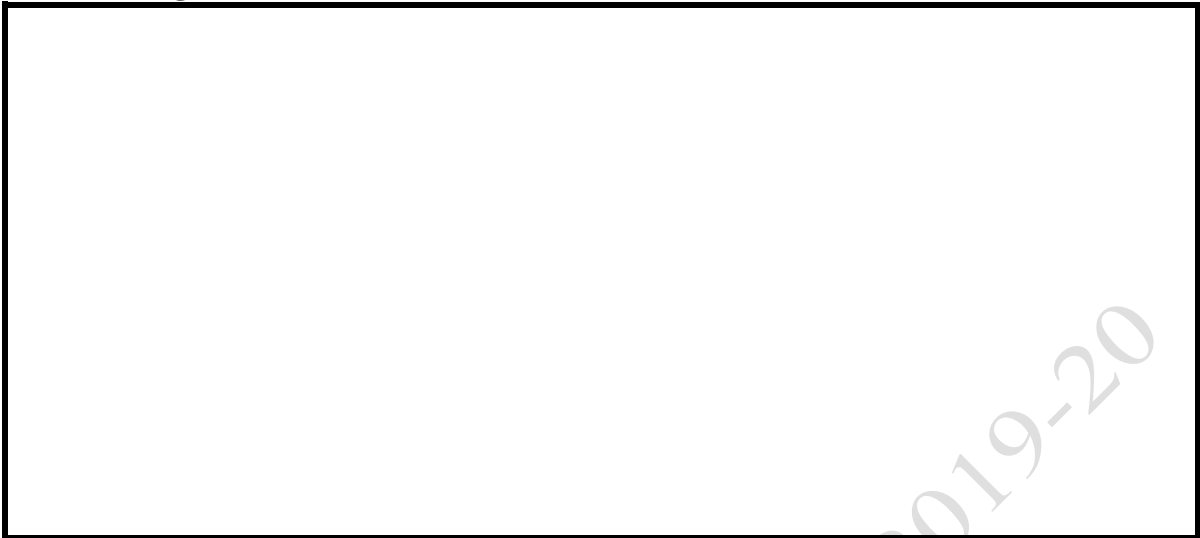| A	B	C	C'	A+B	(A+B)C'

7. Derive the truth table of AND and OR GATE by taking three inputs and also draw the logic circuit for the same

Truth Table:

A	B	C	AND	OR

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Circuit Diagram for AND Gate:

Circuit Diagram for OR Gate:

8. Construct a logic circuit for the Boolean expression for the following:
   a. A.B+C

b. (A.B)' +C.D+(E.F)'

c. (X'+Y).(X+Z).(Y+Z)

Date : _____   **Teachers Signature:_____**