AROR UNIVERSITY
OF ART, ARCHITECTURE,
DESIGN & HERITAGE,
SUKKUR, SINDH

Faculty of Artificial Intelligence & Multimedia Gamming

BS – Artificial Intelligence (Section A)

Digital Logic Design Lab

Lab # 04:

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Task 01: Construct and simulate the given Boolean expression in Multisim software.
- Given Expressions:
    1. AB + A(B+C) + B(B+C)
    2. AB + BC(B + C)
    3. A + B(A + C) + AC
    4. A'BC + AB'C + ABC' + ABC
- Design the digital circuit in Multisim based on the above expressions.

Task 02: Simplify the expression
- Use the Boolean algebra rules to simplify the following Expressions:

Expression	Simplified Expression
1. AB + A(B+C) + B(B+C)	
2. AB + BC(B + C)	
3. A + B(A + C) + AC	
4. A'BC + AB'C + ABC' + ABC	

- Once you've simplified the expression, translate it into a digital circuit using Multisim software

Task 3: Compare the circuits

Expression	Simplified Expression
1. AB + A(B+C) + B(B+C) *(Insert image of the circuit here)*	*Write the simplified expression here* *(Insert image of the circuit here)*
2. AB + BC(B + C) *(Insert image of the circuit here)*	*Write the simplified expression here* *(Insert image of the circuit here)*
3. A + B(A + C) + AC *(Insert image of the circuit here)*	*Write the simplified expression here* *(Insert image of the circuit here)*
4. A'BC + AB'C + ABC' + ABC *(Insert image of the circuit here)*	*Write the simplified expression here* *(Insert image of the circuit here)*

Task 4: Compare the truth tables

● Fill in a table showing all possible input values (A, B, and C) for each simplified expression separately.

Truth Table of:

      1. $AB + A(B+C) + B(B+C)$

A	B	C	Output of expression	Output of simplified expression
0	0	0		
0	0	1		
0	1	0		
0	1	1		
1	0	0		
1	0	1		
1	1	0		
1	1	1		

Truth Table of:

      2. $AB + BC(B + C)$

A	B	C	Output of expression	Output of simplified expression
0	0	0		
0	0	1		
0	1	0		
0	1	1		
1	0	0		
1	0	1		
1	1	0		
1	1	1		

Truth Table of:

      3. $A + B(A + C) + AC$

A	B	C	Output of expression	Output of simplified expression
0	0	0		
0	0	1		
0	1	0		
0	1	1		
1	0	0		
1	0	1		
1	1	0		
1	1	1		

Truth Table of:

1. A'BC + AB'C + ABC' + ABC

A	B	C	Output of expression	Output of simplified expression
0	0	0		
0	0	1		
0	1	0		
0	1	1		
1	0	0		
1	0	1		
1	1	0		
1	1	1		

Task 05: Compare the each circuit and outputs in truth table of each expression separately, and verify that they produce same output results for all possible input combinations or not.