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

Faculty of Artificial Intelligence & Multimedia Gamming

BS – Artificial Intelligence (Section B)

Digital Logic Design Lab

Lab # 06: Karnaugh Map

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Lab Learning Objectives:

Upon successful completion of this experiment, the student will be able:
- To Simplify a Boolean expression using Karnaugh maps
- To Use a circuit with inputs to derive:
    - The output experimentally and using Boolean algebra
    - The Karnaugh map

Background Theory:

Karnaugh maps are useful for minimizing the number of logic gates needed in a circuit. In a practical sense, this reduction also results in a decrease in cost for a manufacturer since fewer components are needed to create an equivalent circuit.
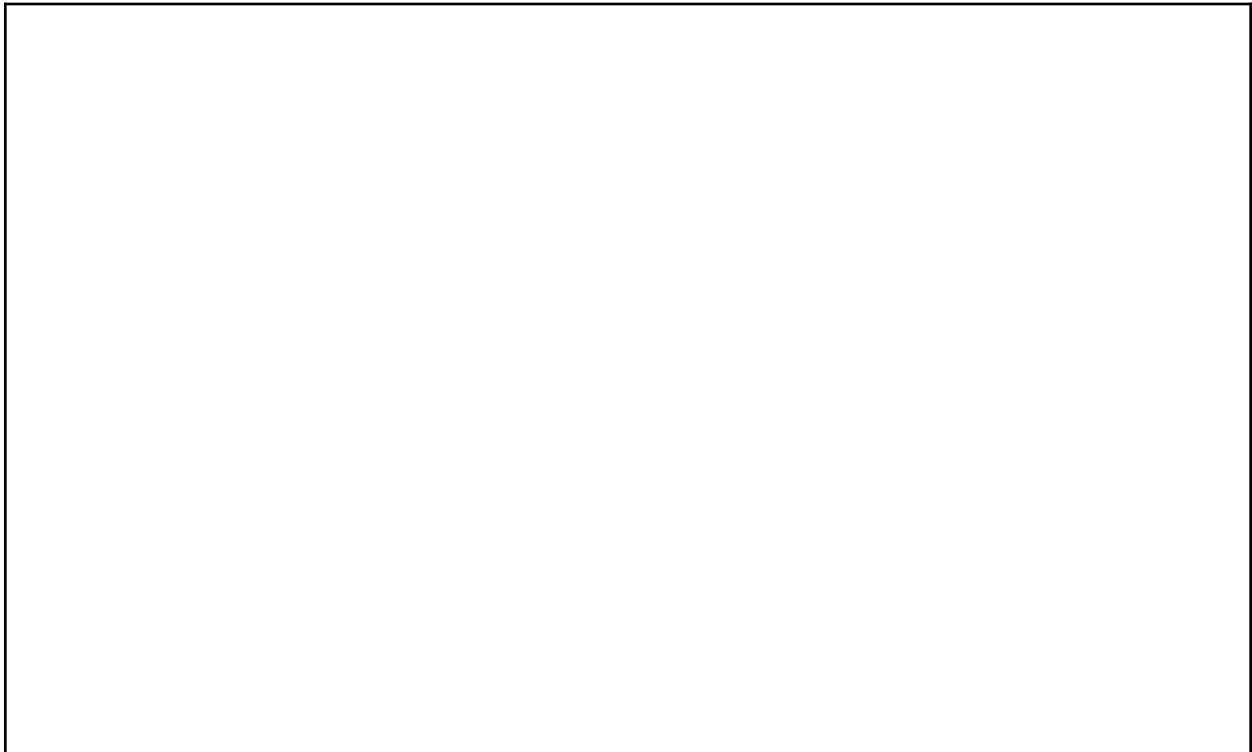
Lab activities

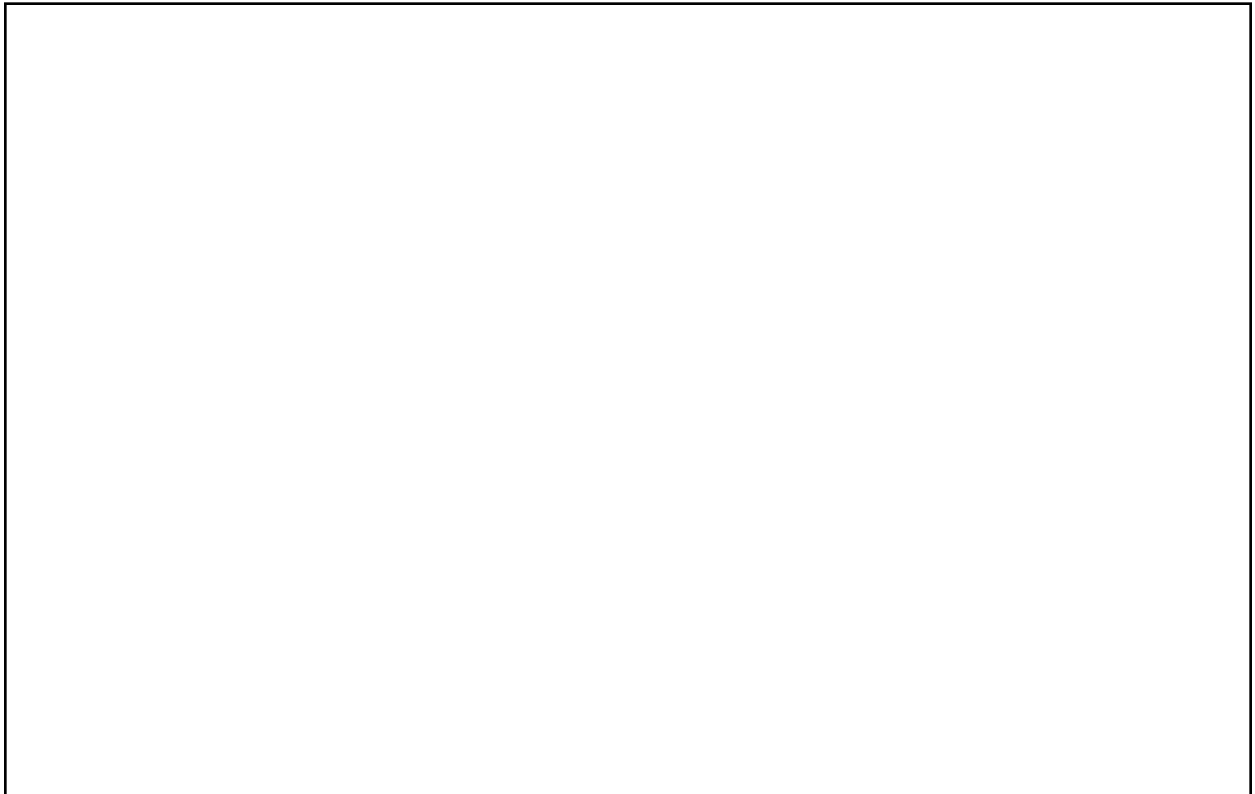## Task 01: Working with 3-Variable Karnaugh Maps

A. Translate the provided Boolean expression into a 3-variable Karnaugh map and then create the corresponding electronic circuit in Multisim software.

$$ABC + A'BC + A'B'C' + ABC' + A'BC' + AB'C'$$
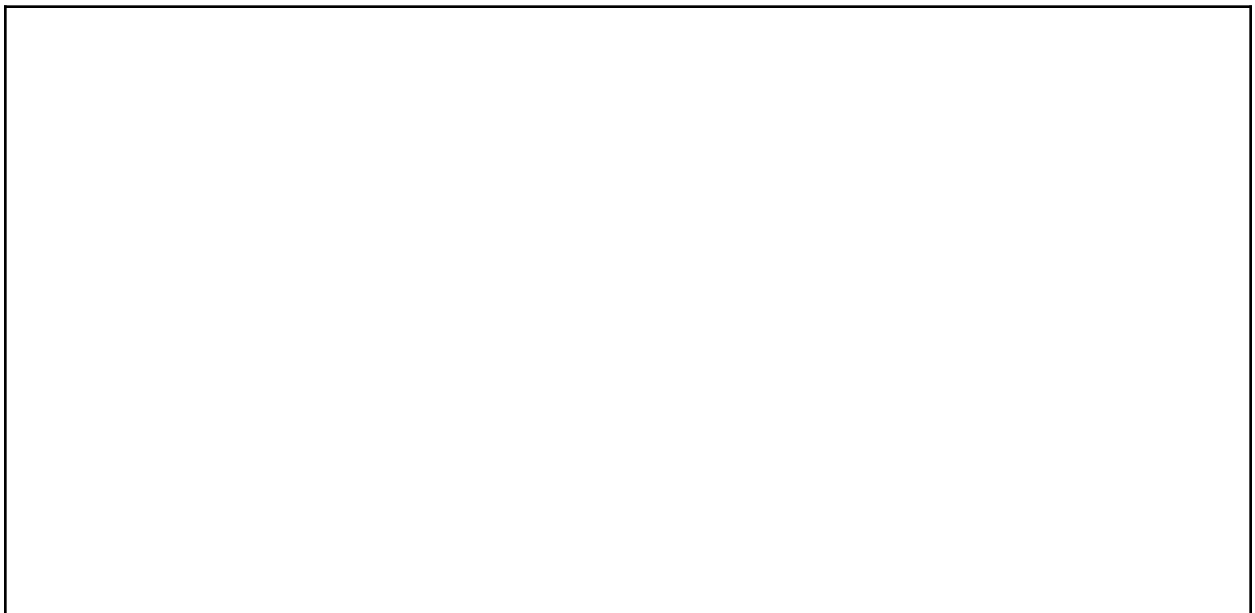
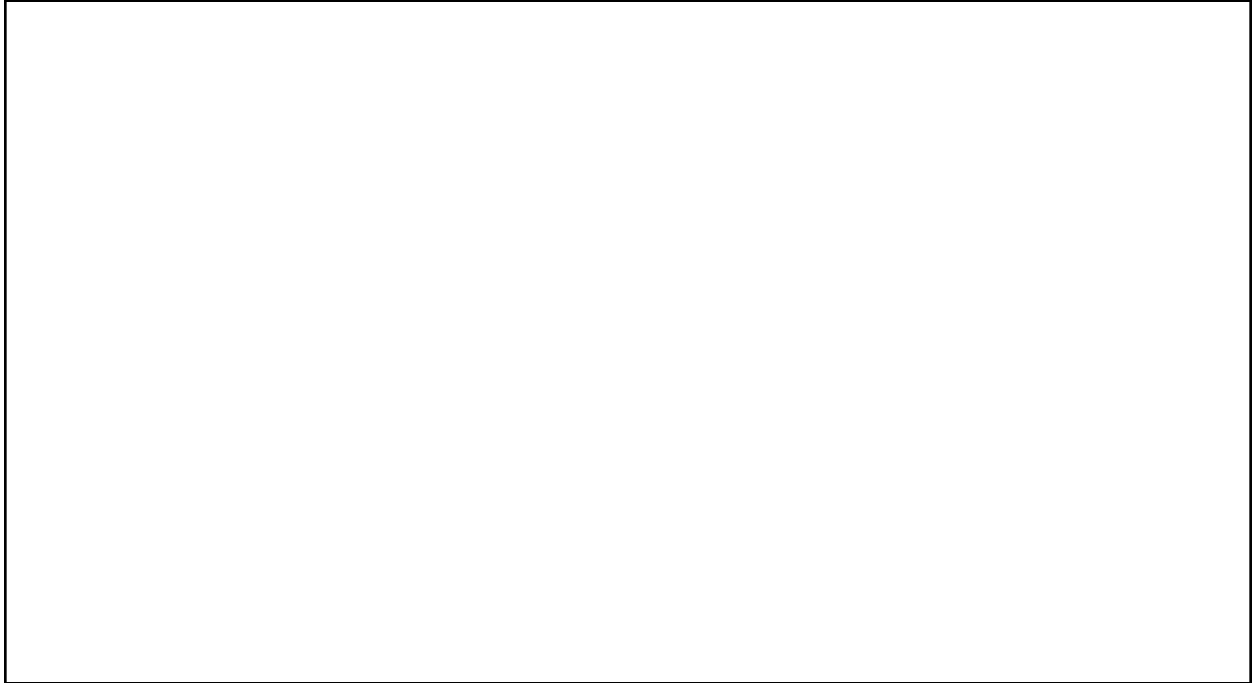**Add the image of K-Map here**

Add the image of circuit here

B. Simplify the Boolean expression using the Karnaugh map.

Add the picture of solution

C. Construct the circuit for the simplified expression in Multisim software.

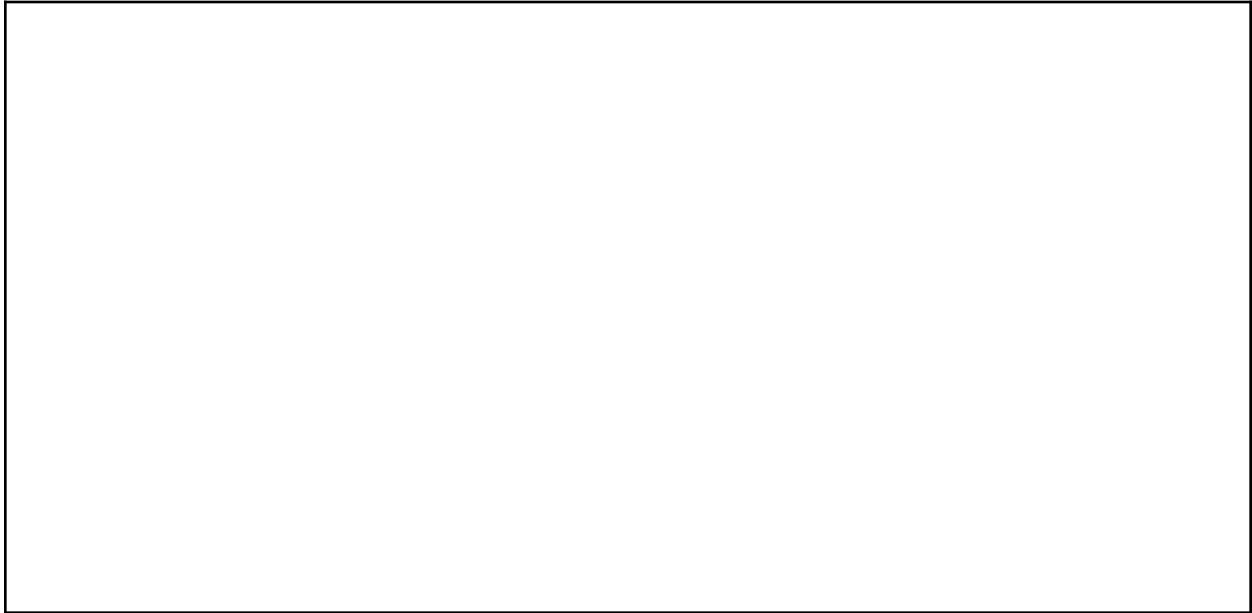Add the picture of simplified circuit

D. Fill the following truth Table

A	B	C	Original Expression	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 02: Working with 4-Variable Karnaugh Maps

A. Map the provided Boolean expression into a 4-variable Karnaugh map and then create the corresponding electronic circuit in Multisim software.

$$ABCD + A'BCD' + A'B'C'D' + ABC'D' + A'BC'D + AB'C'D + ABCD' + A'BCD'$$
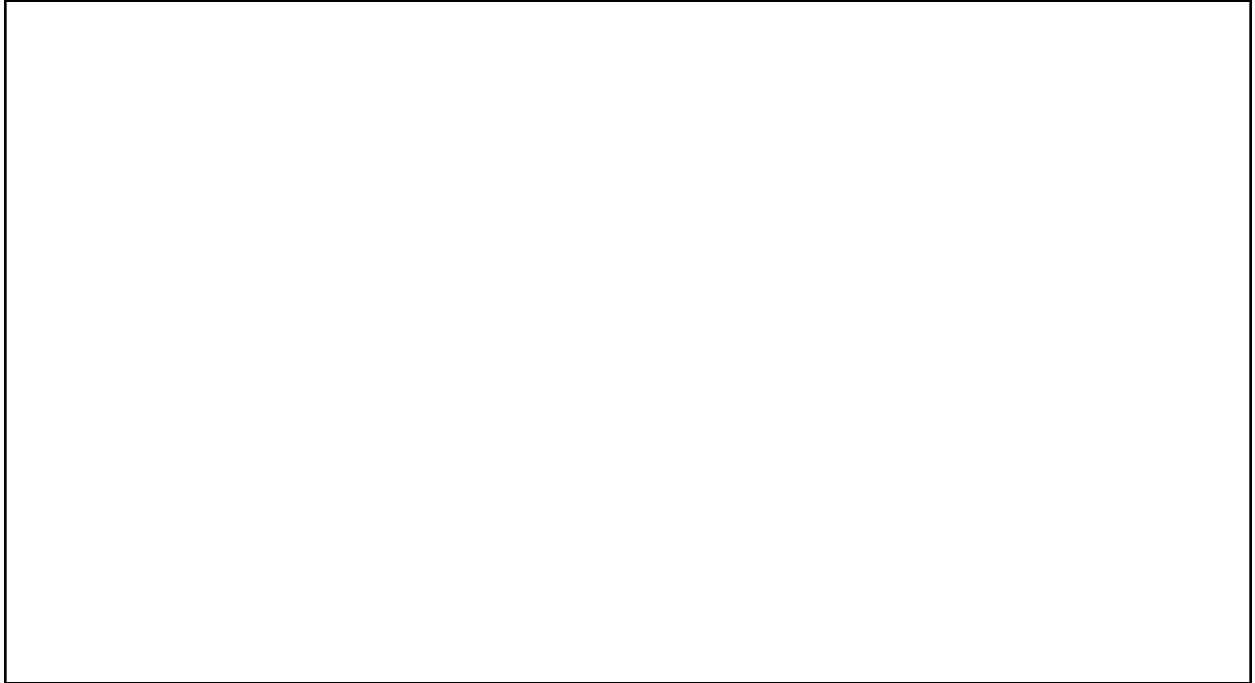
Add the image of K-Map here

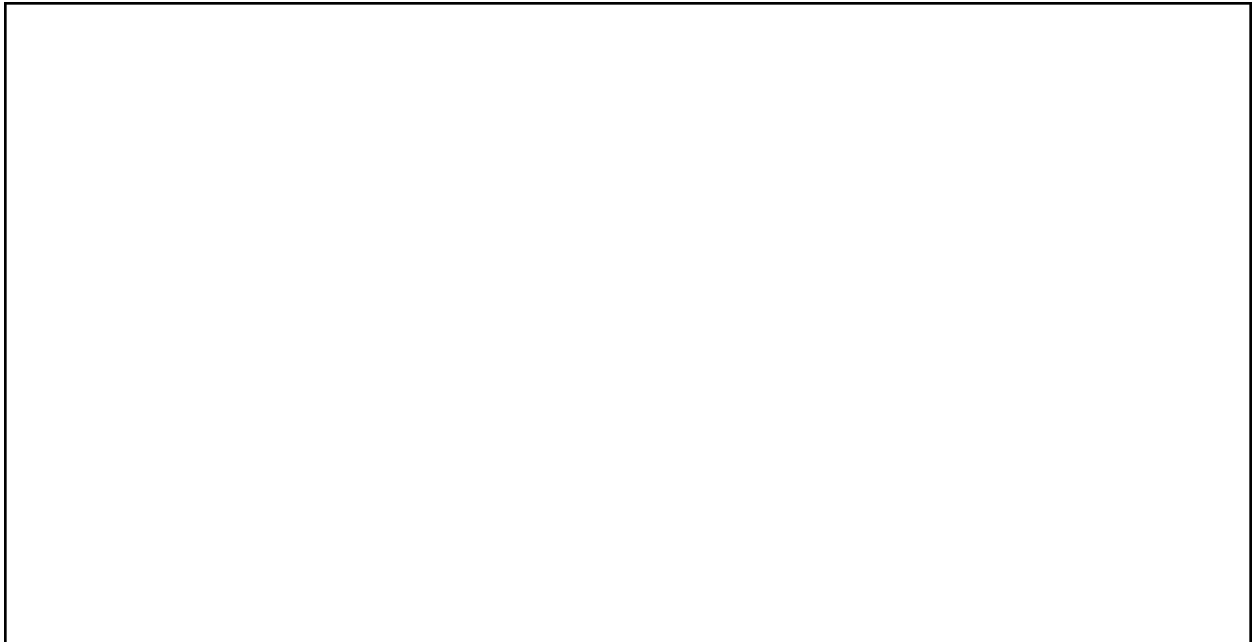**Add the image of circuit here**

B. Simplify the Boolean expression using the Karnaugh map.

Add the picture of solution

C. Construct the circuit for the simplified expression in Multisim software.

Add the picture of simplified circuit

D. Fill the following truth Table

A	B	C	D	Original Expression	Simplified Expression
0	0	0	0		
0	0	0	1		
0	0	1	0		
0	0	1	1		
0	1	0	0		
0	1	0	1		
0	1	1	0		
0	1	1	1		
1	0	0	0		
1	0	0	1		
1	0	1	0		
1	0	1	1		
1	1	0	0		
1	1	0	1		
1	1	1	0		
1	1	1	1		