Course: Digital Engineering **Semester:** 1st term 2025/2026.	**Lecturers:** Dr. Osama Elnahas, Dr. Dina Abdelhafiz, Dr. Bassant Tolba, Dr. Radwa Rady
Assignment 3	

Question 1: Given a 3-bit (A, B, C) input to function F

1. Construct the truth table for the function F(A, B, C), where F = 1 if the binary number represented by A, B, C is **an odd number**, and F = 0 otherwise.
2. From your truth table, determine all the midterms (where F = 1) and maxterms where (F = 0). Clearly label minterms (m_0 to m_7).
3. Simplify the function using a 3-variable Karnaugh Map (K-map) to obtain the minimal Sum of Products (SOP) form, draw the map, and show all groupings in the K-map.
4. Write the simplified Boolean expression for F(A, B, C) from K-maps.
5. Find the dual of the simplified function.
6. Find the complement of the simplified function.
7. Draw the logic circuit diagram for the simplified function using basic logic gates (AND, OR, NOT).

Question 2: Given: 3-bit input (F = A B C), F = 1 when the number of 1-bits in (N) is two or more (i.e., 011, 101,11), F = 0 otherwise.

1. Construct the truth table for the function F(A, B, C), where F = 1 if the number of 1-bits represented by A, B, C is **2 or more**, and F = 0 otherwise.
2. From your truth table, determine all the midterms (where F = 1) and maxterms where (F = 0).
3. Simplify the function using a 3-variable Karnaugh Map (K-map) to obtain the minimal Sum of Products (SOP) form, draw the map, and show all groupings in the K-map.

A/BC	00	01	11	10
0				
1				

4. Write the simplified Boolean expression for F(A, B, C) from K-maps.
5. Find the dual of the simplified function.
6. Find the complement of the simplified function.
7. Draw the logic circuit diagram for the simplified function using basic logic gates (AND, OR, NOT).