



كلية تكنولوجيا الصناعة والطاقة

Information Technology Department
2nd Year



جامعة برج العرب التكنولوجية
BORG AL ARAB TECHNOLOGICAL UNIVERSITY

جامعة برج العرب التكنولوجية

Course: Digital Engineering Semester: 1 st term 2025/2026.	Lecturers: Dr. Osama Elnahas, Dr. Dina Abdelhafiz, Dr. Bassant Tolba, Dr. Radwa Rady Assistant: Eng. Rania Helal, Eng. Assma, Eng. Israa Mohsen, Eng. Ahmed Kamel, Eng. Belal,
Tutorial 4: Minterms and Maxterms	

- In Boolean algebra, a function can be expressed in two main canonical forms:
 - Sum of Products (SOP): Logical OR of minterms where the function equals 1.
 - Product of Sums (POS): Logical AND of maxterms where the function equals 0.
- A minterm represents one combination producing logic 1, while a maxterm represents one combination producing logic 0.

Question 1: For the given truth table with three variables A, B, and C, and an example function F:
Given truth table for F(A, B, C):

A	B	C	F
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	0

Answer the following:

- Express the function F in Sum of Products (SOP) form.
- Express the function F in Product of Sums (POS) form.

Question2: Convert the following Boolean functions from a canonical sum-of-products form to a standard simplified product-of-sums form and vice versa.

a) $F(x,y,z) = \Sigma(0,2,4,5)$

b) $F(x,y,z) = \Sigma(1,2,3,7)$

c) $F(x,y,z) = \Pi(1,3,4)$



Question3: Complete the following questions:

1. In Boolean algebra, a minterm is defined as -----
2. $A + B + C$ is a -----term in a Boolean expression with variables A, B, and C.
3. $A' \cdot B \cdot C'$ is a -----term in a Boolean expression with variables A, B, and C.
4. If a Boolean function $F(A,B,C)$ is represented as the sum of minterms $\Sigma m(1, 3, 5)$, does it imply that F is ---- for input combinations 1, 3, and 5.
5. If a Boolean function $F(A,B,C)$ is represented as the sum of minterms $\Pi M(0,2,4)$, does it imply that F is ---- for input combinations 1, 3, 5, 6, and 7, and imply that F is ---- for input combinations 0, 2 and 4.
6. $A \cdot B$ and $A' \cdot B'$ are examples that represent --- terms for variables A and B?
7. -----is A sum term that produces a logic 0 for exactly one combination of inputs.
8. Write a function that represents an example of a sum of minterms?
9. The maxterm M2 for variables A and B is -----
10. The expression $F(A,B,C) = \Pi M(0,2,4)$ imply that F is --- for input combinations -----.
11. For a Boolean function with two variables A and B, which minterm corresponds to the combination $A = 0, B = 1$?



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Question 4: Simplify the following questions:

Q1. $F = x(\bar{x} + y) + x$

Q2. $F = \overline{(x + y)} (\bar{x} + \bar{y})$

Q3. $F = A.B.C + \bar{A} + A.\bar{B}.C$

Q4. $F = A.\bar{B} + \overline{(\bar{A} + \bar{B} + C\bar{C})}$

