

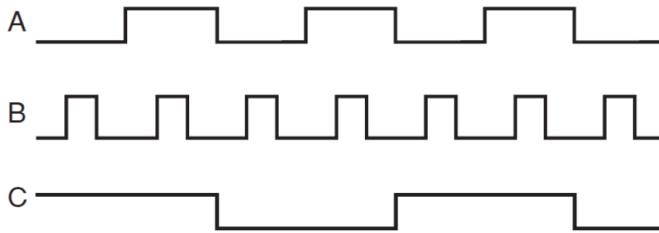
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Digital Electronics & Computer Organization (DECO)

1st Year CSE 2024-25 (Even Semester)

Tutorial Sheet (Unit - 1)

1. Explain and verify the De-Morgan's Law of 3 Variables.
2. Write the Truth Table of 3 input NAND, NOR, and XOR gates.
3. For the given input signals A, B, and C, sketch the output for an OR gate.



4. Draw the corresponding logic circuit for $x = \overline{A.B(C + D)}$ expression, using AND, OR, and NOT gates.
5. Write the truth table of the following Boolean Expressions and also draw the logical diagram of the given expressions:
 - a. $Y = AB + B'C$
 - b. $Y = A' + BC$
 - c. $Y = AC' + B'D$
 - d. $Y = B + A'C$
6. Minimize the following Boolean expressions using Boolean algebra:
 - a. $F = A'B'C' + A'BC' + A'BC + ABC'$
 - b. $F = A'BC + ABC' + AB'C'$
 - c. $F = AB'C + A'BC' + AB'C'$
7. Find the equivalent expression of $X \oplus Y \oplus XY$, if X and Y are Boolean variables.
8. Write all the Minterms and Maxterms of 4 variables in Tabular form.
9. Express $F = XY + XZ$ in a product of Maxterms form.
10. Simplify the following Boolean expressions using K-map

$$(\overline{A} + \overline{B} + C + D)(\overline{A} + B + \overline{C} + \overline{D})(A + B + \overline{C} + D)(\overline{A} + \overline{B} + \overline{C} + \overline{D})(A + B + \overline{C} + \overline{D})$$

11. Simplify the following expressions using K-map:

- a. $F(A,B,C) = \Sigma m(0,1,3,7)$
- b. $F(A,B,C,D) = \Sigma m(0,2,3,5,7,9,11,13,15)$
- c. $F(A,B,C,D) = \Sigma m(0,1,4,6,9,10,12)$

12. Simplify the following expressions using K-map:

- a. $F(A,B,C) = \Sigma m(0,1,3,7) + d(2,4)$
- b. $F(A,B,C,D) = \Sigma m(0,2,3,5,7,9,11,13,15) + d(1,6,8,14)$
- c. $F(A,B,C,D) = \Sigma m(0,1,4,6,9,10,12) + d(2,3,13,14,15)$

13. Simplify the following expressions using K-map:

- a. $F(A,B,C) = \prod M(0,1,2,6)$
- b. $F(A,B,C,D) = \prod M(0,1,3,6,7,9,10,13,14)$
- c. $F(A,B,C,D) = \prod M(1,3,5,9,11,12,13)$

14. Simplify the following expressions using K-map:

- a. $F(A,B,C) = \prod M(1,6,7).d(2,3)$
- b. $F(A,B,C,D) = \prod M(0,3,5,9,11,12,15).d(1,4,7,13)$
- c. $F(A,B,C,D) = \prod M(0,1,5,6,12).d(2,3,11,15)$

15. Draw a logic circuit, incorporating any gates of your choice, which will produce an output 1 when its two inputs are different. Also, draw the same logic circuit incorporating only NOR gates.

16. Draw a logic circuit, incorporating any gates of your choice, which will produce an output 1 when its two inputs are the same. Also, draw the same logic circuit incorporating only NAND gates.

17. Implement the following Boolean Expressions using NAND gate only:

- a. $Y = A + BC'$
- b. $Y = A' + B'C$
- c. $Y = AB' + A'B$

18. Implement the following Boolean Expressions using NOR gate only:

- a. $Y = (A+B).(B+C)$
- b. $Y = A.(B + C')$

*****End of Tutorial Sheet*****