SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

19ECB204 – LINEAR AND DIGITAL CIRCUITS

II YEAR/ III SEMESTER

UNIT 3 – GATES AND MINIMIZATION TECHNIQUES

TOPIC 4 - Canonical and Standard Forms

CANONICAL FORM ?

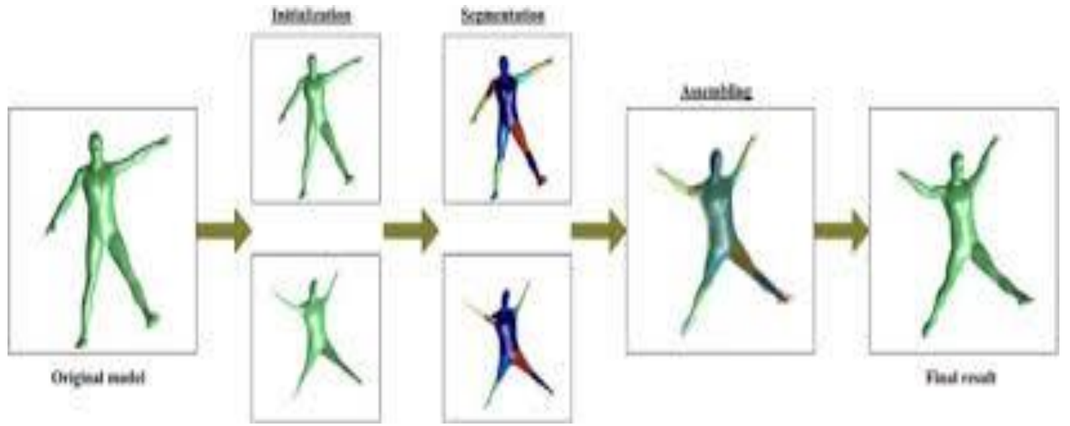
- Canonical form in Boolean Expression can be expressed by two sub forms.

1. Standard Sum of Product (SSOP) - Each product term contains all the variables of the function.

eg.

F(A,B,C) =A'BC + ABC'(standard Sop since all the three variables are available)

F(A,B,C) =AB+ ABC'(not a standard Sop since 'C' variable is missing in the first function



CANONICAL FORM ?

2. Standard Product of Sum (SPOS) - Each sum term contains all the variables of the function.

eg.

F(A,B,C,D) = (A+B+C'+D) (A+B'+C+D) (A+B+C+D')- standard POS since all the four variables are available in each function.

F(A,B,C) = (A+B+C'+D) (A+B'+D) (A+B+C+D')- not a standard POS since 'C' variable is missing in the second function

STANDARD FORM?

- Standard SoP form means Standard Sum of Products form.
- In this form, each product term need not contain all literals.
- Hence, the product terms may or may not be the min terms.
- Thus, the Standard SoP form is the simplified form of canonical SoP form.

Difference between Canonical and Standard form

- Canonical form is a way of representing Boolean outputs of digital circuits using Boolean Algebra.

- Standard form is a simplified version of canonical form that represents Boolean outputs of digital circuits using Boolean Algebra

Canonical SoP and PoS forms

- A truth table consists of a set of inputs and outputs . If there are ‘n’ input variables, then there will be 2^n possible combinations with zeros and ones.

- So the value of each output variable depends on the combination of input variables. So, each output variable will have ‘1’ for some combination of input variables and ‘0’ for some other combination of input variables.

Therefore, we can express each output variable in following two ways.

1. Canonical SoP form
2. Canonical PoS form

Canonical SoP form

- Canonical SoP form means Canonical Sum of Products form.
- In this form, each product term contains all literals. So, these product terms are nothing but the min terms.
- canonical SoP form is also called as **sum of min terms** form.
- First, identify the min terms for which, the output variable is one and then do the logical OR of those min terms in order to get the Boolean expression *function* corresponding to that output variable.
- This Boolean function will be in the form of sum of min terms.

Canonical PoS form

- Canonical PoS form means Canonical Product of Sums form.

- In this form, each sum term contains all literals. So, these sum terms are nothing but the Max terms.

- Hence, canonical PoS form is also called as **product of Max terms** form.

- First, identify the Max terms for which, the output variable is zero and then do the logical AND of those Max terms in order to get the Boolean expression *function* corresponding to that output variable.

- This Boolean function will be in the form of product of Max terms.

Standard SoP and PoS forms

- There are two standard forms of representing the Boolean outputs s .
- These are the simplified version of canonical forms.

1. Standard SoP form
2. Standard PoS form

- The main **advantage** of standard forms is that the number of inputs applied to logic gates can be minimized.

- Sometimes, there will be reduction in the total number of logic gates required.

Standard SoP form

- Standard SoP form means **Standard Sum of Products** form.
- In this form, each product term need not contain all literals.
- So, the product terms may or may not be the min terms.
- Therefore, the Standard SoP form is the simplified form of canonical SoP form.
- We will get Standard SoP form of output variable in two steps.

1. Get the canonical SoP form of output variable
2. Simplify the above Boolean function, which is in canonical SoP form.

THANK YOU