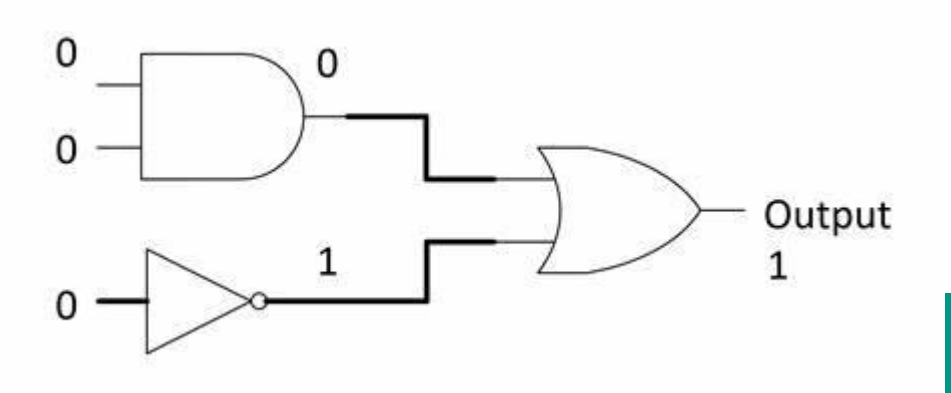
# SNS COLLEGE OF ENGINEERING

(Autonomous)

DEPARTMENT OF INFORMATION TECHNOLOGY

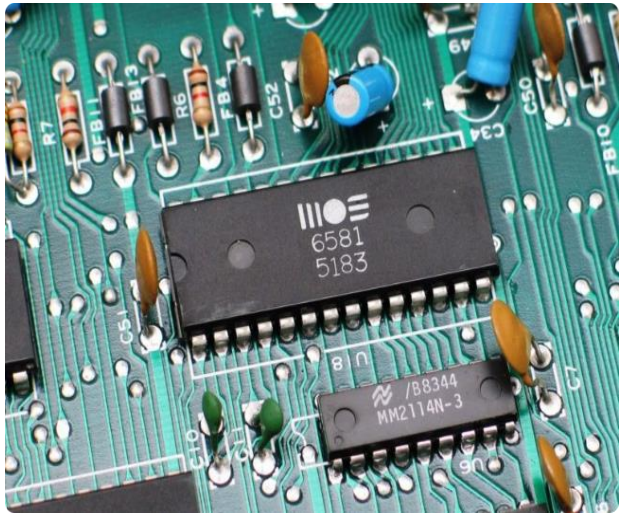
23ITT201 – DIGITAL PRINCIPLES AND COMPUTER ORGANIZATION

## UNIT -1 COMBINATIONAL LOGIC




# Introduction to Combinational Circuits

- Combinational circuits are digital circuits where the output is determined solely by the current input.
- They are the building blocks of more complex digital systems, enabling efficient logic operations and decision-making capabilities.

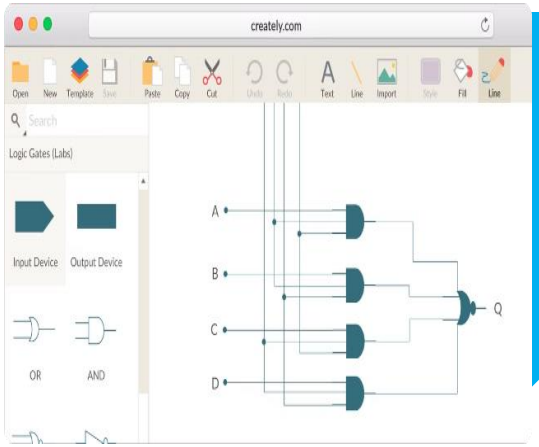


# Boolean Algebra and Logic Gates

1

**AND Gate**

Produces a 1 output only when all inputs are 1.




2

**OR Gate**

Produces a 1 output when any one or more inputs are 1.

3

**NOT Gate**

Inverts the input, producing a 1 output when the input is 0, and vice versa.

## Truth Tables

Systematically mapping all possible input combinations to their corresponding outputs.

## Boolean Expressions

Algebraic representations of the logic function, using AND, OR, and NOT operations.

## Karnaugh Maps

Graphical method for simplifying Boolean expressions and minimizing logic circuits.

# Combinational Circuit Analysis

1

## Input Identification

Determine the inputs that affect the output of a combinational circuit.

2

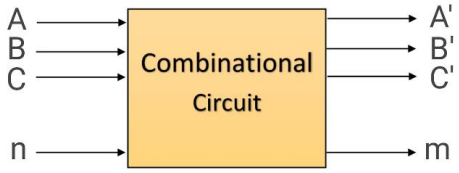
## Truth Table Generation

Construct a truth table to represent the logic function of the circuit.

3

## Output Determination

Analyze the truth table to identify the output for each input combination.



# Combinational Circuit Optimization

## Simplify Boolean Expressions

Use Boolean algebra and Karnaugh maps to minimize the number of logic gates required.

## Reduce Propagation Delay

Arrange logic gates in a way that minimizes the time it takes for signals to propagate through the circuit.

## Improve Power Efficiency

Design circuits that consume less power by reducing the number of active components.

## Multiplexer

Routes one of many input signals to a single output based on a select signal.

## Demultiplexer

Connects a single input to one of many outputs based on a select signal.

## Encoders and Decoders

1

### Encoder

Converts a set of parallel inputs into a coded output, such as binary.

2

### Binary to Seven-Segment Decoder

Converts a binary input into the appropriate signals to drive a seven-segment display.

3

### Decoder

Converts a coded input into a set of parallel outputs, activating the corresponding output.

## Applications of Combinational Circuits

| | |
|---|---|
| Arithmetic Circuits | Adders, Subtractors, Multipliers |
| Comparators | Greater Than, Less Than, Equal To |
| Parity Generators | Detect errors in data transmission |
| Code Converters | Binary to BCD, Binary to Gray Code |


Thank
you