

Welcome

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Technology: Electronics

Semester: 3rd

Subject: Digital Electronics – I(26831)

Chapter: 1st

Chapter Name: Fundamentals of digital electronics.

OBJECTIVES

- To develop knowledge and skill on programming Basics.
- • To develop knowledge and skill to create, compile, debug & execute a program.

Overview of this Chapter

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- 1.1 Define digital Electronics and digital signal.
 - 1.2 Compare between digital and analog signal.
 - 1.3 Describe logic level, Negative logic level and positive logic level,
 - 1.4 Explain the parameter Frequency, Time period, Rise time, Fall time,
 - Rising edge, falling edge, On time, Off time and Duty cycle of digital

1.1 Define digital Electronics and digital signal.

Digital electronics is a field of electronics involving the study of digital signals and the engineering of devices that use or produce them. This is in contrast to analog electronics which work primarily with analog signals. Despite the name, digital electronics designs include important analog design considerations.

A digital signal has two or more distinguishable waveforms, in this example, high voltage and low voltages, each of which can be mapped onto a digit.

1.2 Compare between digital and analog signal.

Difference between Analog and Digital Signal	
Analog Signals	Digital Signals
Continuous signals	Discrete signals
Represented by sine waves	Represented by square waves
Human voice, natural sound, analog electronic devices are a few examples	Computers, optical drives, and other electronic devices
Continuous range of values	Discontinuous values
Records sound waves as they are	Converts into a binary waveform
Only used in analog devices	Suited for digital electronics like computers, mobiles and more

1.3 Describe logic level, Negative logic level and positive logic level,

- In positive logic, a low voltage (often near 0 volts) represents a logic 0, and a high voltage (like 5 volts) represents a logic 1. Conversely, in negative logic, these assignments are reversed: a high voltage represents a logic 0, and a low voltage signifies a logic 1.

1.4 Explain the parameter Frequency, Time period, Rise time, Fall time,

Frequency (often denoted as 'f') is the number of complete cycles or oscillations of a periodic signal that occur within one second

Rise time (often denoted as 'tr') is the time taken for a signal to transition from a low voltage level to a high voltage level

- Fall time (often denoted as 'tf') is the time taken for a signal to transition from a high voltage level to a low voltage level.

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Rising edge, falling edge, On time, Off time and Duty cycle of digital

- In digital signals, a rising edge is a transition from low to high, a falling edge is a transition from high to low, on time is the duration a signal is high, off time is the duration a signal is low, and duty cycle is the percentage of time a signal is high within a period

Chapter: 2nd

Chapter Name: Number systems and codes

- 2.1 Define Number system and Base of number system.
- 2.2 Describe Decimal, Binary, Octal and Hexadecimal number system.
- 2.3 Convert Decimal, Binary, Octal and Hexadecimal number system.
from each other.
- 2.4 Determine 1's & 2's complement of binary number.
- 2.5 Compute binary arithmetic. 2.5 Compute binary arithmetic.
- 2.6 Describe 8421, Excess-3code, Gray code, BCD code, Hamming code,
ASCII code and Unicode.
- 2.7 Convert one code to another.
- 2.8 Describe the addition and subtraction of BCD coded number.

Define Number system and Base of number system

- A number system is a method of representing numbers using digits or symbols in a consistent way, while the base of a number system is the number of unique digits used to represent numbers within that system

Describe Decimal, Binary, Octal and Hexadecimal number system

Number Systems		
System	Base	Digits
Binary	2	0 1
Octal	8	0 1 2 3 4 5 6 7
Decimal	10	0 1 2 3 4 5 6 7 8 9
Hexadecimal	16	0 1 2 3 4 5 6 7 8 9 A B C D E F

2.3 Convert Decimal, Binary, Octal and Hexadecimal number system. from each other

- Start with the rightmost digit of the binary number.
- Multiply this digit by the corresponding power of 2.
- Repeat steps 1 and 2 for each digit in the binary number.
- Add the results of all the multiplications to get the decimal number.
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- Chapter: 3rd

Chapter Name: Logic gates

Logic gates

Define logic gate.

3.2 Classify logic gate.

3.3 Describe logic symbol, logic statements, truth table and Boolean equation of different logic gates.

3.4 Analyze the electrical circuit for basic gates.

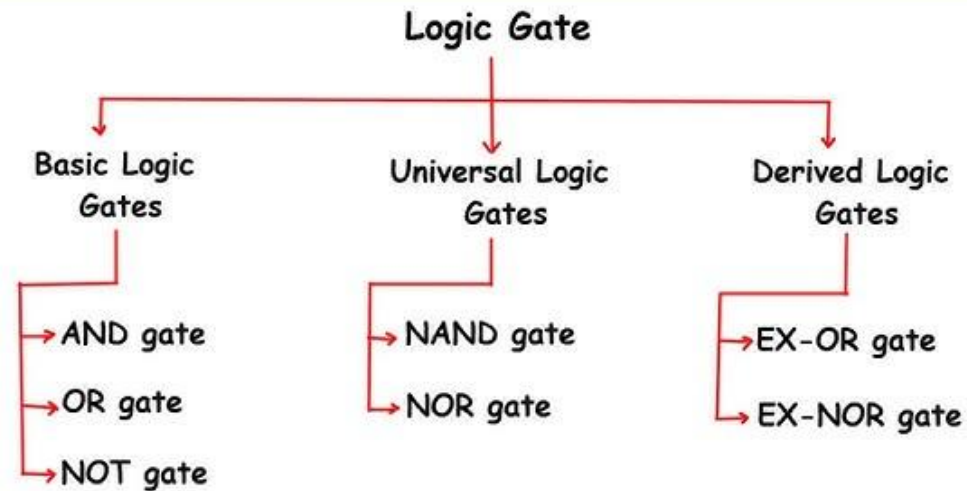
3.5 Describe pin and signals of different gate IC.

Define logic gate.

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- A logic gate is a fundamental electronic circuit that performs a basic logical operation on one or more binary inputs, producing a single binary output, and is a building block of digital circuits.

3.2 Classify logic gate

Classification of Logic Gates



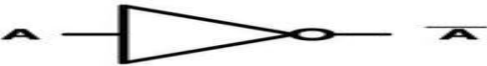






Describe logic symbol, logic statements, truth table and Boolean equation of different logic gates.

- Logic gates are basically classified into three categories; Basic Logic Gates comprising NOT, AND and OR gates, Universal Logic Gates comprising NAND and NOR gates, and the third is the special purpose gates including Ex-OR and Ex-NOR gates. Let us understand the three of the categories one by one

Describe logic symbol, logic statements, truth table and Boolean equation of different logic gates.

- 1. Basic Logic Gates:
 - **AND Gate:** Outputs a high (1) only if all inputs are high.
 - **OR Gate:** Outputs a high (1) if at least one input is high.
 - **NOT Gate (Inverter):** Outputs the inverse of the input (high becomes low, low becomes high).
- 2. Universal Logic Gates:
 - **NAND Gate:** A combination of AND and NOT, outputs low (0) only if all inputs are high.
 - **NOR Gate:** A combination of OR and NOT, outputs high (1) only if all inputs are low.
- 3. Special Purpose Logic Gates:
 - **XOR (Exclusive OR) Gate:** Outputs high (1) if the inputs are different (one high, one low).
 - **XNOR (Exclusive NOR) Gate:** Outputs high (1) if the inputs are the same (both high or both low).
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Analyze the electrical circuit for basic gates.

Name	Symbol & notation	Explanation
NOT		The inverter NOT simply accepts an input and outputs the opposite.
AND		All inputs must be positive (1) before the output is positive (1 or ON)
NAND <small>*Not AND</small>		Same as AND, but the outcome is the inverse (NOT). So, perform AND first, then apply NOT to the output.
OR		At least one input must be positive (1) to give a positive output (1 or ON). All inputs could also be positive.
NOR <small>*Not OR</small>		Same as OR, but the outcome is the inverse (NOT). So, perform OR first, then apply NOT to the output.
XOR <small>*eXclusive OR</small>		Only one input can be positive (1) to give a positive output (1 or ON). If both are positive, the output is negative (0 or OFF)
XNOR <small>*eXclusive Not OR</small>		All inputs must be the same (either high or low) for a positive output (1). Otherwise, the output is negative (0 or OFF)

Any Question???

Thanks to Everybody.