SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
An Autonomous Institution

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A+' Grade
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

19ECB204 – LINEAR AND DIGITAL CIRCUITS

II YEAR/ III SEMESTER

UNIT 2 – **COMPARATORS AND SPECIAL FUNCTION IC's**

TOPIC 7 - Analog to Digital Converter

WHAT IS ADC?

➢ADC is an electronic device that converts a continuous analog input signals to discrete digital number.

WHERE IT IS USED?

➢Microcontrollers can store information using digital logic.

➢Digital data is easily reproducible.

➢It compress information to digital form for efficient storage.

ANALOG TO DIGITAL CONVERSION

1. **<u>SAMPLING</u>**

    In signal processing,sampling is the reduction of a continuous signal to discrete signal.

2. **<u>QUANTIZING</u>**

    It breaks down analog value is a set of finite states.

3. **<u>ENCODING</u>**

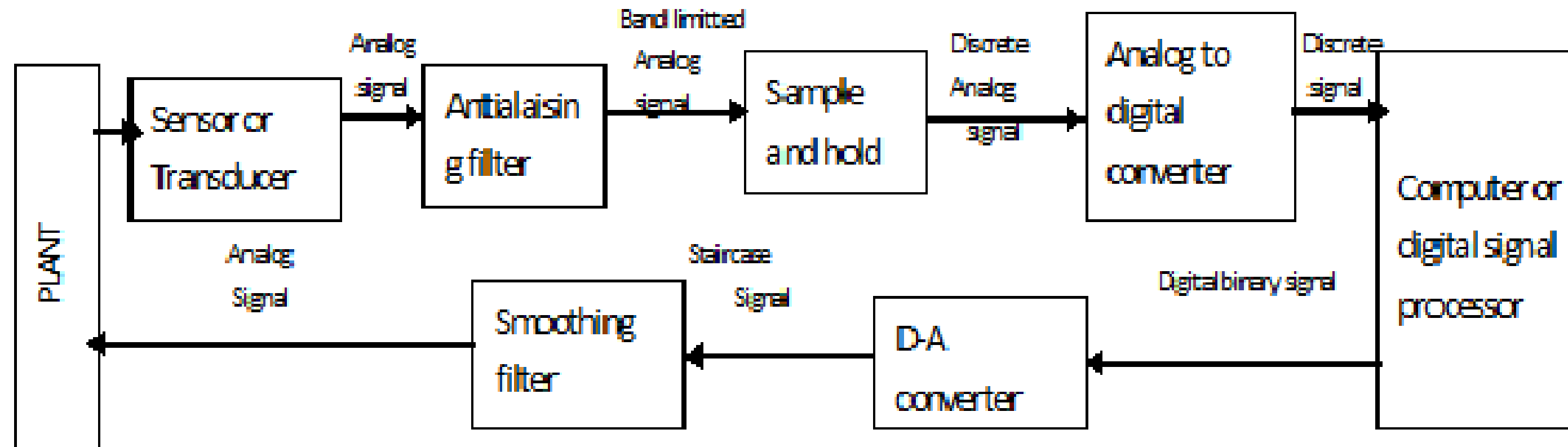   It assigns a digital word or number to each state and matches it to the input signal.

Block Diagram of ADC & DAC

BLOCK DIAGRAM OF ADC & DAC

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ANALOG TO DIGITAL CONVERSION

➢In modern life, electronic equipment is frequently used in different fields such as communication, transportation, entertainment, etc.

➢ ADC and DAC are very important components in electronic equipment.

➢Since most real world signals are analog, these two converting interfaces are necessary to allow digital electronic equipments to process the analog signals.

ANALOG TO DIGITAL CONVERSION

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ANALOG TO DIGITAL CONVERSION

➢In electronics, an ADC is a device for converting an analog signal (voltage, current etc.) to a digital code, usually binary.

➢ In the real world, most of the signals sensed and processed by humans are analog signals.

➢ Analog to Digital conversion is the primary means by which analog signal are converted into digital data that can be processed by computers for various purposes.

➢The sensor & transducer connects the input analog signal to the Analog to Digital converter & it converts the non electrical input signal into electrical signal.

ANALOG TO DIGITAL CONVERSION

➢Antialiasing filter is used to band limit the analog signal i.e., there by band width requirement is reduced.

➢Sample & hold circuit is used to sample the band limited signal based on the sample theorem.

➢ So the signal becomes a discretized signal. Though the signal is in analog form, hold the discrete signal until the conversion is completed.

➢ Analog to Digital converter converts the discretized signal into binary digits i.e., discrete digital signal and then it is given to the processors.

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# *Block Diagram of Analog to Digital*

ANALOG TO DIGITAL CONVERTER
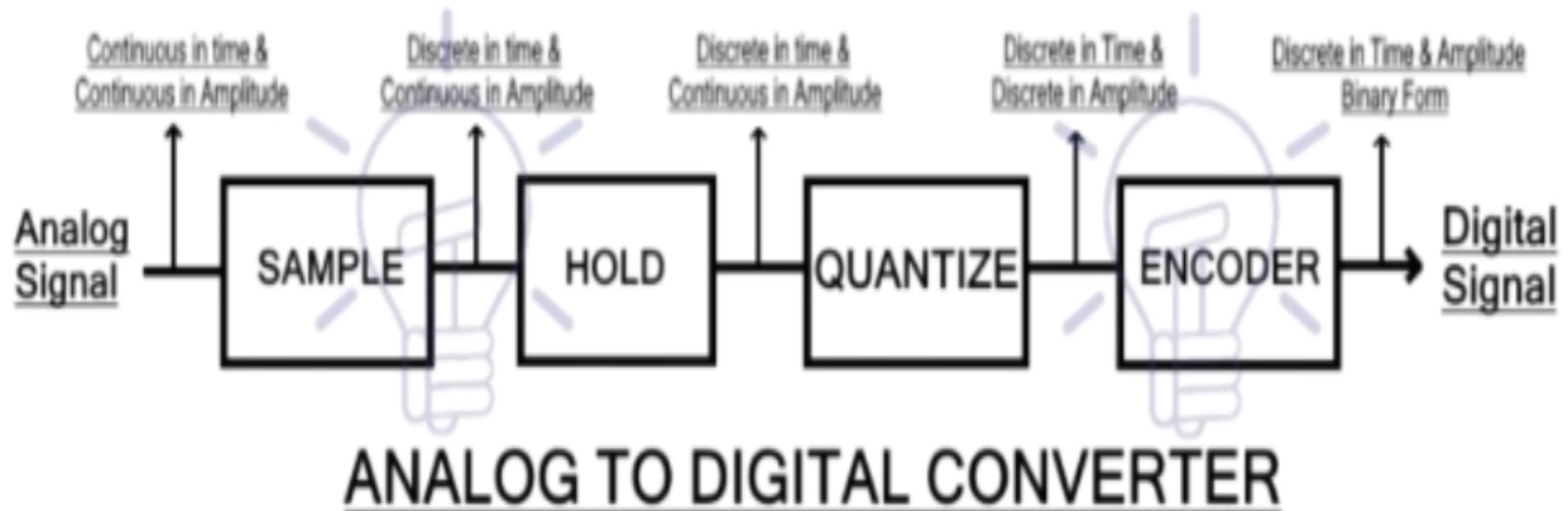
ANALOG TO DIGITAL CONVERSION

➢ In A/D conversion, there are two main steps of process

➢ 1. Sampling and Holding

➢ 2. Quantization

➢ In order to be able to perform digital signal processing on natural signals that are analog in nature, they must first be sampled and quantized into digital form.
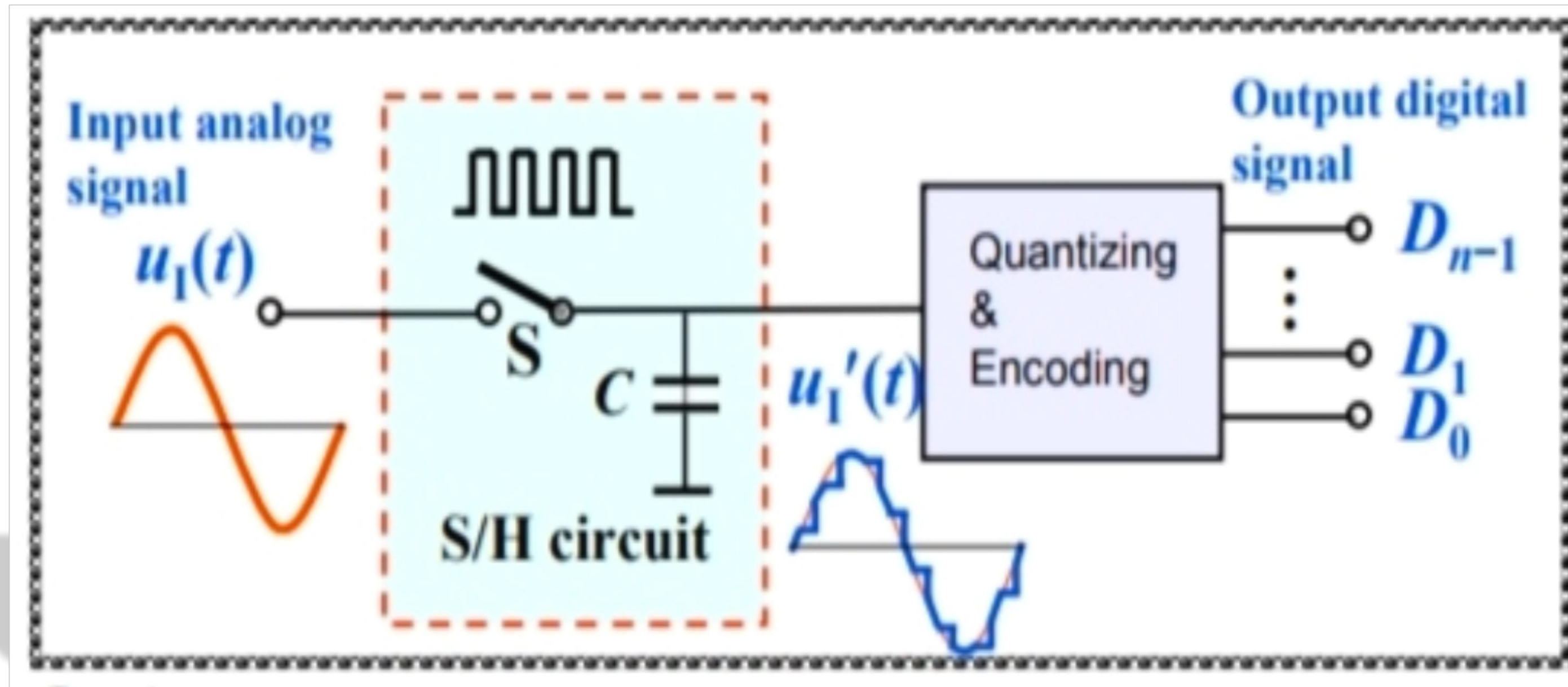
ANALOG TO DIGITAL CONVERSION
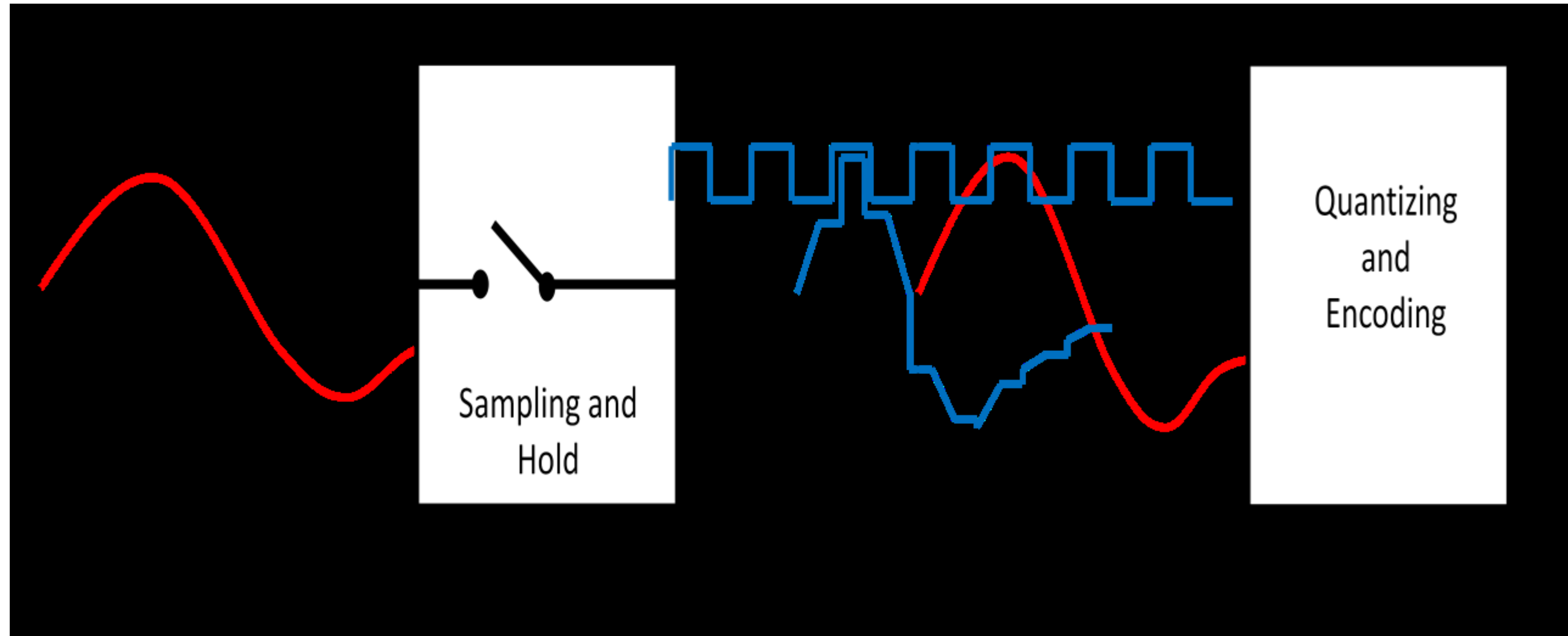
ANALOG TO DIGITAL CONVERSION

LIST OF SPECIFICATION

➢ Analog Input Voltage Range It is the maximum allowable input–voltage range in which ADC will operate properly.

➢ Typical values are 0 to 10 V, 0 to 12 V, ±5 V, ±10 V, and ± 12V.

➢ Quantization error: The error is a process of quantization called quantization error. .

➢ The accuracy of an ADC depends on quantization error, digital system noise, gain error, offset error, and deviation from linearity, etc.
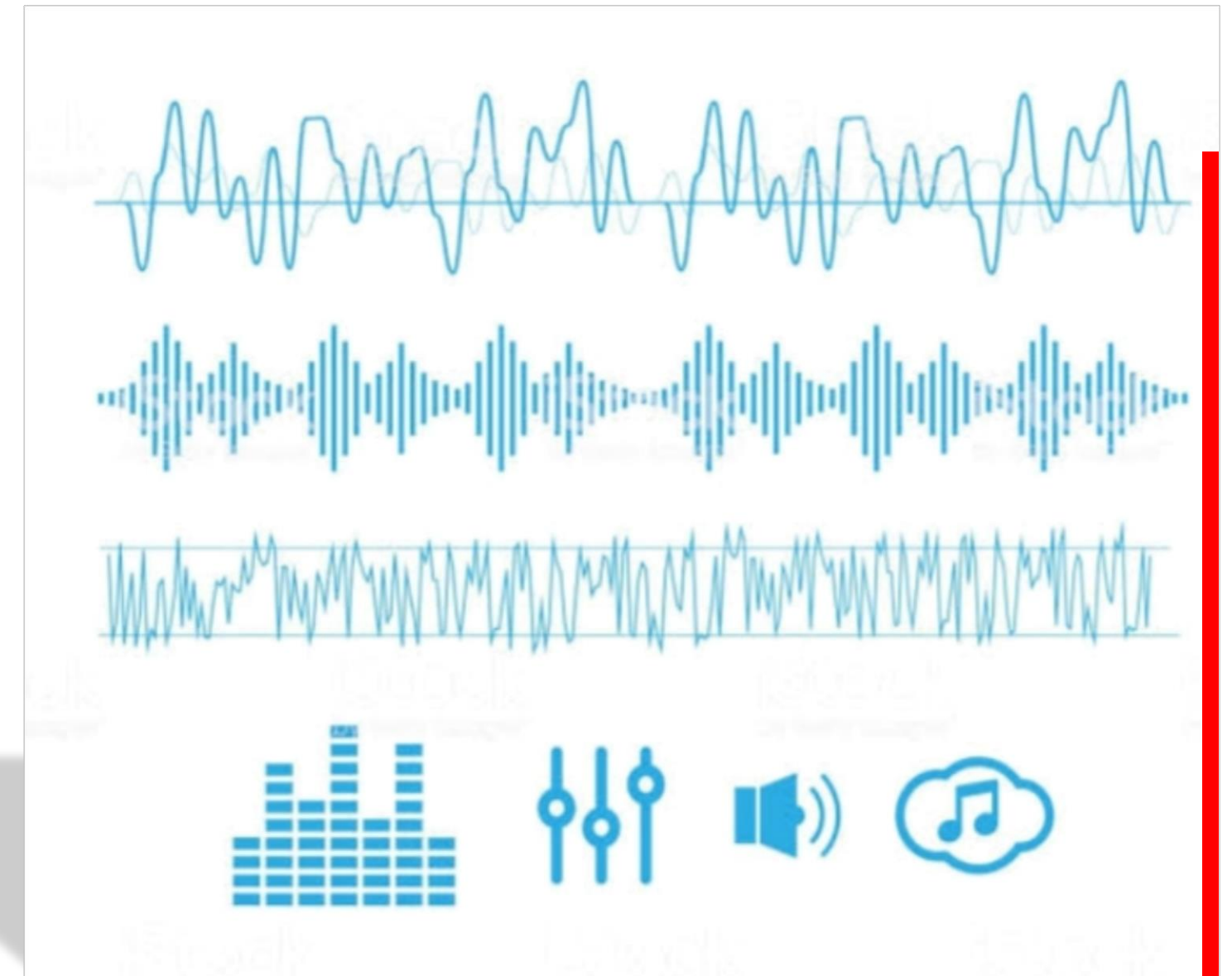
LIST OF SPECIFICATION

➢ Resolution The resolution is defined by the ratio of reference voltage to number of output states.

Resolution = Reference voltage / (2–1)

where N = number of bits of the ADC.

➢ conversion time varies from 50 µs to a few ns for slow/medium speed to a high-speed ADC.

➢ Temperature Stability Accuracy of an A/D converter depends on temperature variation. Typical temperature coefficients of error are 30 ppm/ºC.

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THANK YOU

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