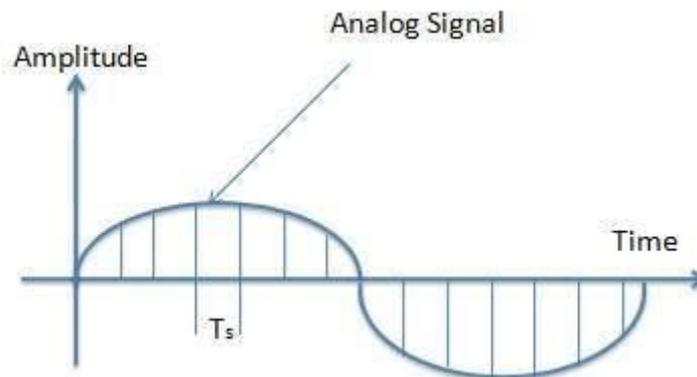


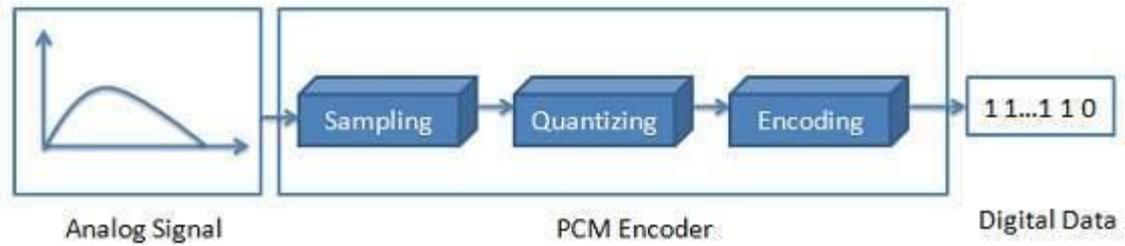
Sampling Techniques

Digitization of Sound

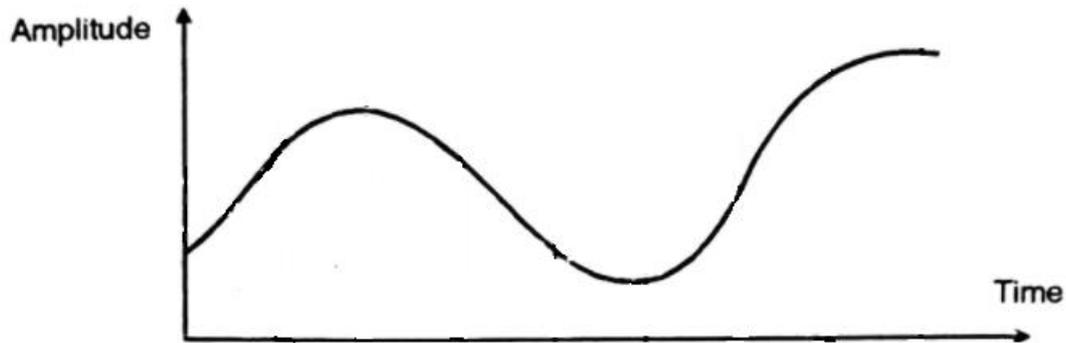
Digitization is a process of converting the analogue signals to a digital signal. There are three steps of digitization of sound.



1. **Sampling** - Sampling is a process of measuring amplitude at equally spaced moments in time, where each measurement constitutes a sample. A sampling rate is the number of times the analogue sound is taken per second. A higher sampling rate implies that more samples are taken during the given time interval and ultimately, the quality of reconstruction is better. The sampling rate is measured in terms of Hertz, Hz in short, which is the term for Cycle per second. Sampling rates most often used in multimedia are 44.1kHz (CD-quality), 22.05kHz and 11.025kHz.
2. **Quantization** - Quantization is a process of representing the amplitude of each sample as integers or numbers. How many numbers are used to represent the value of each sample known as sample size or bit depth or resolution. Commonly used sample sizes are either 8 bits or 16 bits. The larger the sample size, the more accurately the data will describe the recorded sound. An 8-bit sample size provides 256 equal measurement units to describe the level and frequency of the sound in that slice of time. A 16-bit sample size provides 65,536 equal units to describe the sound in that sample slice of time. The value of each sample is rounded off to the nearest integer (quantization).
3. **Encoding** - Encoding converts the integer base-10 number to a base-2 that is a binary number. The output is a binary expression in which each bit is either a 1(pulse) or a 0(no pulse).



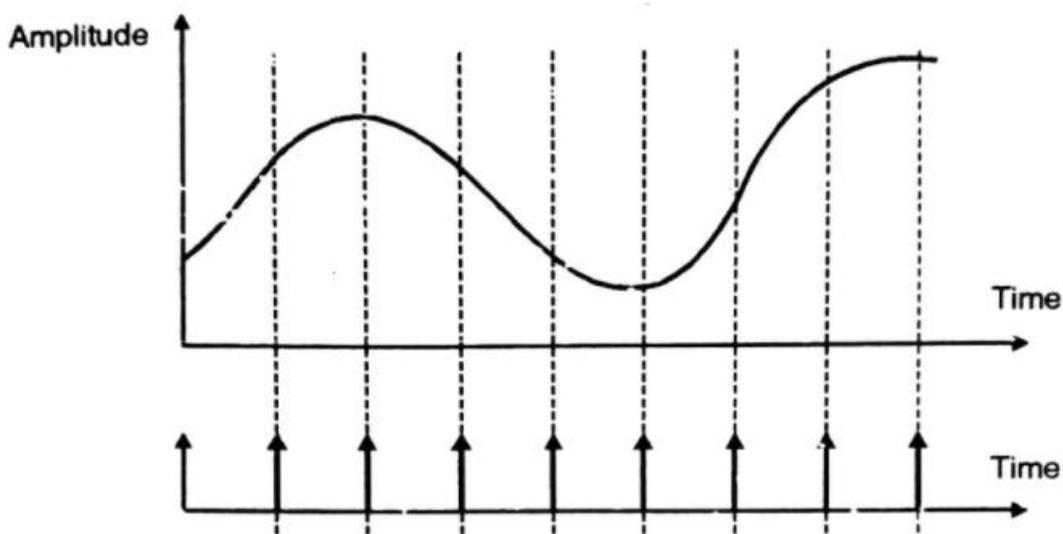
Example



The analogue curve to be converted to digital

Sampling:

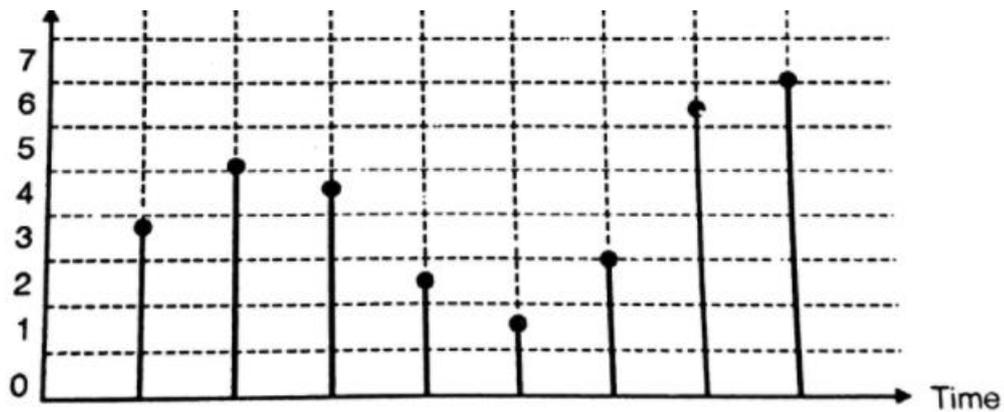
- The process of converting continuous time into discrete values is called sampling.
- The time axis is divided into fixed intervals.
- The reading of each value of analogue signal is taken for each time interval.



The time axis is divided into fixed intervals

Quantization:

- The process of converting continuous sample values into discrete values is called quantization.
- In this process we divide the signal range into a fixed number of intervals.
- Each interval is of same size and is assigned a number. These intervals are numbered between 0 to 7.
- Each sample falls in one of the intervals and is assigned that interval's number.



The readings are taken

Coding:

- The process of representing quantized values digitally is called coding
- In our example, eight quantizing levels are used. These levels can be coded using 3 bits if the binary system is used, so each sample is represented by 3 bits.
- The analogue signal is represented digitally by the following series of binary numbers: 001, 011, 100, 100, 010, 001, 011, 110, and 110.

