

KNOWLEDGE PROBE 1: Data Conversion Fundamentals

Data Conversion Part 1

Learning Objectives

1. Name the two types of data conversion.
 2. List three key reasons why data conversion is needed and so important in electronics today.
 3. Explain the Nyquist theory.
 4. Define aliasing and methods to prevent aliasing.
 5. Name five common DAC applications.
 6. Explain how the following words are used in discussing data conversion: sampling, quantization, resolution, and digitize.
 7. Determine sampling rates required to prevent aliasing.
 8. Determine the resolution of data conversion modules.
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1. The word digitize describes
 - a. Digital-to-analog conversion
 - b. Analog-to-digital conversion
 - c. Could be used to describe either
 - d. None of the above
 2. Which of the following is NOT a reason for the need of data conversion?
 - a. Digital signal processing
 - b. Humans react easier with digital than analog
 - c. More reliable data communications by digital methods
 - d. Widespread use of computers
 3. The output of a DAC is
 - a. Analog
 - b. Digital
 4. The output of an ADC is
 - a. Analog
 - b. Digital
 5. DSP can be used to perform all of the following EXCEPT
 - a. Amplification
 - b. Demodulation
 - c. Filtering
 - d. Modulation
 6. The digital output of an ADC may be either serial or parallel.
 - a. True
 - b. False



7. To digitize an AM radio signal with a frequency response up to 5 kHz, the ADC must sample at a rate no less than
 - a. 3 kHz
 - b. 5 kHz
 - c. 10 kHz
 - d. 50 kHz
8. What is the sampling interval for a 48 kHz sampling rate?
 - a. 15.3 microseconds
 - b. 20.8 microseconds
 - c. 48.0 microseconds
 - d. 192.6 microseconds
9. If a 20 kHz signal is sampled at a rate of 32 kHz, what is the alias signal produced upon recovery?
 - a. 12 kHz
 - b. 20 kHz
 - c. 21 kHz
 - d. 52 kHz
10. How can an alias error be prevented?
 - a. Lowering the frequency of the input
 - b. Putting a low pass filter with a cut-off just above the highest input frequency
 - c. Sampling faster than twice the highest input frequency
 - d. All of the above
11. What frequency cut-off low pass filter should be used in front of the ADC to prevent an alias on an input signal with a frequency as high as 3 MHz?
 - a. 2.5 MHz
 - b. 3.3 MHz
 - c. 4.2 MHz
 - d. 6.0 MHz
12. What defines the resolution of an ADC or DAC?
 - a. Input voltage range
 - b. Number of bits in the binary word
 - c. Output voltage range
 - d. Type of circuit used
13. An 8-bit ADC has an input voltage range of 0 to 3 volts. What is the resolution?
 - a. 3.3 mV
 - b. 8.0 mV
 - c. 11.7 mV
 - d. 375.0 mV



14. What is the resolution of a 12-bit DAC?
- .0120 %
 - .0244 %
 - .0976 %
 - .4096 %
15. What is the output of a DAC?
- DC voltage
 - Parallel binary word
 - Serial binary word
 - Stepped approximation of the digitized analog signal
16. DACs are NOT used in
- CD/DVD players
 - Cell phones
 - FM radios
 - Video monitors
17. DACs are found in which of the following.
- HDTV
 - Robots
 - Satellite TV
 - All of the above
18. Which of the following is used to define resolution?
- Converting the measured sample voltage into a proportional binary code
 - Measuring the analog signal for a short instant at fixed time intervals
 - The fineness of amplitude definition or representation
 - The process of taking an analog signal and converting it into a sequence of fixed length and proportional binary numbers
19. Which of the following is used to define sampling?
- Converting the measured sample voltage into a proportional binary code
 - Measuring the analog signal for a short instant at fixed time intervals
 - The fineness of amplitude definition or representation
 - The process of taking an analog signal and converting it into a sequence of fixed length and proportional binary numbers
20. Which of the following is used to define quantization?
- Converting the measured sample voltage into a proportional binary code
 - Measuring the analog signal for a short instant at fixed time intervals
 - The fineness of amplitude definition or representation
 - The process of taking an analog signal and converting it into a sequence of fixed length and proportional binary numbers



21. Which of the following is used to define digitize?
- a. Converting the measured sample voltage into a proportional binary code
 - b. Measuring the analog signal for a short instant at fixed time intervals
 - c. The fineness of amplitude definition or representation
 - d. The process of taking an analog signal and converting it into a sequence of fixed length and proportional binary numbers
22. According to the Nyquist theorem, information in an analog signal will be accurately preserved if it is sampled at a rate at least
- a. Equal to the highest frequency component of the signal
 - b. Any amount higher than highest frequency component of the signal
 - c. Twice the highest frequency component of the signal
 - d. Three times the highest frequency component of the signal