Lecture 1&2&3
Digital Signal Processing

Chapter 1

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Topics That we discussed on Lecture 1

1. What is Signal and system? Explain it with example.
2. Give three example of natural signal.
3. What are the basic elements of an Analog/Digital Signal Processing System? Explain it with figure.
4. What are the advantages of using Digital over Analog Signal Processing System?
5. What are the advantages of using Analog over Digital Signal Processing System?

Topics That we discussed on Lecture 1

2. Define the following signal with example:
   i. Multichannel Signals.
   ii. Single /Two dimensional / Multidimensional signals.
   iii. Multichannel and Multidimensional Signals
   iv. Continuous-Time and Discrete-Time Signals.
   v. Analog and Digital Signal.
   vi. Continuous-Valued and Discrete-Valued Signals.
   vii. Deterministic Versus Random Signals.

Topics That we discussed on Lecture 1

7. Distinguish between
   i. Continuous-Time and Discrete-Time Signals.
   ii. Analog and Digital Signal.
   iii. Continuous-Valued and Discrete-Valued Signals.
   iv. Deterministic Versus Random Signals.

Topics That we discussed on Lecture 2

8. Write down the characteristics of Continuous time sinusoidal/analog signal.
9. How a sinusoidal signal can be obtained by adding two equal-amplitude complex-conjugate exponential signals?
10. Write down the characteristics of a discrete time sinusoidal/ digital signal.
11. Prove that, a discrete-time sinusoid is periodic only if its frequency f is a rational number.
12. Discrete-time sinusoids whose frequencies are separated by an integer multiple of 2π are identical.

Topics That we discussed on Lecture 2

13. Draw the discrete time signal when $\omega=\pi/8$,$\pi/4$, $\pi/2$, π or f=1/16 ,1/8, 1/4, 1/2 or n=16,8,4,2
14. Explain the analog to digital conversion process with figure.
15. Determine which of the following sinusoids are periodic. Compute their fundamental period. (See exercise 1.2)

(a) $\cos 0.01\pi n$ (b) $\cos\left(\pi\frac{30n}{105}\right)$ (c) $\cos 3\pi n$ (d) $\sin 3n$ (e) $\sin\left(\pi\frac{62n}{10}\right)$

Topics That we discussed on Lecture 2

16. Determine whether or not each of the following signals is periodic. If a signal is periodic, specify its fundamental period. (See exercise 1.3)

(a) $x_a(t) = 3\cos(5t + \pi/6)$

(b) $x(n) = 3\cos(5n + \pi/6)$

(c) $x(n) = 2\exp[j(n/6 - \pi)]$

(d) $x(n) = \cos(n/8)\cos(\pi n/8)$

(e) $x(n) = \cos(\pi n/2) - \sin(\pi n/8) + 3\cos(\pi n/4 + \pi/3)$

Topics That we discussed on Lecture 3

17. Define sample period and sampling frequency.
18. Show that, a periodic sampling establishes a relationship between the time variables t and n of continuous-time and discrete-time signals.
19. Show that periodic sampling of analog signals is $f=\frac{F}{F_S}$ where symbols have their conventional meanings.

or

20. Show that periodic sampling of analog signals is $\omega = \Omega T$ where symbols have their conventional meanings.

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Topics That we discussed on Lecture 3

21. Show the relations between frequency variables of continuous time signals and discrete time signals.
22. What is aliasing effect?
23. What is folding frequency and Nyquist rate?
24. Example: 1.4.1, 1.4.2, 1.4.3, 1.4.4

Assignment

Exercise

1.1, 1.2, 1.3, 1.6, 1.9, 1.10