Question Bank

Digital Signal Processing

1. Give two main advantages of the digital signal processing.
2. What do you understand with term signal?
3. What do you understand with term signal processing?
4. Give concept of linearity
5. Define convolution
6. Discuss sampling theorem
7. Define the principle of superposition in regard with linearity
8. Define the principle of homogeneity in regard with linearity
9. Give the relation ship between the unit step discrete time signal and unit step discrete time signal
10. Give the different methods for the representation of the discrete time signals with examples
11. Define linear time invariance in the discrete time signals
12. Find relation between Fourier transformation of analog and digital signal
13. Explain difference between linear and circular convolution
14. Explain frequency transformation of the digital filters
15. What is the significance of the Discrete time unit impulse signal
16. What is the significance of the Discrete time unit step function
17. What is the significance of the Discrete time exponential function
18. What is the significance of the Discrete time sinusoidal function
19. Test the linearity of the given functions
    - Y(n)=1/3{x(n+1)+x(n)+x(n-1)}
    - Y(n)=G{x(n)}={$x^2(n)$}
20. Find the unit sample response

    Y(n)=1/3x(n+1)+1/3x(n)+1/3x(n-1)
21. Find the unit sample response

    Y(n)=1/n+1{y(n-1)+x(n)}
22. Find the convolution of two finite duration signals

    X(n) = 1 , -1<=n<=1
    0 , Otherwise

    h(n) = 1 , -1<=n<=1
    0 , otherwise
23. Find the convolution of the finite duration sequence with an infiite duration sequence

    X(n) = n+1 , -1<=n<=1
    0 , Otherwise

    h(n)= a^nu(n) for all n
24. Find convolution of ant two finite duration sequences
25. Find the stability of the 3 sample averager
26. Show the stability of the first order recursive filter
27. Show the stability of the second order filter

28. For the following difference equations determine and sketch the unit sample response sequence

$Y(n)=x(n)-x(n-N)$

$Y(n)=ay(n-1)+x(n)+x(n-1)$

29. Implement the digital filter that generates $\cos(\omega_0 n)$,for $n>=0$

30. For each of the following transformations determine that whether the system is stable causal, linear, and shift invariant

$Y(n)=ax(n-n_0)+bx(n-n_1)$

$Y(n)=x(n)x(n-n_0)$

$Y(n)=x(2n)$

31. Find the transfer function of the 3 sample averager

32. Find the transfer function of the first order recursive filter

33. Find the transfer function of the second order recursive filter

$r^n\cos(\omega_0 n)u(n)$ fotr all n

34. Define linearity property of the Discrete Fourier transform

35. Define periodicity property of the Discrete Fourier transform

36. Define symmetry properties of the Discrete Fourier transform

37. Find the magnitude and phase spectra of the delayed unit sample sequence. Find the magnitude and phase response of the 3 sample averager

$H(e^{\omega j})=1/3\{1+2\cos(\omega)\}$

38. Find the magnitude and phase response of the first order recursive filter

$|H(e^{\omega j})|^2= H(e^{\omega j})\, H^*(e^{\omega j})$

39. Find the magnitude and phase response of the second order recursive filter

$H(e^{\omega j})=\{1-r\cos(\omega_0)\, e^{-\omega j}\}/1-2r\cos(\omega_0)\, e^{-\omega j}+r^2 e^{-2\omega j}$

40. Find the impulse response

$x(n) =1/3, -1<=n<=1$

0 , otherwise

$h(n) = a$, for $n>=0$

0, otherwise

41. Find the Discrete Fourier transform of an even sequence

42. Find the Discrete Fourier transform of the even symmetry sequence

43. Find magnitude and phase response of an odd sequence

44. Discrete Fourier transform of an asymmetric sequence. Find the inverse Fourier transfer of the following sequence

$H(e^{\omega j})=1/3(1+2\cos(\omega))$

45. Determine the output sequence of the output spectrum

$Y(e^{\omega j})=1/3\ \{e^{\omega j}+1+ e^{-\omega j}\}/\{1-a\, e^{-\omega j}\}$

46. Find the Fourier transform of the product of two sequences $h(n)=\sin(\pi n/4)/\ \pi n/4$

47. Give definition of the z-transformation.

Find the z transformation of the 3-sample averager

$h(n) = 1/3$, for $-1<=n<=1$

0, otherwise

Find the z- transformation of the first order recursive filter

$h(n) = a^n$, for $n>=0$

0, otherwise

Find z-transformation of the second order recursive filter

$h(n)=r^n \sin(\omega_0 n)$

48. Define the linearity property of the z-transform

Show the convolution of the two sequences give the system function of the 3-sample averager $y(n)=1/3\{x(n+1)+x(n)+x(n-1)\}$

49. Find the system function of the first order recursive filter

$y(n)=ay(n-1)+x(n)$

50. Find the system function of any second order recursive filter
51. Define z transformation
52. Name important properties of z transformation
53. Show the ROC of the following function

$h(n) = a^n$, for $n>=0$

0, otherwise

54. Check the stability of the following functions

$H(n) = 1$ for $n>=0$

0 otherwise

55. Check the stability of the following functions

$H(n) = \cos(\beta n)$ for $n>=0$

0 otherwise

56. Can we determine the ROC from the unit sample response
57. Find the z transformation of $2^n\delta(n-1)$
58. What are different methods for inverse z-transformation determination
59. Name different types windows for obtaining finite impulse response
60. Write the characteristics of the rectangular window function based FIR filter design
61. What are design considerations for FIR filters
62. Write the characteristics of the triangular window function based FIR filter design
63. Write the characteristics of the Bartlett window function based FIR filter design
64. Write the characteristics of the Hanning window function based FIR filter design
65. Compare the features of the butterworth and chebechev filters
66. Write the elliptical filter design procedure
67. Write different methods for converting an analog filter into a digital filter
68. What is unilateral z transform
69. What is one sided z transform
70. Explain overlap save method
71. Explain overlap add method
72. Draw the relation between the DTFT and DFT
73. Consider the LSIV described by

$y(n)=(1/2)x(n)+2x(n-1) +2x(n-2) +2x(n-3)+(1/2)x(n-4)$ and we wish to find the impulse response

74. It is known that $x(n)=n$, $0<=n<=N$

$2N-n$ $N+1<=n<=2N$

write the expression for x(n) using step sequence u(n)

75. sketch the following discrete signals

$x(n)=-3\delta(n+5)+1.5\delta(n+3)+ 2\delta(n-1)-3\delta(n-2)$

76. Check the stability of the signals

$\phi[x(n)]=g(n)x(n)$

$\phi[x(n)]=e^{x(n)}$

77. Check the causality o the signals

$\phi[x(n)]=x(n-n_0)$

$\phi[x(n)]=ax(n)+b$

78. Check for linearity

$\phi[x(n)]=g(n)x(n)$

$\phi[x(n)]=ax(n)+b$

79. By direct evaluation of the convolution sum determine the step response of the LSIV system whose unit sample response is

$h(n)=a_n u(n), o<a<1.0$

80. Determine x(n) if , $X(e_{\omega j})=(e_{-\omega j3/2}), \omega<=1$

$0.0\ 1<\omega<\pi$

81. Define fixed point representation
82. Define interpolation
83. Define floating point representation
84. What is an extrapolator
85. Give effects of coefficient quantization
86. What are the effects of round off noise in the digital filters
87. Explain the limit cycles
88. What is the relation between the $h_1(n)$ and $h_2(n)$, if $h_1(n)*h_2(n)=\delta(n)$
89. Distinguish between the signals represented with x*(nT) and x(n)
90. Find the convolution sum of the x(n) and h(n) where

$x(n)=-3\delta(n+5)+1.5\delta(n+3)+2\delta(n-1)-3\delta(n-2)$

$h(n)=-1.5\ \delta(n+1)+3\delta(n-2)$

91. Evaluate y(n)=x(n)*h(n),where $h(n)=a_n$, o<=n<=N, and 0 elsewhere

$x(n)=b_{n-n0,}n_{0<=n}$

92. For each of the following sequence, identify with reasons which are stable ,causal or both

- u(n)
- $(1/2)_n u(n)$
- $2_n u(n)$

93. Give two applications of $TMS320_CXX$
94. Give instruction set of $TMS\ 320_C$
95. Find the inverse z transform of $X(z)=e_{z-1}$
96. Find the convolution of: x(n)=u(n)-u(n-5),h(n)=u(n+2)-u(n-3)
97. “Quantization is an reversible process” comment.
98. Differentiate with examples between anti causal and non causal systems
99. Explain with example , the signal flow graph representation for discrete time system
100. What are the different series of TMS and ADSP processors?
101. Explain how we can filter long data sequences by overlap add and overlap save methods.
102. Find DFT of x(n)={0,1,2,3,4,5,6,7}
103. Discuss quantization , round off error effects in digital filters.
104. Using blackman window obtain the coefficients of an FIR high pass filter to meet the specification given below: pass band edge frequency: 2.5 khz, transition width :0.75 khz, sampling frequency : 10 khz
105. Determine the convolution and correlation sequence of the following sequences:

x(n)={…..,0,0,2,-1,3,7,1,2,-3,70,0….}, h(n)={…,0,0,1,-1,2,-2,4,-2,5,0,0,….}

106. Discuss the design methods for the FIR filters and IIR filter in detail