SIDDHARTH GROUP OF INSTITUTIONS :: PUTTUR
Siddharth Nagar, Narayanavanam Road – 517583

QUESTION BANK (DESCRIPTIVE)

Subject with Code : ADSP (16EE7511) **Course & Branch**: MTECH-CS

Year & Sem: IYEAR & II-Sem **Regulation:** R16

UNIT-I

1.(a) With suitable examples the classify the Discrete time signals. [5M]
(b) With neat block diagram explain analog to digital converter. [5M]

2.(a) Find fourier transform of the signal $X(t)= e^{-at} U(t)$. [5M]
(b) With neat diagrams explain about sample and hold circuits. [5M]

3. (a) What are the applications of fourier transform. [5M]
(b) How can you justify stability of a system with respect to'BIBO'. [5M]

4. Broadly explain the properties of discrete fourier transform. [10M]

5. Find DFT of the sequence x(n)={1,2,3,4,4,3,2,1} by using decimation in time FFT algorithm. [10M]

6. Find IDFT of the sequence X(k)={ 7, -0.7071 -j 0.7071, -j, 0.7071-j0.7071, 1, 0.7071+j0.7071, j, -0.7071+j0.707} by using decimation in frequency FFT algorithm. [10M]

7. Find DFT of the sequence x(n)={1,1,1,1,1,1,1,0} by using decimation in frequency FFT algorithm. [10M]

8. Find IDFT of the sequence by using decimation in time FFT algorithm. [10M]
X(k)={20,-5.282-j2.414,0,-0.172-j0.414,0,-0.172+j0.414,0,-5.828+j2.414}

9. Compute IDFT of the following sequence, using traditional computation method [10M]
x(n)={ 7,-0.707-j0.707,-j, 0.707-j0.707,1, 0.707+j0.707,j,-0.707+j0.707}

10. Compute DFT of the sequence x(n)={1,2,3,4,4,3,2,1} Using traditional computation method [10M]

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UNIT-II

1.(a) Find convolution of x(n)={1,2,2,3,1} and h(n)= {1,2,3} [5M]

(b) Explain the relation between Z-plane and S-plane. [5M]

2. (a) what is transfer function and explain its importance while analyzing system stability. [5M]

(b) Explain any six properties of Z-transform. [5M]

3. (a) Explain the properties of Linear convolution. [5M]

(b). what are the different methods available to compute inverse Z-transform. [5M]

4.(a) Determine the response of a system whose impulse response h(n) is {1 -1 2 3 -2} for a input sequence x(n)={2 -1 4 2}. [5M]

(b). Find the ROC of the sequence $x(n)=a^nU(n)-b^nU(-n-1)$. [5M]

5. Consider the following Sequence

i) $X_1(n)=(0.4)^nU(n)$ ii) $X_2(n)=(-0.6)^nU(n)$

iii) $X_3(n)=(0.3)^nU(n-4)$ iv) $X_4(n)=(-0.3)^nU(-n-2)$

(a) Determine the ROCs of the Z-Transform of each of the above sequence [5M]

(b).From the ROCs determined in part (a), Determine the ROC of following sequence [5M]

i) $Y_1(n)= X_1(n)+ X_2(n)$ ii) $Y_2(n)= X_1(n)+ X_3(n)$

iii) $Y_3(n)= X_2(n)+ X_4(n)$ iv) $Y_4(n)= X_3(n)+ X_4(n)$

6. Show that the following sequences have same Z-Transform and different ROCs

i) $X_1(n)=-6(0.3)^nU(n) - 6(0.5)^nU(-n-1)$ [5M]

ii) $X_2(n)=-6((0.3)^n - (0.5)^n)U(-n-1)$ [5M]

7. Let X(z) denotes the Z-Transform of $X(n)= (0.4)^nU(n)$

(a) Determine the inverse Z-Transform of $X(z^2)$ without computing X(z). [5M]

(b) Determine the inverse Z-Transform of $(1+z^{-1})\ X(z^2)$ without computing X(z). [5M]

8. Determine the inverse Z-transform of following [10M]

i) $Y_1(z) = \frac{z(z-1)}{(z+1)(z+\frac{1}{3})}$ $|z|>1$ ii) $Y_2(z) = \frac{4-3z^{-1}+3z^{-2}}{(z+2)(z-3)^2}$ $|z|>3$

9. (a) Explain the properties of ROC [5M]

(b) Find convolution of x(n)={2,-5,3,2-1} and h(n)= {-1,4,-3,2} [5M]

10. Determine the response of a system whose impulse response h(n) is {2,-1,7,3,-5,2} for a input Sequence x(n)={3,-2,1,4,5}. [10M]

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UNIT –III

1. (a) Discuss the realization of FIR filter structures. [5M]

   (b) Realize FIR filter with system function in cascade form [5M]

   H (z) = 1 + (5/2) z-1+2z-2+2z-3.

2. Consider the system $y(n) = y(n - 1) + 2y(n - 2) + x(n)$
   (a) Find H(z) [5M]
   (b) Realize using direct form-II [5M]

3. Realise the discrete system $y(n) = -0.1y(n-1)+0.2y(n-2)+3x(n)+3.6x(n-1)+0.6x(n-2)$ using,
   (a) Cascade forms [5M]
   (b) Parallel forms. [5M]

4. (a) Explain the Direct form-I realization of Linear Constant Coefficient Difference equation. [5M]
   (b) Explain the Direct form-II realization of Linear Constant Coefficient Difference equation [5M]

5. (a) Explain the advantages and disadvantages of Direct form-II realization [5M]
   (b) Realize following system with difference equation in cascade form [5M]
   y(n)=y(n) = y(n - 1) + 2y(n - 2) + x(n)
6. What is the principle of designing FIR filters using windows? [10M]
7. Realize system with following difference equation
   y(n) = (3/4) y(n-1) – (1/8) y(n-2) + x(n) + (1/3)x(n-1)
   (a)direct form-I [5M]
   (b)direct form-II [5M]
8. Realize system with following difference equation
   y(n) = (3/4) y(n-1) – (1/8) y(n-2) + x(n) + (1/3)x(n-1).
   (a) cascade form [5M]
   (b) Parallel form [5M]
9. Explain briefly about different structures in IIR systems [10M]
10. Obtain the direct form I , direct form-II ,cascade and parallel form realization for the system

    y(n)= -0.1y(n-1)+0.2y(n-2)+3x(n)+3.6x(n-1)+0.6x(n-2) [10M]

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UNIT –IV

1. Draw the magnitude spectrum, phase spectrum of the following windows and also write their time domine representation [10M]
   a) Hamming window b) Triangular window c) Blackman window

2. Design an ideal highpass filter with a frequency response as shown in bellow

   $H_d(W) = 1$ where $\{\pi/4 \le W \le \pi$ and $-\pi \le W \le -\pi/4\}$

   $H_d(W) = 0$ {otherwise}

   find the values of h(n) for N=11, and also find H(z), plot magnitude and phase response using Rectangular window. [10M]

3. Design an analog Butterworth filter that has a -2db pass band attenuation at a frequency of 20rad/sec and at least -10dB stop band attenuation at 30 rad/sec (assumeΩc = 21.3868 rad/sec) [10M]

4. (a) What are the effects of windowing? [5M]
   (b) Discuss about characteristics linear phase FIR filters. [5M]

5. Give the expression for rectangular window function. Find its frequency response and also sketch its spectrum. Also discuss its features. [10M]

6. Convert the following analog filter transfer function using backward difference method, Impulse invariant method and Bilinear Transformation method. H(s)=1/(s+0.2) Consider T= 1 Sec [10M]

7. Write a MATLAB program with expected outputs to design the following [10M]
   i) IIR low pass filter ii) IIR high pass filters

8. Write a MATLAB program with expected outputs to design FIR filters using [10M]
   i) Rectangular Window ii) Hanning Window

9.(a) What are the Preliminary conditions to be consider for designing IIR filters [5M]
   (b) Compare FIR and IIR Filters [5M]

9. (a)Discuss about quantization process and explain quantization of fixed-point numbers. [5M]
   (b).Write a short note on dynamic range scaling [5M]
10. (a) Explain the design procedure of Chebyshev approximation [5M]
    (b). Explain the design procedure of Butterworth approximation [5M]

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UNIT –V

1.(a) Explain the quantization by truncation and rounding method. [5M]
(b) Explain zero input and overflow limit cycle oscillations with respect to finite word length effects. [5M]

2. (a) Justify 'sampling after reconstruction' By using suitable equations. [5M]
(b) With an example explain about Interpolator. [5M]

3. (a) How do you Quantize Fixed point numbers [5M]
(b) What is aliasing ? What is the need for anti- aliasingfilter prior to down sampling. [5M]

4. (a) Consider a second order digital filter structure and find its model for product round-off error analysis with an example. [5M]
(b) Discuss about round-off errors in FFT algorithm. [5M]

5. (a) Illustrate the process of quantization of fixed point and floating point numbers in the analysis of finite word length effects. [5M]
(b) Explain the effect of input scaling on signal to noise ratio (SNR). [5M]

6. (a) What are the errors that effect using feedback? [5M]
(b) Write the limits of IIR digital filters. [5M]

7. (a) Discuss about fast DFT algorithm based on index mapping. [5M]
(b)Write a short note on narrow frequency band of DFT. [5M]

8. (a) Explain about multistage implementation of sampling rate conversion.
(b) Explain about sampling rate conversion by a rational factor I/D.

9. (a) Explain clearly type-1 and type-2 Polyphase Decomposition [5M]
(b). Explain clearly about Nyquist filters. [5M]

10. (a) Discuss the need for signal compression. [5M]
(b) Explain the concept of dual tone multi frequency signal detection. [5M]

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