Bharati Vidyapeeth's College Of Engineering For Women,

Pune-411043

Electronics and Telecommunication Department

Sub:- DSP ***Marks:-30***

Class:- T.E$_1$(E&TC.)

N.B.- Solve any two questions

Assume the necessary data

Q-1 a) Compute the Z transform of following sequences and draw the ROC. -------8M

I) $x(n) = 3^n u(n-2)$ II) $x(n) = (1/3)^n u(-n)$

b) Compute the Inverse Z transform of following sequences ----------8M

I) $x(z) = \dfrac{Z^2}{(Z-1)(Z-0.5)}$ II) $\dfrac{Z}{(Z-1)^3}$

Q-2 a) Compute the Discrete Fourier Transform of following sequences ---------8M

I) x(n) = { 1,2,0,-1} II) x(n) = {1,2,1,2}

b) Compute the Discrete Fourier Transform of following sequences ----------6M

I) x(k) = {6,-2+2j,-2,-2-2j} II) x(k) = { 0,2,0,2}

Q-3 a) State & Prove the properties of Z Transform (Any Four) -------6M

b) State & Prove the properties of DFT (Any Four) -------6M

c) Compute the DFT of following sequences by using Circular Convolution ---6M

x1(n)={1,2,3,4} x2(n) ={ 4,3,2,1}

d) Find the DTFT of the following sequence of length L. --------6M

x(n) = A for $0 < n < L-1$

= 0 Otherwise

Q-4 a) Compute the DFT by using DITFFT algorithm --------6M

X(n) = {1,2,4,3}

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Sub:- DSP Class:- T.E$_1$(E&TC.) Marks:-50

N.B.- Solve any two questions from Q-2,Q-3,Q-4,Q-5

Q-1 is compulsory

Assume the necessary data

Q-1 a) State the advantages of DSP over ASP ----------6M

b)Determine the solution of difference equation ----------6M
y(n)= (5/6) y(n-1)-(1/6)y(n-2) + x(n) for x(n)= 2^n u(n)

C) Compute the DTFS of following sequences ----------6M
I) x (n) = cos(pi/3)n

Q-2 a) Determine whether the following systems are Time variant/ Invariant,Stable/Unstable, Causal/Anticausal ,Linear/Nonlinear ---------8M
I) x(n) = nx(n) II) x(n) = y(n)= x(n)+nx(n+1)

b) Determine and sketch the magnitude and phase response of the following systems. --8M
1)y(n)=1/3[x(n)+x(n-1)+x(n-2)]
2) y(n) =1/2[x(n)-x(n-1)]

Q-3 a)Draw the Direct form I & II structure for the following equation ----------10M
y(n)-3/4y(n-1)+1/8 y(n-2)=x(n)+1/2x(n-1)

b)State and prove the relationship of S plane to Z plane for impulse invariance method--6M

Q-4 a) Explain in brief Frequency warping of Bilnear Transformation----------6M

b) Find the Transfer function of
H(s)= 1/(s+1) at its banwidth known to be 1 rad/sec.
Use BZT to design a filterwhose Bb.w. IS 20 hz at 60 sps --------10M

Q-5 a) Design a FIR Filter by using fourier series method Draw the magnitude response also -------12M

Hd(f)= 1 0<=F<=1000HZ
=0 Elsewhere

Impulse sequence duration is limited to 2.5 msec.

b) Compare the FIR filter with IIR filter ----------4M

ALL THE BEST

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Electronics and TeleCommunication Department

Unit Test I T.E. Academic Year: 2009-2010

Subject: DSP

Duration: 1 hour **Marks: 30**

A.)1st question is compulsory.

B.)From 2 to 5 solve any 3 questions.

1. Discuss about causality and stability of DT system. [6]

2. Determine zero input response for 2nd order difference equation.

y(n)=3y(n-1)-4y(n-2)=0 [8]

3. Find out particular solution for following difference equation. Assume

x(n)=u(n).

y(n)+3y(n-1)=x(n). [8]

4. Obtain inverse transform using partial fraction expansion method.

$$X(z)=\frac{1-1/2z^{-1}}{1-1/4z^{-1}}$$ **[8]**

5. A DT system has transfer function H (z) = $\frac{1+2z^{-1}}{1+0.5z^{-1}}$

Give all possible ROC of H (z). State in each case whether system is stable. [8]

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Electronics and TeleCommunication Department

Unit Test II T.E. Academic Year: 2009-2010

Subject: DSP

Duration: 1 hour **Marks: 30**

a.)1st question is compulsory.

b.)from 2 to 4 solve any 2.

1a. Given 2 sequences of length 4 are x(n)={0,1,2,3}. h(n)={2,1,1,2}.

Find circular convolution using graphical method. [4]

1b. Calculate DFT of sequence x(n)={1,1,0,0} & check validity of your answer by

Calculating its IDFT. [4]

1c. Comparison between Impulse Invariance & Bilinear transformation. [4]

2a. Find linear convolution using overlap save method.

x(n)={1,2,-1,2,3,-2,-3,-1,1,1,2,-1}

h(n)={1,2,3}

2b. Compute eight point DFT of sequence

x(n)={1/2,1/2,1/2,1/2,0,0,0,0}

3a.The transfer function of analog filter is $h(s)= \frac{3}{(s+2)(s+3)}$ with T_s=0.1 sec

Design digital IIR filter using BLT. [8]

3b. A digital filter has frequency specifications as

Passband frequency=$w_p=0.2\pi$

Stopband frequency=$w_s=0.3\pi$

What are corresponding specifications for passband frequency in analog domain?

I. Impulse invariance technique is used.

II. Bilinear transformation is used for designing. [8]

4a. design chebyshev analog filter with max. passband attenuation of 2.5db at Ω_p=20rad/sec & stopband attenuation of 30db at Ω_s=50rad/sec.

4b.convert analog filter with system function H(s) into digital filter using impulse invariance method.

$$H(s) = \frac{10}{S^2+7s+10}$$ [8]

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Unit Test I T.E. Academic Year: 2009-2010

Subject: DSP

Duration: 1 hour **Marks: 30**

1) What is ROC with respect to z-transform?What are its properties? [5]

2)Determine Z transform of following finite duration sequence

i) X(n)={1,2,4,5,0,7}

ii) X(n)={1,2,4,5,0,7} [5]

3)Obtain inverse Z transform of the following using Partial fraction expansion

$X(z)= [1-(1/2z)]/[1-(1/4z)]$ $|z|>1/2$ [7]

4)A causal system has differential equation given by

$Y(n)=0.5y(n-1) -0.25y(n-2)+x(n)$

What is ROC of transfer function of system. [7]

5)A DT system has transfer function

$H(z)=[1+2/z]/[(1+0.5/z)(1+3/z)]$

Give all possible ROC of this system.State in each case whether system is stable. [6]

UNIT TEST 2 2009-10

DSP

TE ENTC MARKS[25]

1)Comparison between radix 2 DIT-FFT and Radix 2 DIF-FFT. [3]

2)Write note on

i) Overlap save method

ii) Overlap add method [4]

3)The first five point of 8 pt DFT of real valued sequence are

{0.25,0.125-j0.03018,0,0.125-j0.0518,0}.Determine three remaining 3 pts. [6]

4)Calculate DFT of sequence x(n)={1,1,0,0} and check validity of answer by calculating its IDFT (use tabular factor method). [6]

5)Find linear convolution of x1(n) and x2(n) if

X1(n)={1,2,3,4} x2(n)={1,1,1}

Obtain same result using circular calculation. [6]

UNIT TEST 3 2009-10

DSP

TE-ENTC

1)What are the advantages of windowing method in FIR? [2]

2)Wrute a short note on Gibbs phenomenon ? [2]

3)Why FIR filtera are called inherently stable? [3]

4)Determine the filter coeffecients hd(n) for desired frequency response of low pass filter given by

$Hd(e^{j\omega})$ ={$e^{-j\omega}$ - π/4 ≤ ω ≤ π/4

0 π/4 ≤ ω ≤ π }

If we define new filter coefficients by

h(n)=hd(n) w(n)

w(n)={ 1 for 0 ≤ n ≤ 4

0 otherwise

Determine h(n). [8]

5)Obtain linear phase realization of

H(z) = 1+ 1/4z +1/4z^2 +1/z^3 [5]

6)Realize following system function in Direct form

H(z)= 1+3/4z +17/8z^2+3/4z^3+z^{-4} [5]

UNIT TEST 1 2010-11

DSP

TE ENTC

1a)List the advantages and disadvantages of DSP over analog signal processing. [4]

b)Obtain Z transform of the following duration sequence

x(n)={1,2,4,5,0,7} [4]

c)Obtain inverse Z transform using P.F.E method

X(Z)= [1-1/2z]/[1-1/4z^2] |Z|>1/2 [7]

OR

2a)Discuss about causality and stability of discrete time system. [4]

b)Determine Z transform of x(n)=(n+1)μ(n) [4]

c)Obtain inverse Z transform using P.F.E method

X(Z)=1/(1-1.5z^{-1} + 0.5z^{-2})

i) ROC: |Z|>1
ii) ROC: |Z|<0.5
iii) ROC: 0.5<|Z|<1 [7]

3a)Compute DFT of four point sequence

X(n)={0,1,2,3} [4]

b)Perform circular convolution using matrix method

X(n)={1,2,3,1} h(n)={4,3,2,2} [4]

c)Find linear convolution using overlap add method

X(n)={1,2,-1,2,3,-2,-3,-1,1,1,2,-1} h(n)={1,2,3,} [7]

OR

4a)Determine length 4 saquence from its DFT

X(K)={4,1-j,-2,1+j} [4]

b)Perform circular convolution using concentric circle method

X(n)={0,1,2,3} h(n)={2,1,1,2} [4]

c)Find linear convolution using overlap save method

x(n)={1.2.-1.2.3.-2.-3.-1.1.1.2.-1}

h(n)={1,2,3} [7]

UNIT TEST 2 2010-11

DSP

TE ENTC

1)Show and compare computational complexity is reduced if 32 pt DFT is computed using Radix 2 DIT FFT algorithm. [3]

b)Find out H(z) using impulse invariance method at 5Hz sampling frequency from H(s)

H(s)=2/(s+1)(s+2) [6]

c)A digital filter has frequency specifications as,

i)pass band frequency =ω_p=0.2π

ii)stp band frequency=ω_z=0.3π

What are the corresponding specifications for pass band and stop band frequency in analog domain if

i)Impulse invariance technique is used for designing.

ii)Bilinear transformation technique is used for designing. [6]

OR

2a)IIR LP filter is required to meet following specification

Pass band peak to peak ripple ≤ 1dB,pass band edge 1.2KHz,
stop band attenuation ≥ 40dB,stop band edge 2.5KHz ,sample rate 8KHz

Filter is designed by performing BLT on analog system function of required order Butterworth filter so as to meet specification in implementation. [10]

b)How stable analog filter is converted into stable digital filter and explain. [5]

3)Given x(n)= 2^n and N=8. Find x(k) using DIT FFT algorithm [8]

b)The transfer function of analog filter is

H(S)=3/(s+2)(s+3) with ts=0.1sec

Find system transfer of digital filter using BLT. [7]

OR

4a)Obtain DFT of sequence

X(n)={1/2,1/2,1/2,1/2,0,0,0,0} using DIF FFT algorithm. [8]

b)Design Chebyshev analog filter with maximum passband attenuation of 205dB at Ω_p=20 rad/sec .Stop band attenuation of 30dB at Ω_s=50 rad/sec.