7. (a) Consider the causal linear shift-invariant filter with system function 7

$$H(z)=\frac{\left(1+0.875z^{-1}\right)}{\left(1+0.2z^{-1}+0.9z^{-2}\right)\left(1-0.7z^{-1}\right)}$$

Draw a signal flow graph for the system using direct form II.

(b) Show that for bilinear transformation

$$S=\frac{2}{T}\left(\frac{1-z^{-1}}{1+z^{-1}}\right)$$ where T in sampling duration. 7

8. (a) Design a filter with 7

$$H_d\left(e^{-jw}\right)=\begin{cases} e^{-j3w}, & \frac{-\pi}{4}\le w\le\frac{\pi}{4} \\ 0, & \frac{\pi}{4}\le|w|\le\pi \end{cases}$$

using a Hamming window with M=7

(b) Derive order formula for cheby shev filter. Assume required parameters. 7

9. (a) Determine the IDFT of $x(u)=\{3,(2+j),1,(2-j)\}$ 7

(b) consider the dinerete time sequence $x[n]=cos\left(\frac{n\pi}{8}\right)$

Find two different continuous time signal, that would produce thin sequence when sampled at a frequency of $f_s=10Hz$. 7

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Code : 041710

B.Tech.7th Semester Special Examination,2016

Digital Signal Processing

Time : 3 hours *Full Marks : 70*

Instructions :

*(i) There are **Nine** questions in this paper.*

*(ii) Attempt **Five** questions in all.*

*(iii) **Questions No.1 is Compulsory.***

(iv) The marks are indicated in the right hand margin.

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1. Answer any seven questions: 2×7=14

(a) Find convolution of $x[n]=a^n u[n]$ and $G[n]=u[n]$

(b) $x[n]=(6-n)[u[n]-u[n-6]]$

value of sketch of $y,[n]=x(4-n)$

(c) Find the correlation between the sequence

$x(n)=u[n]-u[n-6]$ and $G[n]=u(n-2)-u(n-5)$

(d) Define the linear phase filter

(e)

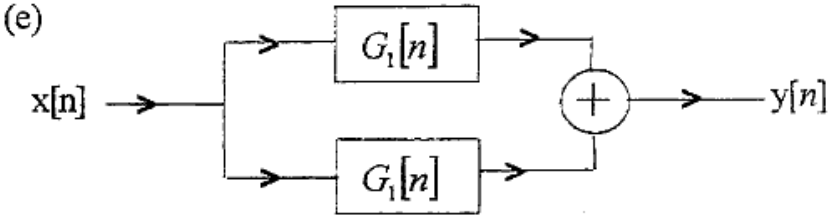

Fig- -1

Find the frequency response of the parallel network shown in Fig-1. The systems are Linear shift-invariant systems.

(f) Find the DTFT of the sequence

$x_1[n]=\alpha^n u[n]$ for $|\alpha|<1$

(g) Let $G[n]$ be the unit sample response of an linear shift invarient system.

Find the frequency response

when $G[n]=\delta[n]+6\ \delta[n-1]+3\ \delta[n-2]$

(h) Explain Nyanist Sampling theorem with proper mathematical expressions

(i) If $X(Z)$ in Z transform of $x[n]$,

Then find the Z transform of $nx[n]$

(j) Let $x[n]$ be the sequence

$x[n]=2\ \ \delta[n]+\delta[n-1]+\delta[n-3]$

then find four-point DFT of $x[n]$

2. (a) Suppose that a sequence $x[n]$ has a Z transform 7

$$x(Z)=\frac{4-\frac{7}{4}z^{-1}+\frac{1}{4}z^{-2}}{1-\frac{3}{4}z^{-1}+\frac{1}{8}z^{-2}} \text{ with Roc } |z|>\frac{1}{2}$$

find $x[n]$ using partial fraction expansion method.

(b) Discuss the advantages of DSP over analog processing. 7

3. (a) The Z - transform of a sequence $x[n]$ is

$$X(z)=\frac{z+2z^{-2}+z^{-3}}{1-3z^{-4}+z^{-5}}$$ 7

if ROC include the unit circle.

Then find the DTFT of $x[n]$ at $\omega=\pi$

(b) Evaluate the convolution of the two sequence 7

$G[n]=(0{\cdot}5)^n u[n]$ and $x[n]=3^n u[-n]$

4. (a) A causal linear shift-invariant system is characterized by the difference equation

$$y[n]=\frac{1}{4}y[n-1]+\frac{1}{8}y[n-2]+x[n]-x[n-1]$$

Find the system function $H(z)$, and the unit sample response $G[n]$. 7

(b) How may we compute the N-point DFT of two real-valued sequencer $x_1(n)$ and $x_2(n)$, using one N-point DFT? 7

5. (a) Consider two Sequence 7

$$x_1(n)=cos\left(\frac{2\pi n}{n}\right) \text{ and } x_2(n)=sin\left(\frac{2\pi n}{N}\right)$$

Find the N point circular convolution of $x_1(n)$ with $x_2(n)$.

(one DFT property)

(b) Design a Low pass buffer worth filler to meet the specifications $fp = 6kHz$, $fs = 10kHz$, $Sp = \delta$ s=0·1. 7

6. Discuss with mathematical expression on decimation in time FFT algorithm also draw the eight point radix-2 butterfly signal flow diagram 14

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