B.Tech. Degree VI Semester (Supplementary) Examination, October 2009

CS/EI/EE 601 DIGITAL SIGNAL PROCESSING

(2002 Scheme)

Time: 3 Hours Maximum Marks: 100

I a) (i) Find the convolution of the signals

$x(n)=1$ for $n=0,1$

$=2$ for $n=2,3$

$=0$ elsewhere

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

(ii) Determine the response of the initially relaxed system characterized by the impulse response $h(n)=(1/2)^n u(n)$ to the input signal $x(n)=2^n u(n)$. (5)

b) Check the linearity, time invariance, causality and stability of the following systems

i) $y(n)=nx(n)$

ii) $y(n)=\cos w_0 n$ (10)

OR

II a) (i) Write short notes on system function. (5)

(ii) State and explain the time reversal and differentiation property of $z-$transform. (5)

b) Find the inverse $z-$transform of $X(z)=\dfrac{z(z^2-4z+5)}{(z-3)(z-1)(z-2)}$ for ROC

(i) $2<|z|<3$ (ii) $|z|>3$ (iii) $|z|<1$ (10)

III a) (i) Perform the circular convolution of the following sequences

$x(n)=\{1,-1,2,-2\}$ $h(n)=\{1,2,3,4\}$ (5)

(ii) Explain the relationship of DFT to Z – transform. (5)

b) Find the linear convolution of the sequences

$x(n)=\{1,-1,2,-2,3,-3,4,-4,5,-5,6,-6\}$ and $h(n)=\{1,1\}$

using overlap add method. (10)

OR

IV a) Explain DIF FFT algorithm. (10)

b) Determine the DFT values of the sequence $x(n)=\{2,2,2,2,1,1,1,1\}$ using radix 2 DIT FFT algorithm. (10)

V a) (i) Explain Gibbs oscillations. (5)

(ii) Write short notes on windowing. (5)

b) Explain frequency sampling method of FIR filter design. (10)

OR

(Turn over)

VI a) Design an ideal low pass filter with a frequency response

$$Hd\left(e^{jw}\right)=1 \text{ for } -\pi/3 \le w \pi/3$$

$= 0$ elsewhere

Use Fourier series method for the design choosing N = 11. (10)

b) Obtain the direct form, cascade form and lattice structure realization of the FIR systems given by $H(z)=1+2z^{-1}+3z^{-2}+4z^{-3}+3z^{-4}+2z^{-5}+z^{-6}$. (10)

VII a) (i) Write short notes on prewarping. (5)

(ii) Compare FIR and IIR filters. (5)

b) Obtain the direct form I, direct form II, cascade and parallel form realization for the following system.

$$y(n)=-0.1\,y(n-1)+0.2\,y(n-2)+3x(n)+3.6x(n-1)+0.6\,x(n-2).$$ (10)

OR

VIII a) Using the bilinear transform, design a high pass filter, monotonic in pass band with cut off frequency of 1000 Hz and down 10dB at 350 Hz. The sampling frequency is 5000 Hz. (10)

b) Design a chebyshev low pass filter with the following specifications.

$\alpha p=1\,dB$ ripple in the pass band $0 \le w \le 0.2\pi$ $\alpha_s=15\,dB$ in the stop band $0.3\pi \le w \le \pi$ using Impulse invariance. (10)

IX a) Draw and explain the architecture of typical DSP Processor. (10)

b) Explain any two applications of DSP. (10)

OR

X a) (i) Write short notes on product quantization error. (5)

(ii) Write short notes on signal sealing. (5)

b) With an example explain limit cycle oscillations. (10)

***