BTS(C) 051(A)

B.Tech. Degree VI Semester Examination, July 2002

CS/EC/EI 601 DIGITAL SIGNAL PROCESSING

(1999 Admissions)

Time: 3 Hours *Max. Marks: 100*

(All questions carry equal marks)

I a) Explain the terms (i) convolution (ii) up sampling (iii) down sampling.

b) Determine the impulse response and step response of the system

$y(n) = e^{k} y(n-1) - x(n)$ given that $y(n) = 0$ for $n < 0$

OR

II a) State and prove scaling property of Z-transform.

b) Determine the inverse transforms of

(i) $X(z) = \dfrac{1}{1-1.5z^{-1}+0.5z^{-2}}$ $ROC\ |z|>1$

(ii) $X(z) = \dfrac{1}{z^{2}-1.2z+0.2}$ $ROC\ |z|>1$

III a) Explain the term circular convolution and how it is different from linear convolution.

b) A sequence $x(n) = \{-1,0,1,0\}$ is to be convolved with another sequence $y(n) = \{1,-1,0,1\}$ to produce $w(n)$. Determine $w(n)$ using circular convolution.

OR

IV a) Show that to any DIT FFT algorithm there corresponds to an inverse transform algorithm that is decimation in frequency.

b) Compare the multiplications and additions involved in radix 2 FFT algorithm and direct computation of DFT.

V a) Explain frequency sampling method of FIR filter design.

b) Using frequency sampling method, design a filter whose magnitude characteristic is given by

$H(0) = H(1) = H(15) = 1$ and

H(k)=0 *for* $k = 2,3,.....14$

Realize the filter.

OR

VI a) Compare the characteristics of different windows used in filter design.

b) Design a linear phase FIR digital filter for a -3dB cut-off frequency of 30π rad/sec. and attenuation of 50 dB at 45π rad/sec with a sampling rate of 100 per sec. Realize the filter.

VII a) Explain bilinear transformation as applied to the design of digital filters.

b) Realize the following IIR filter using bilinear transformation.

$$H(s) = \frac{2s^{2}+3s+3}{s^{2}-10s+5}$$

Draw the block diagram of the resulting transfer function.

OR

VIII a) Compare Butterworth and Chebyshev filters.

b) Design an IIR filter using bilinear transformation -5 dB at 600 Hz Monotonic stop and pass band response at least -16 dB at 1 KHz. Sampling rate 2000/sec.

IX a) Describe briefly any one application of DSP.

b) Explain how fixed point and floating point representation are used to represent numbers in a digital system.

OR

X a) Explain what is meant by truncation and rounding.

b) Explain the architecture of a typical DSP processor briefly.

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