BTS(C) – VI – 06 – 017 (C)

B.Tech. Degree VI Semester Examination, June 2006

CS/EI/EE 601 DIGITAL SIGNAL PROCESSING

(2002Admissions)

Time: 3 Hours

Maximum Marks: 100

I a) Test the following systems for the properties of linearity, causality, time invariance and stability. (4+4=8)

(i) $y(n) = nx(n)$ (ii) y(n)=x(n)-x(n-1)

b) Obtain and sketch the impulse response of a system described by (12)

$$y(n) = 0.4x(n) + x(n-1) + 0.6x(n-2) + x(n-3) + 0.4x(n-4)$$

OR

II a) Find the one sided Z transform of the following sequence. (5)

x(n) $=na^{n-1}$

b) Find the inverse Z transform of $X(z) = \dfrac{1}{1-1.5z^{-1}+0.5z^{-2}}$ (5)

c) Determine the impulse response for the cascade of two LTI systems with impulse responses (10)

$$h_1(n) = \left(\frac{1}{2}\right)^n u(n) \text{ and } h_2(n) = \left(\frac{1}{4}\right)^n u(n).$$

III a) State and prove the time shifting property of DFT. (8)

b) Express the relation between Z transform and DFT. (2)

c) Using DFT perform circular convolution of the two sequences (10)

$$x(n) = Cos\left(\frac{\pi n}{2}\right) n = 0,1,2,3 \text{ and } h(n) = 2^n \ n = 0,1,2,3.$$

OR

IV Determine the response of an LTI system by radix 2 DITFFT whose input is $x(n) = \{1,1,1\}$ and impulse response is $h(n) = \{-1,-1\}$ (20)

V a) Draw the direct form structure of the FIR system described by the transfer function. (5)

$$H(z) = 1 + \frac{1}{2}z^{-1} + \frac{3}{4}z^{-2} + \frac{1}{4}z^{-3} + \frac{1}{2}z^{-4} + \frac{1}{8}z^{-5}$$

b) Describe the following window functions with their responses. (8)

(i) Hanning Window (ii) Hamming window (8)

c) Describe the fourier series method of filter design. (7)

OR

VI Design a HPF using hamming window with a cut off frequency of 1.2 rad/sec and N=9 (20)

(Turn Over)

VII a) Obtain the direct form 1 and direct from II realizations of discrete time system represented by the transfer function .

$$H(z)=\frac{8z^3-4z^2+11z-2}{(z-1/4)(z^2-z+1/2)}$$ (10)

b) Describe 5 properties each of Butterworth filters and Chebyshev filters. (10)

OR

VIII Design a Butterworth IIR digital filter using bilinear transformation for the specifications.

$$\frac{1}{\sqrt{2}} \le |H(w)| \le 1.0 \quad ; \quad 0 \le w \le 0.2\pi$$

$$|H(w) \le 0.08 \quad ; \quad 0.4\pi \le w \le \pi$$ (20)

IX a) Draw and explain the block diagram of any typical DSP processor. (10)

b) What is meant by finite word length effects in digital filters? (5)

c) Compare fixed point and floating point number arithmetic. (5)

OR

X a) Explain limit cycle oscillations with an example. (5)

b) Explain truncation and rounding. (5)

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