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SF-7071

B. E. III (Sem. VI) (CO.) Examination

May / June – 2011

Digital Signal Processing

Time : Hours] [Total Marks :

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ **B. E. III (Sem. VI) (CO.)**

Name of the Subject :

☛ **Digital Signal Processing**

☛ Subject Code No. : **7 0 7 1** ☛ Section No. (1, 2,.....) : **NIl**

Seat No. :

Student's Signature

(2) Assume suitable data.

(3) Usage of scientific caculator is permitted.

(4) Figures to the right indicate marks.

1 (a) Asnwer the following. **10**

(1) Find the Z-transform of **2**

$$x(n)=2^n u(n-2)$$

(2) Check the stability condition for **2**

$$y(n)=a^n u(n)$$

(3) The analog signal is sampled by 600 samples per second. What is the maximum frequency ? **2**

(4) State differentiation property of ZT. **1**

(5) How many number of complex multiplications and additions are required for 8-point DFT ? **2**

(6) Find ZT of x(n) = u(–n) **1**

(b) With the help of Z.T. Prove linear convolution in time domain. **6**

2 (a) Find Z.T. of $2^n + 3^{-n}$ *for* $n \geq 0$ **6**

(b) By using PFE method, find I.Z.T. of **8**

$$H(z)=\frac{-4+8z^{-1}}{1+6z^{-1}+8z^{-2}}$$

OR

(b) Determine I.Z.T. of $x(z)=\frac{5z}{6z^2-z-1}$ 8

$Roc: \frac{1}{3}<|z|<\frac{1}{2}$

3 (a) Check whether the system is linear or non-linear and variant or time invariant. 4

$y(n)=n[x(n)]^2$

(b) A second-order discrete time system is characterised by the difference equation 8

$y(n)-0.1\,y(n-1)-0.02\,y(n-2)=2x(n)-x(n-1)$. Determine $y(n)$ *for* $n\geq 0$ *when* $x(n)=u(n)$ and the initial conditions are $y(-2)=5$

OR

(b) Find x(n) corresponding to difference equation. 8

$x(n-2)-2x(n-1)+x(n)=1$ *for* $n\geq 0$ with initial condition $x(-1)=0.5,\ x(-2)=0$.

(c) Determine $\mathbb{R}_{yx}(l)$ for given sequence 8

$x(n)=\{-3,-2,\ 1,4,8,-3\}$

$y(n)=\{1,1,\ 1,-1,2,-2\}$

4 (a) Perform linear convolution of given sequence using DFT. 8

$x(n)=\{\underset{\uparrow}{1},2\}$ *and* $h(n)=\{\underset{\uparrow}{2},1\}$

(b) Given $x(n)=\{0,1,2,3,4,5,6,7\}$ 8

Find x(k) using DIT FFT algorithm.

OR

4 (a) Give $x(k)=\{20,-5.828,-j2.414,-0.172,-j0.414,0,-0.172+j0.414,0,-5.828+j2.414\}$ 8

Find x(n)

(b) Find the 4-point DFT of the sequence $x(n)=\cos\frac{n\pi}{4}$ 8

5 (a) An FIR filter has the unit impulse response sequence h(n) = {2,2,1}. Determine the output sequence in response to the input sequence x(n) = {3,0,–2,0,2,1,0, –2,–1,0} using the overlap - add convolution method. **8**

(b) Design a digital butterworth filter that satisfies the following constraint using bilinear transformation. Assume T = 15. **8**

$$0.9 \le \left|H(e^{jw})\right| \le 1 \qquad 0 \le w \le \pi/2$$

$$\left|H(e_{jw})\right| \le 0.2 \qquad \frac{3\pi}{4} \le w \le \pi.$$

6 Write short note on following. **18**

(Attempt any three)

(1) Overlap-Save method.

(2) Divide and conquer approach.

(3) Design of IIR filter using approximate derivatives.

(4) Application of DSP.

(5) Computational complexity of FFT method.