B.Tech. Degree VI Semester (Supplementary) Examination, November 2005

CS/EI/EE 601 DIGITAL SIGNAL PROCESSING
(2002 Admissions)

Time: 3 Hours   Maximum Marks: 100

I   a)   Explain the different basic properties of discrete system with example.   (8)

     b)   Check the y(n)=nx(n) system are time invariant, Linear as static   (6)

     c)   Explain the classification of discrete time signals.   (6)

<div align="center">OR</div>

II   a)   Evaluate the convolution y(n)=x(n)*h(n) of the sequence

$$x(n) = \{1,1,0,1,1\}$$
<div align="center">↑   and</div>

$$h(n) = \{1,-2,-3,4\}$$
<div align="center">↑</div>

                  (7)

     b)   Explain the important properties of the ROC of the z-transform.   (5)

     c)   Determine the causal signals x(n) having z-transform $x(z) = \dfrac{1}{(1+z^{-1})(1-z^{-1})^{2}}$ (8)

III   a)   Find the convolution of the two signals $x(n) = u(n)$ and h(n)=a^{n}u(n) ROC $|a| < 1, n \geq 0$.   (10)

     b)   Explain any five properties of DFT.   (10)

<div align="center">OR</div>

IV   a)   Find the 4 point DFT of the seg $x(n) = \dfrac{\cos n\pi}{4}$.   (10)

     b)   Explain the Radix-2 DIT FFT algorithm.   (10)

V   a)   Determine direct form I and II and cascade form for the realization for the transfer

   $f \wedge$ of an FIR system is given by $H(z) = (1 - \dfrac{1}{4}z^{-1} + \dfrac{3}{8}z^{-2})(1 - \dfrac{1}{8}z^{-1} - \dfrac{1}{2}z^{-2})$ (9)

     b)   Discuss the cascade realisation of FIR system.   (4)

     c)   Design FIR filter using FS method and discuss Cribb's oscillation and how to reduce cribb's oscillations.   (7)

<div align="center">OR</div>

VI   a)   The desired response of a LPF is $Hd(e^{j\omega}) = \begin{cases} e^{-j3\omega} & \dfrac{-3\pi}{4} \leq |\omega| \leq \dfrac{3\pi}{4} \\ 0 & \dfrac{3\pi}{4} < |\omega| \leq \pi \end{cases}$

   Determine H($e^{-j3\omega}$) for M=7 using a Hamming window.   (10)

     b)   A LPF has the desired response as $Hd(e^{j\omega}) = \begin{cases} e^{-j3\omega} & 0 \leq \omega \leq \pi/2 \\ 0 & \pi/2 \leq \omega \leq \pi \end{cases}$

   Determine the filter co-efficients h(n) for M=7 using type I frequency sampling techniques.   (10)

VII   a)   Compare Butterworth and Chebychev filter.   (4)

b)   Convert the following analog filter into digital filter using impulse invariant method.   (6)
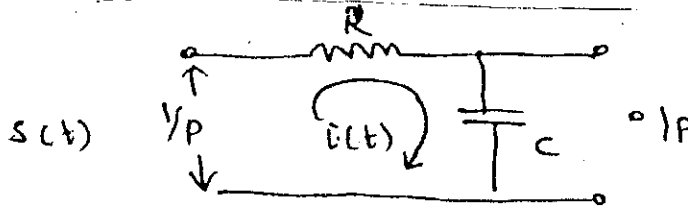
(c)   Obtain direct form I and II cascade and parallel form realization for the following system.

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

OR

VIII   a)   What is the mapping procedure between S plane and Z plane in the method of mapping of differential? What are its characteristics?   (6)

b)   Design a Chebychev filter for the following specification.

$$0.8 \le |H(e^{j\omega})| \le 1 \qquad 0 \le \omega \le 0.2\pi$$

$$|H(e^{j\omega})| \le 0.2 \qquad 0.6\pi \le \omega \le \pi$$

using   i) bilinear   and   (ii) impulse invariant method.   (14)

IX   a)   Write *short notes* on:
   i)   Limit cycle oscillations
   ii)   Quantization effecting the computation of DFT.   (10)

b)   Explain the application of DSP in image processing.   (10)

OR

X   a)   Draw and explain the architecture of a typical DSP processor.   (10)

b)   What are the effects of finite word length in digital filter? Explain the Rounding and Truncation error.   (10)

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