C.U.SHAH UNIVERSITY
Summer Examination-2016

Subject Name : Digital Signal Processing

Subject Code : 4TE06DSP1   **Branch: B.Tech (IC)**

Semester : 6   **Date : 13/05/2016**   **Time : 02:30 To 05:30**   **Marks : 70**

Instructions:
(1) Use of Programmable calculator & any other electronic instrument is prohibited.
(2) Instructions written on main answer book are strictly to be obeyed.
(3) Draw neat diagrams and figures (if necessary) at right places.
(4) Assume suitable data if needed.

Q-1   **Attempt the following questions:**   **(14)**

a)   Find Z transform of x(n)={1,2,3,4}.
  i) $1+1/z+5/2z+4/3z$ ii) $1+1/z+3/2z+4/3z$
  iii) $1+2z^{-1}+3z^{-2}+4z^{-3}$ iv) none of the above

b)   The system $y(t) = x(t) + 2x(t + 3)$ is,
  i) causal system   ii) non-causal system
  iii) partly (a) and partly (b)   iv) none of these

c)   The applications of FFT algorithm includes
  i) Linear filtering   ii) Correlation
  iii) Spectrum analysis   iv) all of the above

d)   Why IIR systems are called recursive systems?
  i) Because the feedback connection is present from input side to input
  ii) Because the feedback connection is present from output side to output
  iii) Because the feedback connection is present from output side to input
  iv) Because the feedback connection is present from input side to output

e)   If 'F' is the frequency of the analog signal, then what is the minimum sampling rate required to avoid aliasing?
  i) F   ii) 2F   iii) 3F   iv) 4F

f)   Zero padding means
  i) increasing length by adding zeros at the end of sequence
  ii) Decreasing length by removing zeros at the end
  iii) Inserting zeros in between the samples
  iv) None of the above

g)   What is meant by autocorrelation?
  i) the correlation of a sequence with its shifted

ii) this indicates how fast the signal changes

iii) both (i) and (ii)

iv) none

h) To realize FIR filter,

i) no feedback paths and forward path

ii) no feedback paths and no forward path

iii) feedback paths and no forward path

iv) feedback paths and forward path

i) Mention the advantages of DSP.

i) Veracity ii) Simplicity iii) Repeatability iv) All of the above

j) What is/are the crucial purposes of using the Fourier Transform while analyzing any elementary signals at different frequencies?

i) Transformation from time domain to frequency domain

ii) Plotting of amplitude & phase spectrum

iii) Both (i) & (ii)

iv) None of the above

k) What is impulse invariant transformation?

i) The transformation of analog filter to digital filter

ii) The transformation of digital filter to analog filter

iii) Both (i) & (ii)

iv) None of the above

l) Energy signal is,

i) Periodic ii) aperiodic iii) Continuous   iv) none

m) State the condition for a digital filter to be causal.

i) Digital filter is causal if its impulse response $h(n) = 0$ for $n<0$

ii) Digital filter is causal if its impulse response $h(n) = 1$ for $n<0$

iii) Digital filter is causal if its impulse response $h(n) = $ infinite for $n<0$

iv) None of the above

n) What is the reason that FIR filter is always stable?

i) all the poles are at imaginary axis

ii) all the poles are at real axis

iii) all the poles are at origin

iv) none of the above

Attempt any four questions from Q-2 to Q-8

Q-2   **Attempt all questions**

   a   What are the basic elements of DSP and its requirements?   **(07)**

   b   Explain in detail about direct form structures of FIR system.   **(07)**

Q-3   **Attempt all questions**

   a   Define convolution theorem as applied to discrete time signals.   **(07)**

Find the inverse z-transform of $X(z) = \dfrac{z}{(z-1)^2}$ using convolution theorem.

b   Explain in detail about direct form structures of IIR system. **(07)**

Q-4   **Attempt all questions**

a   Discuss various properties of DFT. **(07)**

b   Use graphical method, obtain a 5-point circular convolution of two DT signals **(07)**
defined as,
$x(n) = (1.5)^n, \quad 0 \le n \le 2$
$y(n) = 2n - 3, \quad 0 \le n \le 3$

Q-5   **Attempt all questions**

a   Explain relationship between, (1) DTFT and DFT (2) Z transform and DFT. **(07)**

b   Compute 4-point DFT of causal three sample sequence given by, **(07)**

$$x(n) = \begin{cases} \dfrac{1}{3}, & 0 \le n \le 2 \\ 0, & else \end{cases}$$

Q-6   **Attempt all questions**

a   Discuss decimation in time FFT algorithm for radix-2. **(07)**

b   Write a note on applications of dsp. **(07)**

Q-7   **Attempt all questions**

a   Discuss decimation in frequency FFT algorithm for radix-2. **(07)**

b   Write short note on application of wavelets. **(07)**

Q-8   **Attempt all questions**

a   Explain IIR filter design by Bilinear Transformation method. **(07)**

b   Compare FIR and IIR filters. **(07)**