Registration no: | | | | | | | | | | |

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B.TECH
PCEC 4304

Sixth Semester Examination – 2013
DIGITAL SIGNAL PROCESSING
BRANCH(EEE)
Time: 3 Hours
Max marks: 70

Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

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Q1 Answer the following questions: (2 x 10)

a) Define ROC. How to determine the stability criteria of a system function for a given ROC.

b) Determine the Z-transform of the signal given by

$$x(n)=\left(\frac{1}{2}\right)^n[u(n)+u(n-10)]$$

c) What is the relationship of DFT to fourier transform of an aperiodic sequence?

d) What is the importance of Discrete Cosine Transform?

e) Determine the direct form realization of the linear phase FIR filter having co-efficients h(n)={1, 2, 3, 4, 3, 2, 1}

f) Draw the butterfly diagram of the sequence x(n)={1,4,3,2} using DIF-FFT algorithm.

g) State Parseval's relation in DFT.

h) Compute the circular convolution of the sequence x(n)={1, 2, 3, 4} and h(n)={1, 2} using time domain method.

i) What is Gibb's phenomena in FIR filter?

j) Write the expression for LMS algorithm.

Q2 a) Compute the convolution of the following signals by Z-transform (6)

$$x_1(n)=\begin{cases}\left(\frac{1}{3}\right)^n, & n\geq 0\\ \left(\frac{1}{2}\right)^{-n}, & n<0\end{cases} \qquad x_2(n)=\left(\frac{1}{2}\right)^n u(n)$$

b) Determine the z-transform of the sequence given by (4)

$$x(n)=(n+1)u(n)$$

Q3 a) Compute the convolution of a long data sequence with an impulse response using overlap add method where (6)

x(n)={1, -1, 2, 3, -4, 1, 2, 8, 3, 1, 7, 8, 2, 0, 0, 1, 5, 4 }
h(n)={1, 2, 3, -1}

b) A linear time-invariant system with frequency response $H(\omega)$ is excited with the periodic input (4)

$$x(n) = \sum_{k=-\infty}^{\infty} \delta(n - kN)$$

Suppose that we compute the N-point DFT Y(k) of the samples $y(n), 0 \le n \le N-1$ of the output sequence. How is Y(k) related to $H(\omega)$?

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Q4 Determine the sample response of the system characterized by the difference equation (10)

$$y(n) = 2.5y(n-1) - y(n-2) + x(n) - 5x(n-1) + 6x(n-2)$$

Q5 a) What is the need of FFT algorithm? Compare the number of multiplications and additions required to compute the DFT of a 64-point sequence using direct computation and that using FFT. (3)

b) Compute the FFT for the sequence $x(n) = n + 1$ where N=8 using decimation in time algorithm. (7)

Q6 a) Convert the analog IIR filter given by the transfer function $Ha(s) = \frac{s + 0.1}{(s + 0.1)^2 + 16}$ into digital IIR filter by means of Bilinear transformation method. (6)

b) Realize the above filter using Direct Form-II structure. (4)

Q7 Compute the Direct Form-I, Direct form-II, cascade and parallel form realization of the given IIR filter where $H(z) = \frac{8z^3 - 4z^2 + 11z - 2}{(z - \frac{1}{4})(z^2 - z + \frac{1}{2})}$ (10)

Q8 Write Short notes on **(any two)** (5 x 2)

a) Type-II Discrete Cosine Transform
b) Adaptive Channel Equalization
c) Transient and Steady state responses
d) Use of FFT algorithm in correlation