Paper Code & Roll No. to be filled in your Answer Book

Roll No. | | | | | | | | | | |

Odd Semester Examination-2016

B.Tech. (Semester-V)

DIGITAL SIGNAL PROCESSING

[Time : 3 Hours] **[Maximum Marks :100]**

Note : Attempt **all** questions.

1. Attempt **any four** parts of the following : [5×4=20]

   (a) Compute the 4-point DFT of Cos(nπ/4).

   (b) Find the DFT of the following sequence and also find its amplitude and phase spectrum

   x(n)={ 1 1 2 2 3 3}, N=6.

   (c) State and prove following properties of DFT.

   (i) Circular convolution

   (ii) Time reversal

   (iii) Circular correlation

(d) Compute (a) linear, (b) circular periodic convolution of the two sequences $x_1(n)$= { 1 2 3 4} and $x_2(n)$= { 1 1 2 2}. (c) also find circular convolution using DFT and IDFT.

(e) Find the response of time invariant system with impulse response h(n)={1,2,1,-1} & input signal x(n)={1,2,3,6}

(f) Derive the relation between DFT and Z-transform.

2. Attempt **any four** parts of the following : [5x4=20]

(a) What is FFT? Why it is needed? List its applications.

(b) How many multiplications and additions are required to compute N-point DFT using Radix-2 FFT algorithm?

(c) Compute DFT of x(n)={1,2,3,4,4,3,2,1} using Radix-2 DIT FFT algorithm.

(d) Prove that the multiplication of DFT's of two sequences is equivalent to DFT of circular convolution of two sequences.

(e) Write a short note on Goertzel & Chirp Z algorithms.

(f) Find the DFT of two real sequence using only one FFT flow graph

$x_1(n)=\{1\ 1\ 1\ 1\}$, $x_2=\{2\ 1\ 2\ 1\}$.

3. Attempt **any two** parts of the following : [10x2=20]

(a) An LTI system is described by the equation

$y(n)+2y(n-1)-y(n-2)=x(n)$

(b) Determine the lattice coefficients corresponding to the FIR system with the system function $H(z)=1+7/9\ Z^{-1}+3/5\ Z^{-2}$

(c) Obtain Direct form I ,II, cascade & parallel form realization for the following system:
$Y(n) = -0.1y(n-1) + 0.2y(n-2)+3x(n) + 3.6x(n-1) + 0.6x(n-2)$

4. Attempt **any two** parts of the following : [10×2=20]

(a) Compare Butterworth and chebyshev approximation techniques of filter design.

(b) Design a filter with

$$H_d(w) = \begin{cases} e^{-j3w} & -\frac{\pi}{4} \le w \le \frac{\pi}{4} \\ 0 & \frac{\pi}{4} \le w \le \pi \end{cases}$$

Using Hamming window with M = 7

(c) Explain process of window functions and what are types of window functions and also explain its frequency domain characteristics.

5. Attempt **any two** parts of the following : [10×2=20]

(a) Explain Discrete Cosine Transform. Also write its applications.

(b) Design the Hilbert transforms and its frequency response. What are the applications of Hilbert transform.

(c) Compute the Walsh transform of the sequence {8 5 -1 3 }.

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