TEC-502   **45**   Printed Pages : 3

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

Roll No. [ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]

B. Tech. III Year (V Sem.)

Odd Semester Examination-2015

DIGITAL SIGNAL PROCESSING

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

Unit - 1

Answer any Four   **(4X5=20)**

1.   (1)   Write expression of N point DFT of a sequence. Discuss the circular convolution property of DFT.

     (2)   Find the convolution of two finite sequences

$$x(n) = \begin{cases} 1, & for -1 \le n \le 1 \\ 0, & otherwise \end{cases} \quad and \quad h(n) = \begin{cases} 1, & for -1 \le n \le 1 \\ 0, & otherwise \end{cases}$$

     (3)   State and prove any two properties of DFT.

     (4)   Derive the relationship between DFT and

       (a)   Z transform

       (b)   Fourier transform of a aperiodic function.

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(5) Show that the DFT values of a real sequence are always complex conjugates.

Answer Any Four (4x5=20)

2. (1) Compare DFT and FFT.

(2) Briefly explain the need of FFT in digital signal processing.

(3) Derive the computational equation for 8-point FFT DIT.

(4) Given x(n)={1,2,3,4,4,3,2,1}, Find X(k) using DIT FFT algorithm.

(5) Explain how FFT algorithm can be used to compute IDFT.

Answer Any Two (2x10=20)

3. (1) i) What is mean by linear phase filters?

ii) Explain the necessary and sufficient condition for linear phase characteristic in an FIR systems.

3. (2) Obtain cascade and parallel realisation for the system function by $H(z) = \dfrac{1 + \dfrac{1}{4}z^{-1}}{(1 + \dfrac{1}{2}z^{-1})(1 + \dfrac{1}{2}z^{-1} + \dfrac{1}{4}z^{-2})}$

(3) Given the system function

$H(z) = \dfrac{2 + 8z^{-1} + 6z^{-2}}{1 + 8z^{-1} + 12z^{-2}}$ Realise using ladder structure.

(2)

Answer Any Two (2x10=20)

4. (1) What is an FIR system? Compare an FIR system with an IIR system.

    (2) Describe the impulse invariant technique of IIR filter design.

    (3) i) Name different types of window functions. How are they defined?

        ii) The following transfer function characterises an FIR filter (M=11). Determine the magnitude response and show that the phase delay and group delay are constant.

Answer Any Two (2x10=20)

5. (1) Using Block diagram Explain the concept of Adaptive equalisation

    (2) Using MMSE(minimum mean square error) criterion derive the expression for optimal filter coefficients.

    (3) Explain Discrete cosine transform? How are they applied in digital signal processing?

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