TEC-502   1086

Odd Semester Examination, 2017-18

B.TECH. (SEMESTER-V)

DIGITAL SIGNAL PROCESSING

Time: 03:00 Hours   Max Marks : 100

Note : Attempt all questions.

1. Attempt any four parts of the following :   (5x4)

  (a) State and prove "Circular convolution "property of DFT.

  (b) Differentiate between DTFT and DFT

  (c) Describe the following properties of Z- transform:

    (i) Time – reversal

    (ii) Time – shifting.

  (d) Find the response of on FIR filter with impulse response $h[n] = [1, 2, 4]$ to the input sequence $x[n] = [1, 2]$ using linear transformation method.

  (e) Given $x(n) = \{0, 1, 2, 3, 4, 5, 6, 7\}$ find $x(x)$ using DIT FFT algorithm.

2. Attempt any four parts of the following :   (5x4)

  (a) Find the DFT of a sequence $x(n) = \{1,1,0,0\}$ find the inverse DFT of $y(x) = \{1,0,1,0\}$

  (b) Define parseval's theorem and circular correlation.

  (c) Determine the IDFT of $x[k] = [3,(2+j), 1, (2-j)]$

  (d) Draw flow diagram of DIT FFT for n=8

  (e) Write a shot note MATLAB

3. Attempt any two: (10x2)

  (a) Discuss about MPEG coding standardization.

  (b) Obtain the direct form I, direct form II, cascade form and parallel form realization for the following system. $Y(n) = -0.1\, y(n-1) + 0.2\, y(n-2) +3x(n) +3.6x(n-1)+0.6x(n-2)$

  (c) Design a single pole low – pass digital filter with a 3db bandwidth of 0.2π by use of bilinear transformation applied to the analog :

$$H(s) = \frac{\Omega_c}{s + \Omega_c}$$

Where Ω_c is the 3db bandwidth of analog filter.

(10*2)

4. Attempt **any two** :

(a) Write short note on the following:

(i) Discrete cosine transform

(ii) Chirp –z– algorithm.

(b) Using bilinear transformation, design a Butterworth filter which satisfies the following conditions :

$0.8 \le |H(e^{jw})| \le 1$ $0 \le w \le 0.2\pi$

$|H(e^{jw})| \le 0.2$ $0.6\pi \le w \le \pi$

(c) The designed frequency response of a low – pass filter is given :

$$H_d(e^{jw}) = \begin{cases} e^{jw}, & -3\pi/4 \le w \le 3\pi/4 \\ 0, & 3\pi/4 < |w| \le \pi \end{cases}$$

Find $H(e^{jw})$ for M = 7 using a rectangular window

(10x2=20)

5. Attempt **any two** :

(a) Design a low – pass 1 rad/sec bandwidth chehyshev filter with the following characteristics.

(i) Acceptable passband ripple of 2db

(ii) Cut-off radian frequency of 1 rad/sec.

(iii) Stopband attenuation of 20db on greater beyond 1-3 rad/sec.

(b) Draw the flow graph for the implementation of 8- point DIT-FFT of the following sequences.

$X(n) = \{0.5, 0.5, 0.5, 0.5, 0, 0, 0, 0\}$

(c) Explain in details the uses of adaptive filter, what is meant by Echo cancellation? Explain in details.

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