Code: 9A04603

R9

B.Tech IV Year I Semester (R09) Supplementary Examinations, May 2013

DIGITAL SIGNAL PROCESSING

(Electrical and Electronics Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 Check for causality and stability of following systems:

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

(ii) $y(n) – 2y(n - 1) = x(n)$.

2 Determine the circular convolution of the following sequences and compare the results with linear convolution.

$x(n)= \{ 1, 1, 1, 1, -1, -1, -1, -1\}$.

$h(n) = \{ 0, 1, 2, 3, 4, 3, 2, 1\}$.

3 Given the sequences $x_1(n)$ and $x_2(n)$ below, compute the circular convolution using DIF-FFT algorithm.

$x_1(n) = \{2, 1, 1, 2\}$ $x_2(n) = \{1, -1, -1, 3\}$

4 State and prove following properties of z-transform:

(i) Time reversal.

(ii) Time convolution.

(iii) Differentiation in z-domain.

5 Convert the following analog filter transfer function using backward difference method and impulse invariant method.

$H(s) = 1/(s + 2)(s + 4)$

6 A low pass filter has the desired frequency response as given by:

$H_d(e^{j\omega}) = e^{-j\omega}$ $-\pi/4 \le \omega \le \pi/4$

$=1$ $\pi/4 \le |\omega| \le \pi$

Determine the filter coefficients hd(n) if the window function is used is

$w(n) = 1$ $0 \le \omega \le 5$

$= 0$ otherwise

Also determine the frequency response $H(e^{j\omega})$ of the designed filter.

7 The spectrum of a signal x(n) is symmetrical triangular pulse with amplitude of ‘2’ and frequency boundaries are -0.25 to 0.25. Sketch the spectrum and sketch spectrums of:

(i) The zero interpolated signal $y(n) = x(n/2)$.

(ii) The decimated signal $d(n) = x(2n)$.

(iii) The signal g(n) that equals to x(n) for even n, and zero for odd n.

8 With the help of block diagram, explain about signal compression system

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