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:

$$H_d(e^{j\omega}) = e^{-j\omega} \quad -\pi/4 \le \omega \le \pi/4$$
$$= 1 \quad \pi/4 \le |\omega| \le \pi$$

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

$$w(n) = 1 \quad 0 \le \omega \le 5$$
$$= 0 \quad \text{otherwise}$$

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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