Code: 9A04603

R09

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December 2015
DIGITAL SIGNAL PROCESSING
(Electrical & Electronics Engineering)

Time: 3 hours   Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks
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1   Determine the sequence corresponding to following frequency domain representation:
$$X(e^{j\omega}) = 1 \quad |\omega| \le W \quad \text{or} \quad -W \le \omega \le W$$
$$= 0 \quad W \le \omega \le \pi$$

2   (a)   Determine the DFT of 4-point sequence $x(n) = \{0,1,2,3\}$.
     (b)   Find inverse DFT of $X(k) = \{4, 1-j, -2, 1+j\}$

3   Explain Radix 2 DIF-FFT algorithm in detail. Explain how calculations are reduced**.**

4   (a)   State and prove time shifting property of z-transform.
     (b)   Determine z-transform, ROC and pole-zero locations of:
            $$x(n) = \alpha^n u(n) + \beta^n u(-n-1)$$

5   (a)   Explain the features of Butterworth approximation
     (b)   Discuss the location of pole for Butterworth filter**.**

6   Design highpass filter using hamming window with a cutoff frequency of 1.5 rad/sec and N = 9.
     Consider:
            $$H_d(e^{j\omega}) = e^{-j\alpha\,\omega} \qquad \omega_c \le |\omega| \le \pi$$
            $$= 0 \qquad \text{otherwise}$$
     Also find $H(e^{j\omega})$.

7   Consider $x(n) = $ tri $(n/6)$.Sketch the following signals and describe how they differ.
     (a) $x(3n/2)$, using step interpolation followed by decimation.
     (b) $x(3n/2)$, using decimation followed by step interpolation.

8   Write short notes on the following:
     (a)   Entropy.
     (b)   Single Echo filter.
     (c)   Musical sound processing.

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