# *B. Tech Degree VI Semester (Supplementary) Examination September 2010*

## CS/EI/EE 601 DIGITAL SIGNAL PROCESSING

*(2002 Scheme)*

Time : 3 Hours Maximum Marks : 100

I. (a) Explain the properties of discrete systems with suitable examples. (12)

(b) Find the Z-transform of $x(n) = r^n Cos(n\theta)u(n)$. (8)

**OR**

II. (a) Determine the signal $x(n)$ whose Z – transform is given by

$X(z) = \log(1 + az^{-1})$ and

$ROC\ |z| > |a|$. (7)

(b) Determine the system function and unit sample response of the system described by the difference equation $y(n) = \frac{1}{2} y(n-1) + 2x(n)$. (8)

(c) Explain any five properties of region of convergence (ROC). (5)

III. (a) Explain the properties of DFT. (10)

(b) Compute 8- point DFT of $x(n) = 2^n$ by radir – 2 DIT – FFT algorithm. (10)

**OR**

IV. (a) Perform linear convolution of $x(n)$ and $h(n)$ using overlap save method, given

$x(n) = \{1, 2, 3, -1, -2, -3, 4, 5, 6\}$ and

$h(n) = \{2, 1, -1\}$. (8)

(b) Find the IDFT of the sequence

$$X(k) = \{4, 1 - j2.414, 0, 1 - j0.414, 0, 1 + j0.414, 0, 1 + j2.414\}$$

using DIF algorithm. (12)

V. (a) Compare FIR and IIR filters. (6)

(b) Explain the use of window functions. Also explain each window in detail. (14)

**OR**

VI. (a) Design a bandpass filter to pass frequencies in the range 1 to 2 rad/sec using hanning window with N = 5. (12)

(b) Write the step by step procedure for FIR filter design using frequency sampling method. (8)

VII. (a) Obtain the cascade and parallel form realizations for the

system $H(z) = \dfrac{1 + \frac{1}{2} z^{-1}}{\left(1 - z^{-1} + \frac{1}{4} z^{-2}\right)\left(1 - z^{-1} + \frac{1}{2} z^{-2}\right)}$. (14)

(b) Compare Butterworth and Chebyshev type – 1 filters. (6)

**OR**

VIII. (a) Convert the analog filter with system functions $H_a(s)$ into digital filter using bilinear transformation $H_a(s) = \frac{s+0.3}{(s+0.3)^2+16}$. (10)

(b) Compare Impulse Invariant and Bilinear transformation. (6)

(c) Explain frequency warping in bilinear transformation. (4)

IX. (a) Explain the architecture of typical DSP Processor. (10)

(b) Explain finite word length effects in FIR and IIR filters. (10)

**OR**

X. (a) Explain any four applications of Digital Signal Processing. (10)

(b) Explain –

(i) Truncation (3)

(ii) Rounding (3)

(iii) Limit Cycle (4)

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