

GUJARAT TECHNOLOGICAL UNIVERSITY**PDDC - VIth Semester-Examination – May- 2012****Subject code: X61103****Subject Name: Digital Signal Processing****Date: 10/05/2012****Time: 10:30 am – 01:00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Draw the basic block diagram of digital signal processing. Enlist the applications of DSP & discuss any one in brief. **07**
- (b) Give the classification of Systems. Check the systems for Linearity, Causality, and Time Variance. **07**
- i) $y_1(n) = x(2n)$
- ii) $y_2(n) = x(2 - n)$

- Q.2** (a) Define the z-transform. Enlist the properties of z-transform & prove convolution property. **07**
- (b) Discuss the stability & causality criterion for LTI system. If Impulse response of LTI system is given by $h(n) = \{1, 2, 1, -1\}$, determine the response of the LTI system for the input signal $x(n) = \{1, 2, 3, 1\}$. **07**

OR

- (b) Determine the total solution of diff. eq. **07**
- $y(n) - (5/6)y(n-1) + (1/6)y(n-2) = 5^{-n}$, $n \geq 0$ with initial conditions $y(-2) = 25$ & $y(-1) = 6$.
- Q.3** (a) Determine the z transform for the **07**
- 1) $x_1(n) = (-1/3)^n u(n) - (1/2)^n u(-n-1)$
- 2) $x_2(n) = n a^n u(n)$
- (b) Define the z-transform & ROC. Explain the properties of the region of convergence of z-transform with illustrations & sketches. **07**

OR

- Q.3** (a) Determine the inverse z-transform for **07**
- 1) $X(z) = z / (3z^2 - 4z + 1)$ for all possible sequences.
- 2) $H(z) = (2+3z^{-1}) / ((1+z^{-1})(1+0.5z^{-1})(1-0.25z^{-1}))$
- (b) Define linear convolution. Perform linear convolution of given sequence using DFT $x(n) = \{1, 2\}$ & $h(n) = \{2, 1\}$. **07**
- Q.4** (a) Define DFT & FFT. Obtain $X(k)$ for $x(n) = \{0, 1, 2, 3\}$ using DIT FFT algorithm. **07**
- (b) Explain Goertzel algorithm. **07**

OR

- Q.4** (a) Solve the followings. **07**
i) Obtain Direct form I & II for IIR system described by difference equation $y(n) - 3y(n-1) + 2y(n-2) = x(n) - x(n-1)$.
ii) Determine the impulse response & draw the parallel form of realization for discrete causal IIR system having transfer function $H(z) = (1 - z^{-1}) / (1 - 0.2z^{-1} - 0.15z^{-2})$.
(b) Define circular convolution. How it is different from linear convolution. **07**
Determine the linear convolution for given sequences $x_1(n) = \{1, 2, 5\}$ & $x_2(n) = \{2, 1\}$ verify the result using circular convolution.
- Q.5** (a) Enlist the properties of Fourier transform. Determine & sketch the frequency spectrum for i) $x_1(n) = a^n u(n)$ ii) $x_2(n) = \delta(n-3)$. **07**
(b) Explain Decimation in frequency FFT algorithm in brief. **07**

OR

- Q.5** (a) Explain the IIR filter design by bilinear transformation. Obtain analog filter transfer function using bilinear transformation $H(s) = 2 / ((s+1)(s+3))$ **07**
(b) With help of block diagram explain architecture of TMS320C6XXX processor. **07**
