

GUJARAT TECHNOLOGICAL UNIVERSITY**M. E. Sem. – IInd - Examination – June/July- 2011****Subject code: 1720702****Subject Name: Digital Signal Processing****Date: 24/06/2011****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) A discrete-time signal $x(n]$ is defined as **07**

$$x(n) = 1 + \frac{n}{3}, -3 \leq n \leq -1$$

$$= 1, 0 \leq n \leq 3$$

$$= 0, \text{ elsewhere}$$

(i) Determine its values and sketch the signal $x(n]$

(ii) Sketch the signals that result if we:

(1) First fold $x(n]$ and then delay the resulting signal by four samples.(2) First delay $x(n]$ by four samples and then fold the resulting signal.**(b)** Compute the convolution $y(n) = x(n) * h(n)$ of the following signals: **07**
 $x(n) = \{1, 2, 4\}$; $h(n) = \{1, 1, 1, 1\}$ **Q.2 (a)** Find out impulse response of the system: **07**

$$y(n) = x(n) + \frac{3}{4}y(n-1) - \frac{1}{8}y(n-2)$$

$$\text{Where, } x(n) = \left(\frac{1}{2}\right)^n, n \geq 0$$

$$= 0, \text{ elsewhere}$$

(b) Consider the first-order system **07**

$$y(n) = -a_1y(n-1) + b_0x(n) + b_1x(n-1)$$

Draw and explain the realization of this system using:

(i) Direct Form I structure

(ii) Direct Form II structure

OR**(b)** Explain the frequency domain sampling and reconstruction of discrete-time **07**
signals using the frequency transform.**Q.3 (a)** Explain the Discrete Fourier Transform (DFT) and Inverse Discrete Fourier **07**
Transform (IDFT) for a finite duration sequence.**(b)** Illustrate the computation of an 8-point DFT using three stages. Further extend **07**
it to eight point decimation-in-time FFT algorithm. Show basic butterfly
computation. Give your observations.**OR****Q.3 (a)** Explain the concept and applications of correlation technique for discrete-time **07**
signals.**(b)** Explain briefly the factors affecting the choice of the realization of discrete- **07**
time system.

- Q.4** (a) Draw the block-diagram and explain the Direct-form structure realization of a Finite Impulse Response (FIR) system. **07**
(b) Draw and explain the lattice structure for an all-pole Infinite Impulse Response (IIR) system. **07**

OR

- Q.4** (a) Explain with illustration IEEE 754 standard for representing a 32-bit, single precision, floating point number. **07**
(b) Draw the magnitude characteristics of the physically realizable filters. Explain the various bands. Show the main specifications of a filter on the characteristics and explain their significance. **07**
- Q.5** (a) Discuss the problems and issues related with estimation of the power density spectrum of a signal from the observation of the signal over a finite time interval. **07**
(b) Give typical applications where sampling rate conversion is needed. Give comparison of following two methods used for sampling rate conversion: **07**
(i) using D/A converter and re-sampling in analog domain
(ii) sampling rate conversion in digital domain

OR

- Q.5** (a) Explain the evolution and development of general purpose DSP processors. **07**
(b) Explain the application of DSP processor in radar. **07**
