

GUJARAT TECHNOLOGICAL UNIVERSITY**PDDC - SEMESTER-VI • EXAMINATION – WINTER • 2014****Subject Code: X 61103****Date: 04-12-2014****Subject Name: Digital Signal Processing****Time: 02:30 pm - 05:00 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) List the properties of the region of convergence for the Z transform. **07**
- Q.2** (a) How circular convolution is different from linear convolution? Compute the linear convolution of the following sequences: $h[n] = \{3, 2, -4, 1\}$, $x[n] = \{1, -2, -3\}$ **07**
- (b) Explain sampling theorem. For given analog signal $x_a(t) = 3\cos 50\pi t + 10\sin 300\pi t - \cos 100\pi t$. What is the Nyquist rate for this signal? **07**
- OR**
- (b) Check time invariance and linearity for accumulator system. If accumulator system is excited by sequence $x(n) = n u(n)$, determine the response under the condition that it is initially relaxed. **07**
- Q.3** (a) Define the z-transform. Prove the convolution and differentiating property of z transform. **07**
- (b) Determine the z transform for the given sequences and indicate the ROC.
- 1) $x_1(n) = -n a^n u(-n-1)$ **04**
- 2) $x_2(n) = a^n \cos(\omega n) u(n)$ **03**
- OR**
- Q.3** (a) Write a detail note on Goertzel algorithm. **07**
- (b) Determine the inverse z transform :
- 1) $X_1(z) = 1/(1 - 1.5z^{-1} + 0.5z^{-2})$, for all possible sequences. **04**
- 2) $X_2(z) = 1/[(1+z^{-1})(1-z^{-1})^2]$, for causal sequence. **03**
- Q.4** (a) Compare FIR & IIR filter. **07**
- (b) Obtain Direct Form I & II realization of a system described by the differential equation $y(n) - 1/6 y(n-1) + 1/3 y(n-2) = x(n) + 2x(n-2)$. **07**
- OR**
- Q.4** (a) Define FT and prove time shifting property. Determine the FT of the signal $x(n) = a^{|n|}$, $-1 < a < 1$. **07**
- (b) Define the DFT & prove periodicity property. Compute the four point DFT for $x(n) = \{0, 1, 2, 3\}$ **07**
- Q.5** (a) Find the number of complex multiplications and complex additions required in the direct computation of 1024 point DFT. How many complex multiplications and complex additions will be required using FFT algorithm? **07**
- (b) List the methods of designing IIR filter. Explain the bilinear transformation method of designing of IIR filter. How does this method overcome the limitation of other methods? **07**
- OR**
- Q.5** (a) Discuss decimation in time FFT algorithm for radix-2. **07**
- (b) With help of block diagram explain architecture of TMS320C6XXX processor. **07**
