Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VIII • EXAMINATION – SUMMER 2013

Subject Code:182402 Date: 13/05/2013

Subject Name: Digital Signal Processing

Time: 10:30 am TO 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.**
4. **Notations/ symbols used have usual meanings.**

Q.1 **(a)** For the system described by y(n) =| x(n)| , determine whether the system is (i) Stable (ii) causal (iii) linear (iv) time ï invariant and (v) memory less or not. **05**

(b) Differentiate: Analog and digital signal processing.. **03**

(c) Let x(n) = ŭ(n) +2ŭ(n-1)-ŭ(n-3) and h(n) = 2 ŭ(n+1) +2ŭ(n-1) Compute and plot the following convolution. (i) $y_1(n)$ =x(n)* h(n) and (ii) $y_2(n)$ = x(n+2) *h(n) **06**

Q.2 **(a)** Consider the linear constant coefficient difference equation y(n) ï (3/4) y(n-1) + (1/8) y(n-2) = 2x(n-1). Determine y(n) for n Ó0 when x(n) = ŭ(n) and y(n) = 0 for n < 0. Plot resultant y(n). **07**

(b) Describe implementation of discrete time system. **07**

OR

(b) Define sampling. State and explain sampling theorem. **07**

Q.3 **(a)** An LTI system is described with the following difference equation y(n) = a y(n-1) + b x(n) for 0 < a < 1 and 0 < b <1. Determine the magnitude and phase of the frequency response of the system. **08**

(b) Discuss effect of pipelining in DSP. **06**

OR

Q.3 **(a)** Find $X(e^{jw})$ for (i)$x(n) = a^n u(n)$ and (ii) x(n) =1 for all n. **08**

(b) Describe Harvard type DSP architecture. **06**

Q.4 **(a)** Define IDFT. Find 4- point DFT of the sequence x (n) ={1,1,0,0}. **07**

(b) Discuss various properties of Z-transform. **07**

OR

Q.4 **(a)** Define DFT. Find the IDFT of Y(k) ={1,0,1,0}. **07**

(b) Find Inverse Z-Transform of following: **07**

(i) $x(z) = 1 / (1-a z^{-1})$ $|z| > |a|$.

(ii) $x(z) = \log(1+ a z^{-1})$ $|z| > |a|$.

Q.5 **(a)** Explain DIT- FFT Algorithm using signal flow graphs for N=4. **08**

(b) Discuss the effect of round - off in the digital filter. **06**

OR

Q.5 **(a)** Obtain the parallel-form structure of the given H(z) for (i) first -order and (ii) second order systems. **08**

$$H(z) = \frac{\left(1 + 2z^{-1} + z^{-2}\right)}{\left(1 - 0.75z^{-1} + 0.125z^{-2}\right)}$$

(b) (i) Compare FIR filter with IIR filter in tabular form. **06**
(ii) Compare Laplace and Z -transforms in tabular form.

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