Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – WINTER • 2013

Subject code: 712903N **Date: 03-01-2014**

Subject Name: Digital Signal Controller

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 Do as directed: (2Marks X 7) **14**

(i) Plot the signal: $x(n) = -2\delta(n-2)$.
(ii) State conditions of conversion for Z-transforms.
(iii) Sketch various limits to approximate a high pass filter.
(iv) Define aliasing and state its remedies.
(v) Define IDFT. State its applications.
(vi) State equation for forward difference system. Will it be causal?
(vii) What are the steps involved in digital signal processing?

Q.2 (a) Discuss the concept of : **07**
(i) all-pass systems (ii) minimum-phase system.

(b) Draw and discuss a general purpose digital signal processor. **07**

OR

(b) Describe the selection criteria for a signal processor. **07**

Q.3 (a) Discuss continuous time processing of discrete time signals. **07**

(b) Find inverse Z-transform of: **07**
(i) $x(z) = 1/(1- az^{-1})$ for $|z| > |a|$.
(ii) $x(z) = 1/(1- az^{-1})$ for $|z| < |a|$. Also, plot x(n) for both.

OR

Q.3 (a) A continuous –time signal is given as : $x(t) = 8\cos(200\pi)t$. Determine **07**
(i) Nyquist rate to avoid aliasing.
(ii) If the sampling frequency is f_s= 400Hz, What will be discrete time signal x(n) or $x(nT_s)$ after sampling.?
(iii) What will be Nyquist interval?

(b) Find Z-transform of : **07**
(i) $x(n) = a^n u(-n-1)$
(ii) $x(n) = (1/2)^n u(n) + 2^n u(n)$.Also, state ROC for both.

Q.4 (a) An LTI system is given by $y(n)- a\, y(n-1) = x(n)$ for $a> 0$; determine its frequency and impulse response using DTFT only. Also determine the magnitude and phase of the frequency response. **06**

(b) (i) What are FIR and IIR systems? **06**
(ii) Write convolution sum formula for FIR and IIR systems.
(iii) State transfer function for FIR and IIR systems.

(c) State and prove linearity and periodicity properties of DFT. **02**

OR

Q.4 (a) Find 4-point DFT of the sequence x(n)= { 0,1,2,3}. Also, sketch the magnitude and phase spectrum. **06**

	(b)	Describe Kaiser window filter design method for a low-pass filter.	**06**
	(c)	Explain unilateral Z-transform in brief.	**02**
Q.5	**(a)**	With help of signal flow graph, discuss structure of Linear Phase FIR system.	**07**
	(b)	Develop DIT-FFT algorithm for N=4.	**07**

OR

Q.5	**(a)**	Enlist various steps involved in Implementation of FIR digital Filter on general purpose digital signal processor.	**07**
	(b)	Write short note on: Hilbert Transform.	**07**

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