Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject code: 714402N **Date: 26-12-2013**

Subject Name: Advance Digital Signal Processing

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) Determine the following systems are Time Variant or Time Invariant. 07

[1] $Y[n] = X[2n]$ [2] $Y[n] = e^{X[n]}$

(b) [1] State and Prove: "Differentiation Property" of Z-Transform. 07

[2] Find Z-Transform for : $X[n] = na^n u[n]$

Q.2 (a) Compute Discrete Fourier Transform(DFT) of sequence: $X[n] = \{0, 1, 2, 3\}$ 07

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(b) Find the Inverse Z-Transform of the following using Partial Fraction Expansion (PEF) Method. 07

$$X[z] = \frac{1+Z^{-1}}{1-\frac{5}{6}Z^{-1}+\frac{1}{6}Z^{-2}}$$

OR

(b) What is FFT? Explain "Decimation in time Fast Fourier Transform (FFT) algorithm Fundamentally. 07

Q.3 (a) With Necessary Diagrams and equation explain note on: Realization structure for IIR Digital Filters. 07

(b) Briefly Explain "Bilinear Z-Transform (BZT)" method. A simple RC Low pass Filter has S-Plane Transfer function H(S) = 1/(S + 1). Determine the transfer function of an equivalent discrete-time high pass filter using "Bilinear Z-Transform (BZT)" method. Assume sampling frequency is 150 Hz and cutoff frequency 30 Hz. 07

OR

Q.3 (a) Compare: Window Method, Optimum Method and Frequency Sampling Method. 07

(b) Obtain First three and Last Three Coefficients of FIR filter for the following Specifications. **<u>Use "Hamming Window"</u>** 07

Pass Band Edge Frequency 1.5 KHz

Transition Width	0.5 KHz
Stop Band Attenuation	>50dB
Sampling Frequency	8 KHz

Q.4	(a)	What do you understand by "Windowing Technique"? Explain "Kaiser Window" with necessary design steps. Mention its advantage.	07
	(b)	List the Various types of FIR structure. Explain "Transversal" structure with suitable example.	07

OR

Q.4	(a)	With neat Sketch and necessary equations, explain "Basic Wiener Filter" theory.	07
	(b)	Write Short note on: Designing of practical sampling Rate Converters.	07

Q.5	(a)	With neat sketch explain any one DSP Application in detail.	07
	(b)	What do you understand by the term "Pipelining"? Explain "Three stages" Pipelining with timing diagram.	07

OR

Q.5	(a)	Define the Terms: (1) Single Instruction Multiple Data (SIMD) (2) Very Large Instruction Word (VLIW) (3) Superscalar Processing.	07
	(b)	With neat sketch explain architecture of TMS320C67xx DSP Processor.	07

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