Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code: 712601N **Date: 23-12-2013**

Subject Name: Digital Signal Processing Algorithm & Processor Architecture

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)** Explain with example (i) BIBO Stable-Unstable (ii) Causal- Non Causal (iii) Time Variant – Time Invariant discrete time systems. **07**

(b) Perform circular and linear convolution of the sequences x(n)={2,1,2} and y(n)={2,3} using graphical method. Make suitable comment about result. **07**

Q.2 **(a)** Find the impulse response, frequency response and magnitude response of **07**

$$y(n) - y(n-1) + \frac{3}{16}y(n-2) = x(n) - \frac{1}{2}x(n-1)$$

(b) Determine the causal signal x(n) having the z-transform **07**

$$\frac{1}{(1+z^{-1})(1-z^{-1})^2}$$

OR

(b) Realize the following in parallel form. **07**

$$H(z) = \frac{(1+z^{-1})(1+2z^{-1})}{\left(1+\frac{1}{8}z^{-1}\right)\left(1-\frac{1}{2}z^{-1}\right)^2\left(1-\frac{1}{4}z^{-1}\right)}$$

Q.3 **(a)** Design a linear phase FIR high pass filter using hamming window with cutoff frequency 0.8π rad/sample and N=7. Given Frequency response **07**

$$H_d(\omega) = e^{-j\omega\alpha}, \quad \omega_c \le |\omega| \le \pi$$
$$= 0, \quad otherwise$$

(b) Explain the Energy Density Spectrum, Power Spectrum and Periodogram. **07**

OR

Q.3 **(a)** Design Digital butterworth filter that satisfy the following constraint using bilinear transformation. Assume Ts= 1s. **07**

$$0.9 \le |H(\omega)| \le 1, \; 0 \le \omega \le \frac{\pi}{2} \quad and \; |H(\omega)| \le 0.2, \; \frac{3\pi}{4} \le \omega \le \pi$$

(b) Explain the fundamentals of Discrete Wavelet Transform. **07**

Q.4 **(a)** Explain the Time reversal and Circular time shift properties of DFT. **07**

(b) Find out 8-point FFT of sequence x(n) = {1,2,1,2} using DIF. **07**

OR

Q.4 **(a)** Explain overlap save method of linear filtering. **07**

(b) Determine the IDFT of sequence X(k)={3,2+j,1,2-j}. **07**

Q.5 **(a)** Explain the features of Digital Signal Processor in brief. **07**

(b) Explain the C5X processor pipeline operation on ARAU memory mapped registers. **07**

OR

Q.5 **(a)** Explain the execution unit of TMS320C5X processor. **07**

(b) Explain the features and internal architecture of TMS320C6X processor. **07**

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