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COLLEGE OF ENGINEERING GUINDY CAMPUS::ANNA UNIVERSITY CHENNAI

B.E. DEGREE EXAMINATIONS APRIL/MAY 2011

Sixth Semester

Electrical and Electronics Engineering (R 2004)

EE 383 Digital Signal Processing

Answer ALL Questions

Max marks: 100 **Time: 3 Hrs**

Part-A (10x2=20)

1. Differentiate: Energy and Power Signals.
2. Define the concept of stability of a system with example. What is the necessary and sufficient condition on the impulse response for stability?
3. Compare and contrast up-sampling and down-sampling with examples.
4. Write the generalized difference equation and transfer function for *IIR* filter.
5. What are the properties of convolution?
6. How to obtain the *IDFT* using *DIF-FFT Radix-2* algorithm.
7. Calculate the multiplication reduction factor, α in computing 1024 point *DFT*, by *Radix-2 FFT* algorithm.
8. What is meant by pre-warping?
9. Find the order and poles of Butterworth *LPF* that has 3 *dB* bandwidth of 500 Hz and an attenuation of 40 *dB* at 1000 *Hz*.
10. What is meant by aliasing?

Part-B (5x16=80)

11. (i) Realize the system function. [6]

$$H(z) = \tfrac{1}{2} + (1/3)\, z^{-1} + z^{-2} + (1/4)z^{-3} + z^{-4} + (1/3)z^{-5} + (1/2)z^{-6}$$

(ii) Illustrate, the Round-off effects in digital filters. [6]

(iii) Discuss elaborately about the various types of errors that occur during sampling rate conversion. [4]

12. a) Determine the response of a system define by the difference equation $y(n) = [5/6]\, y(n-1) - [1/6]y(n-2) + x(n)$ to the input signal $x(n) = \delta(n) - [1/3]\, \delta(n-1)$ using *Z*-transform.

[OR]

b) By means of *DFT* and *IDFT*, determine the response of an *FIR* filter with impulse response $h(n) = \{1, 2, 3\}$ to the input sequence $x(n) = \{1, 2, 2, 1\}$

13. a) Write in detail about bilinear transformation mapping procedure and obtain the relation between the analog and digital frequencies.

[OR]

b) Compute the 8-point DFT of sequence
x(n) = {1/3, 1/2, 1/3, 1/2, 0, 1, 0, 1}using the radix-2 DIF-FFT algorithm.

14. a) Design a *Butterworth-Lowpass-IIR filter* satisfying the following constraints applying bilinear transformation assuming $T = 1$ sec.

$$0.725 \leq |H(e^{j\omega})| \leq 1 \qquad 0 \leq \omega \leq 0.35\pi$$

$$|H(e^{j\omega})| \leq 1 \qquad 0.85\pi \leq \omega \leq \pi$$

[OR]

b) Describe the various salient window functions and their characteristics. Also explain how to design filters by window functions in detail.

15. a) Discuss in detail, about the architectural features of any one type of fixed point *DSP* architecture with neat sketches.

[OR]

b) Explain the basic programming for addition, subtraction, multiplication and convolution for *TMS 320 C 54 XX* processor with examples.
