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B.E / B.Tech (Full Time) DEGREE END SEMESTER EXAMINATIONS, APRIL / MAY 2013

ELECTRICAL & ELECTRONICS ENGINEERING

Fourth Semester

EE9254 Digital Signal Processing

(Regulation 2008)

Time: 3 Hours Answer ALL Questions Max. Marks 100

PART-A (10 x 2 = 20 Marks)

1. Define time invariant and time varying systems.
2. Give the relation between step, ramp and impulse signals with their functional representations.
3. What is aliasing?
4. Determine the pole zero plot for system described by difference equation

$$y(n)-\frac{3}{4}y(n-1)+\frac{1}{8}y(n-2)=x(n)-x(n-1)$$

5. What are the properties of twiddle factor?
6. Compute circular convolution between the following sequences

   x(n)={1,-1,3}, h(n)={1,0,2,-2,4,-1}
7. How analog poles are mapped to digital poles in Impulse Invariant Transformation?
8. What are the properties of FIR filter?
9. Mention the different addressing modes in TMS320C54x processor.
10. What is meant by pipelining?

Part – B (5 x 16 = 80 marks)

11. i) Explain energy and power signal with expressions and check if the following signal are energy or power signals. (8)

    $x_1(n) = (1/3)^n.u(n)$; $x_2(n) = \sin[(\pi/4)^2]$

    ii) Find the linear convolution of $x(n)$ = {1,1,1,1} with h(n) = {2,2} using graphical and tabulation method. (8)

12. a) i) Determine the inverse z-transform of $x(z) = (1+3z^{-1}) / (1+3z^{-1}+2z^{-2})$ for $|z| > 2$ (8)

ii) Find the system transfer function and impulse response of the system given by $y(n)=x(n)+2x(n-1)-4x(n-2)+x(n-3)$ and check for its stability. (8)

OR

b) i) Using Z transform find the input x(n) of the system, if the impulse response h(n) and the output y(n) are, (8)

$h(n) = \{1,2,3,2\}$ & $y(n) = \{1,3,7,10,10,7,2\}$

ii) State and prove the convolution property of Z transform. (8)

13. a) Compute the 8-point IDFT of the sequence $X(k) = \{7, -0.707-j0.707, -j, 0.707-j0.707, 1, 0.707+j0.707, j, -0.707+j0.707\}$ using Radix-2-DIT-FFT algorithm.

OR

b) Derive the steps involved in the computation of an 8-point DFT of a sequence using Radix-2-DIF-FFT algorithm and draw the signal flow diagram.

14. a) Design an analog Butterworth low pass filter for the following specifications. Use bilinear transformation technique assuming T = 1 sec.

$0.9 \leq H(j\Omega) \leq 1$ for $0 \leq \Omega \leq 0.2\pi$

$H(j\Omega) \leq 0.2$ for $0.4\pi \leq \Omega \pi$

OR

b) Design an ideal high pass filter with,

$H_d(e^{j\omega}) = 1$ for $\pi/4 \leq \omega \leq \pi$

$= 0$ for $\omega \leq \pi/4$

using Hamming window for N=11.

15. a) Discuss the architecture of TMS320C54X processor with its block diagram.

OR

b) Explain the various addressing modes and salient features of TMS320C54X processor.
