Register Number……

B.E. DEGREE EXAMINATIONS: APRIL/MAY 2010

Sixth Semester

U07EE605: DIGITAL SIGNAL PROCESSING

(Common to Electrical and Electronics Engineering & Electronics & Instrumentation Engineering)

Time: Three Hours **Maximum Marks: 100**

Answer ALL the Questions:-

PART A (10 x 1 = 10 Marks)

1. Energy E of the signal x(n) is defined as

   (a) E = $\sum_{n=-\infty}^{\infty} 1/P|x(n)|^2$ (c) E = $\sum_{n=-\infty}^{\infty} |1/x(n)|^2$

   (b)E = $\sum_{n=-N}^{\infty} 1/P|x(n)|^2$ (d) E = $\sum_{n=-\infty}^{\infty} |x(n)|^2$

2. If a signal satisfies the condition x(-n)=x(n), then it is said to be,

   (a) Causal signal (b) Time invariant signal (c) odd signal (d) even signal

3. The properties of frequency response states that if the impulse response h(n) is discrete, where as frequency response H(ω) is,

   (a) Discrete of ω (c) symmetric over the interval

   (b) Continuous function of ω (d) anti symmetric over the interval

4. The Z transform of cosωt is

   (a) x(z) = $\frac{z[z-\sin\omega t]}{z^2-2z\sin\omega t+1}$ (c) x(z) = $\frac{z[z+\sin\omega t]}{z^2+2z\sin\omega t+1}$

   (b) x(z) = $\frac{z[z-\cos\omega t]}{z^2-2z\cos\omega t+1}$ (d) x(z) = $\frac{z[z+\cos\omega t]}{z^2+2z\cos\omega t+1}$

5. The multiplication of DFT's of two sequences is equivalent to_____ convolution of two sequences in _____domain.

   (a) Circular, time (b)Linear, frequency (c) circular, frequency (d) linear, time

6. If N =16 , the number of complex addition and complex multiplication for radix-2 FFT is,

   (a) 24, 12 (b)160, 80 (c) 64, 32 (d) 8, 4

7. The expression to determine the order of Chebyshev filter is given by,

   (a) N ≥ $\frac{\cosh^{-1}\frac{\delta_2}{\delta_1}}{\cosh^{-1}\frac{\omega_s}{\omega_p}}$ (b) N ≥ $\frac{\sinh^{-1}\frac{\delta_2}{\delta_1}}{\cosh^{-1}\frac{\omega_s}{\omega_p}}$ (c) N ≥ $\frac{\cosh^{-1}\frac{\delta_2}{\delta_1}}{\sinh^{-1}\frac{\omega_s}{\omega_p}}$ (d) N ≥ $\frac{\sinh^{-1}\frac{\delta_2}{\delta_1}}{\sinh^{-1}\frac{\omega_s}{\omega_p}}$

8. The relation between Ω and ω is given by,

   (a) Ω = 2/T tan ω/2 (b) Ω = 2/T tan $\omega^2/2$ (c) Ω = 4/T tan $\omega^2/2$ (d) Ω = 4/T tan ω/2

9. The feature of multiple bus structure resulting in faster data transfer rate is rated to,

   (a) SISD architecture (c) Von Neumann architecture

   (b) MAC architecture (d) Harvard architecture

10. In _____operation , the overall instruction execution are allowed overlap,

(a) Circular addressing (b) Immediate addressing (c) Pipelining (d) Rigging

PART B (10 x 2 = 20 Marks)

11. Define discrete time signals.
12. What is aliasing effect?
13. Give the properties of z transform.
14. Define Parseval's theorem.
15. Why FFT is needed?
16. What are the difference and similarities between DIF and DIT algorithms?
17. What are the methods of obtaining digital filters from analog filters?
18. What do you mean by prewarping?
19. List out various applications of DSP processors.
20. What are the steps involved in circular convolution.

PART C (5 x 14 = 70 Marks)

21.a) Explain the various types of systems with an example.

(OR)

b)(i) Give the mathematical representation of continuous and discrete type of signals. [07]

(ii) Explain the analog to digital conversion with a neat block diagram. [07]

22.a)(i) Explain the various methods of finding inverse Z transform. [07]

(ii) Explain the stability of second order systems. [07]

(OR)

b)(i) Determine the one sided Z transform of the following, [10]

$y(n)+\frac{1}{2}y(n-1)-\frac{1}{4}y(n-2)=0,\ y(-1)=y(-2)=1.$

(ii) Explain the frequency response of discrete time systems. [4]

23. a) Explain in detail about the various DFT properties.

(OR)

b)(i) An 8 point sequence is given by , [10]

x(n) = { 2,2,2,2,1,1,1,1 }, Compute 8 point DFT of x(n) by radix-2 DIF FFT.

(ii) Draw and explain the basic butterfly diagram for DIT algorithms. [4]

24.a)(i) Explain the rectangular and triangular type window of design of FIR filters. [7]

[7]

(ii) A first order Butterworth lowpass transfer function with a 3 dB cutoff frequency at Ω_c is given by, $H_a(s) = \frac{\Omega_c}{s + \Omega_c}$ Design a single pole low pass with 3 dB bandwidth of 0.2π using bilinear transformation.

(OR)

b)(i) Explain the design procedure for analog Chebsyshev low pass filter. [7]

(ii) Using impulse invariant method, obtain the digital filter realization of the analog filter in the figure below. [7]

25. a) Explain the architecture and features of TMS 320C54 signal processing chip detail.

(OR)

b)(i) Perform circular convolution of the two sequences by graphical method. [10]

$X_1(n) = \{ 2,1,2,1 \}$ $X_2(n) = \{ 1,2,3,4 \}$

(ii) Write short notes on MATLAB and give its features. [4]

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