Register No: …….

B.E. DEGREE EXAMINATIONS: APRIL/MAY 2011

Sixth Semester

U07EE605: DIGITAL SIGNAL PROCESSING

(Common to Electrical & Electronics Engineering and 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 = $\sum_{n=0}^{\infty} |x^2(n)|$ (b) E = $\sum_{n=-\infty}^{\infty} |x(n)|^2$

(c) E = $\sum_{n=-\infty}^{\infty} |x^2(n)|$ (d) E = $\sum_{n=0}^{\infty} |x(n)|^2$

2. A real valued signal x(n) is said to be symmetric if,

(a) x(n) = - x(n) (b) x(n+N) = x(n) (c) x(-n) = - x(n) (d) x(-n) = x(n)

3. The causal system is important because

(a) it can be realized in real time (b) design is simple

(c) it is always stable (d) design is complex

4. The procedure for transforming Z domain to the time domain is called

(a) Z transform (b) Linearization of Z domain

(c) Inverse Z transform (d) Time scaling of Z domain

5. The main drawback of Fourier transform is

(a) Continuous function of ω (b) Continuous function of time

(c) discrete function of ω (d) discrete function of time

6. The numerical value of W_8^2 is,

(a) – 1 (b) 1 + j (c) – j (d) 1 – j

7. Which is not a windowing technique?

(a) Hamming (b) Harlet (c) Hanning (d) Blackmann

8. For a stable filter the poles should lie on

(a) anywhere in s – plane (b) at the origin of s – plane

(c) right half of s – plane (d) left half of s – plane

9. In TMS 320 C 54, C stands for

(a) Chip Number (b) Commercial (c) CMOS (d) Cycle time

10. To avoid aliasing effect

(a) $f_s \geq 2 f_m$ (b) $f_s \geq f_m$ (c) $f_s \leq 2 f_m$ (d) $f_s \leq f_m$

PART B (10 x 2 = 20 Marks)

11. Draw the basic block diagram of DSP.

12. Define Nyquist rate.

13. What is a static system?

14. What is a frequency response function?

15. List any two methods of computing Fast Fourier Transforms.

16. Give any two applications of DFT.

17. What is a pre warping effect?

18. Draw and explain the basic butterfly diagram.

19. What is meant by VLIW architecture?

20. Write the assembly language syntax for TMS 320 C 54 processor for multiplication operation.

PART C (5 x 14 = 70 Marks)

21. a) (i) Briefly discuss about quantization and quantization error. (7)

(ii) Test the following signals for time invariance

(i) $y(n) = nx^2(n)$ (ii) $y(n) = a^{x(n)}$ (7)

(OR)

b) (i) Briefly discuss about the classification of signals. (7)

(ii) Describe the classification of systems in detail. (7)

22. a) (i) Find the inverse z transform of $X(z) = \frac{Z(Z+1)}{(Z-1)^3 \quad (Z-2)}$ for ROC: $|Z|>2$ using partial fraction method. (7)

(ii) State and prove convolution theorem in Z transform. (7)

(OR)

b) Determine the impulse response of the system described by difference equation $y(n) = y(n-1) - 0.5y(n-2) + x(n) + x(n-1)$. Plot the pole zero pattern and discuss on stability.

23. a) (i) Explain any four properties of DFT. (7)

(ii) Find the IDFT of $Y(k) = \{1,0,1,0\}$ (7)

(OR)

b) Evaluate the 8 –point DIT –FFT algorithm for

$$x(n) = \begin{cases} 1 & \text{for } 0 \le n \le 6 \\ 0 & \text{otherwise} \end{cases}$$

24. a) Design a high pass filter using hamming window, with a cut-off frequency of 1.2 radians/sec and N=9.

(OR)

b) The specifications of the desired low pass filter is

$$\frac{1}{\sqrt{2}} \leq |H(\omega)| \leq 1.0 \quad ; \quad 0 \leq \omega \leq 0.2\pi$$

$$|H(\omega)| \leq 0.08 \quad ; \quad 0.4\pi \leq \omega \leq \pi$$

Design a Butterworth digital filter using Bilinear transformation.

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

(OR)

b) Explain the generation of convolution code using the MACD instruction in TMS 350 C 54 processor.

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