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# Question Paper Code : 31235

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2013.

Sixth Semester

Electrical and Electronics Engineering

080280051 — DIGITAL SIGNAL PROCESSING

(Common to B.E. (Part-Time) Fifth Semester Electrical and Electronics Engineering)

(Regulation 2008)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Mention the need for DSP.

2. Define Nyquist rate.

3. Give the Z transform of $x(n - m)$.

4. Find the Fourier transform of $x(n) = 2^n$, $n = 0, \pm 1, \pm 2, \ldots$.

5. Compute the DFT of $x(n) = \delta(n - n_0)$.

6. What is meant by radix – 2 FFT?

7. Write two properties of Chebyshev filters.

8. State the conditions for FIR filters to have linear phase.

9. What does TMS and C stand for in TMS 320 C54 signal processing chip?

10. What is Harvard architecture?

PART B — ($5 \times 16 = 80$ marks)

11. (a) (i) If a system is represented by the following difference equation, then determine whether it is linear, shift invariant, causal and stable. Explain the result. (10)

$y(n) = 3y^2(n-1) - nx(n) + 4x(n-1) - x(n+1)$ for $n \geq 0$.

(ii) Describe quantization and quantization error. (6)

Or

(b) (i) Compute the convolution of (8)

$x(n) = n/2 \quad 0 \leq n \leq 5 \qquad h(n) = 1 \quad -3 \leq n \leq -3$

$= 0 \quad$ otherwise $\qquad = 0 \quad$ otherwise

(ii) Discuss in detail about aliasing effect and how can it be overcome. (8)

12. (a) (i) Explain any three properties of Z transforms in detail. (8)

(ii) Find the inverse Z transform of (8)

$(5 - 2Z^{-1} + Z^{-2})/[(1 + Z^{-1})^2(1 - Z^{-1})^2]$ ROC $|Z| > 1$.

Or

(b) (i) Find the frequency response of the causal system (8)

$y(n) = 0.5x(n) + x(n-1) + 0.5x(n-2)$.

(ii) Find the convolution of $x(n) = 3^n u(-n)$ and $h(n) = (1/3)^n u(n-2)$ using Fourier transform. (8)

13. (a) (i) Find the IDFT of $X(k) = \{5, 0, 1-j, 0, 1, 0, 1+j, 0\}$. (8)

(ii) Explain any three properties of DFT. (8)

Or

(b) (i) Compute the 4-point DFT of $x(n) = \{1, 2, 3, 4\}$. (8)

(ii) Explain Multi resolution Analysis in wavelet context. (8)

14. (a) Design a Butterworth filter satisfying the constraints : (16)

$$0.75 \leq \left|H(e^{j\omega})\right| \leq 1 \quad 0 \leq \omega \leq \pi/2$$

$$\left|H(e^{j\omega})\right| \leq 0.2 \quad 3\pi/4 \leq \omega \leq \pi$$

Or

(b) Using a rectangular window technique design a low-pass filter with pass band gain of unity, cutoff frequency of 1000 Hz and working at a sampling frequency of 5 kHz. The length of the impulse response should be 7. (16)

15. (a) Explain the architecture and special features of TMS 320 C54 signal processing chip. (16)

Or

(b) Mention any four DSP specific instructions used in DSP processor and explain it with an example. (16)

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