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Question Paper Code : 31213

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2015.

Sixth Semester

Electrical and Electronics Engineering

080280051 — DIGITAL SIGNAL PROCESSING

(Common to B.E. (Part-Time) Fifth Semester)

(Regulation 2008)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. A two tone signal has 50Hz and 75Hz tones. If this signal is digitally processed, what would be minimum sampling frequency required to avoid aliasing?

2. If the output of a system $y(n)$ is represented as $y(n) = x(n) - 0.5y(n-1)$, classify the system whether it is recursive or not. Justify your answer.

3. What do you mean by region of convergence in Z transform?

4. Determine the Fourier transform of the signal $x(n) = \left(\frac{1}{2}\right)^{|n|}$.

5. Write the relationship between Z transform and DFT with expressions.

6. State and prove shifting property of DFT.

7. Write two properties of Chebyshev filters.

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

9. What is pipelining?

10. List out the four operation blocks involved in C5X processors.

PART B — ($5 \times 16 = 80$ marks)

11. (a) (i) Determine whether the system having input $x(n)$ and output $y(n)$ and described by the relationship : $y(n) = \sum_{K=-\infty}^{n} x(k+2)$ is (1) memory-less, (2) stable, (3) causal (4) linear and (5) time invariant. (8)

(ii) Explain the successive approximation type analog to digital converter with diagrams. (8)

Or

(b) (i) Discuss the various types of digital signal processing operations with examples. (8)

(ii) What is the input signal $x(n)$ that will generate the output sequence $y(n) = \{1,-1,0,2,-2,1\}$ for linear time invariant system with impulse response of $h(n) = \{1,1,1\}$. (8)

12. (a) State and prove the following properties of Z-transform.

(i) Time shift

(ii) Time scaling and

(iii) Convolution. (4+4+8)

Or

(b) Consider the transfer function of a system $H(z) = \dfrac{1+z^{-1}}{z^{-2}+2z^{-1}+0.75}$.

(i) Find all possible impulse responses of the system.

(ii) Classify the identified system under stability and causality. (10+6)

13. (a) Explain the multi resolution analysis using wavelet method. (16)

Or

(b) In an LTI system the input is $x(n) = \{1,1,1\}$ and the impulse response is $h(n) = \{-1,-1\}$. Determine the response of LTI system by radix –2 DIT FFT. (16)

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

$$0.75 \leq \begin{matrix} |H(e^{jw})| \leq 1 & 0 \leq \omega \leq \pi/2 \\ |H(e^{jw})| \leq 0.2 & 3\pi/4 \leq \omega \leq \pi \end{matrix}$$

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) Draw the architecture of TMS320C54X signal processor and list its major features.

Or

(b) (i) Compare the features of Van Neumann architecture with Harvard architecture. (8)

(ii) Explain the special features available in the DSP architecture which makes it suitable for signal processing applications. (8)
