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Question Paper Code : 63174

B.E/B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Fifth Semester

Electronics and Communication Engineering

EC 1302— DIGITAL SIGNAL PROCESSING

(Regulations 2008)

Time : Three hours Maximum : 100 marks

(Codes/tables/charts to be permitted, if any, may be indicated)

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is in place computation in FFT algorithm?

2. State any two properties of discrete Fourier transform.

3. What is the condition for a filter to have linear phase?

4. What are pass and attenuation bands as far as filters are concerned?

5. What is the cause for limit cycle oscillation?

6. List the advantages of floating point number representation.

7. Define autocorrelation and power spectral density.

8. What are the disadvantages of nonparametric methods?

9. What are the functions of MAC unit?

10. List out the instruction sets of TMS32OC5X.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Compute the 5 point DFT of the signal $x(n) = \{2, 1, 3, 0, 4\}$. (8)

(ii) State and prove the multiplication in time property of DFT. (8)

Or

(b) (i) Explain the salient features of the 8 point Decimation in time FFT algorithm. Explain the advantages of FFT over direct computation of DFT. (8)

(ii) Use the flow graph of 8 point DIT-FFT to compute the DFT of the sequence

$x(n) = \{1,2,3,4, 4,3, 2, 1\}$ (8)

12. (a) Design a digital Butterworth filter to meet the constraints

$$\frac{1}{\sqrt{2}} \le |H(\omega| \le 1;\ 0 \le \omega \le 0.2\pi$$

$$0 \le |H(\omega| \le 0.1;\ 0.5\pi \le \omega \le \pi$$

by using bilinear transformation and assume T = 1 sec.

Or

(b) (i) Determine the frequency response of FIR filter defined by $y[n] = 0.25x[n] + x[n-1] + 0.25x[n-2]$. Calculate the phase delay and group delay. (8)

(ii) The desired frequency response of a filter is

$$H_d(e^{jw}) = \begin{cases} e^{-j2w}, & -\frac{\pi}{4} \le \omega \le \frac{\pi}{4} \\ 0, & \frac{\pi}{4} \le |\omega| \le \pi \end{cases}$$

Determine the filter coefficients of $h_d[n]$ using Hamming window with N= 7. (8)

13. (a) (i) Derive the expression for quantization noise power. (6)

(ii) Analyze the limit cycle behavior for the following systems. (10)

$y(n) = 0.7y(n-1) + x(n)$

$y(n) = 0.65y(n-2) + 0.52y(n-1) + x(n)$

Also determine the dead band of the above systems.

Or

(b) (i) For the system $H(z) = (1 + 0.75z^{-1})/(1 - 0.4z^{-1})$, draw the signal flow graph and find scale factor to avoid overflow in the input adder. (8)

(ii) Derive and explain the analytical model of sample and hold operations. (8)

14. (a) Explain how Bartlet and Turkey method is used in smoothing the periodogram. (16)

Or

(b) (i) Derive the expression for energy density spectrum of discrete time signal. (8)

(ii) Prove that the estimated auto correlation is a consistent estimate of the rue autocorrelation function. (8)

15. (a) List and explain the different addressing modes of TMS320C5X processors.

Or

(b) Sketch and explain the architecture of TMS320C50 processor.
