Reg. No. : | | | | | | | | | | |

Question Paper Code: 31461

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2016

Sixth Semester

Electronics and Communication Engineering

01UEC601 - DIGITAL SIGNAL PROCESSING

(Regulation 2013)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1. Differentiate DTFT and DFT.
2. When will you use FFT?
3. List the limitations of impulse invariant mapping.
4. Define pre warping. Why it is needed?
5. Collect the properties of Chebyshev filter?
6. Define Gibb's phenomenon.
7. Distinguish the fixed point and floating point arithmetic.
8. Give some Recommendation to prevent overflow.
9. Name some of the applications of multi rate digital signal processing.
10. Define interpolation and decimation.

PART - B (5 x 16 = 80 Marks)

11. (a) (i) An 8-point sequence is given by x(n) = {2, 1, 2, 1, 4, 2, 4, 2}. Estimate 8 point DFT of x(n) is using radix- 2 DIF-FFT. (8)

(ii) Apply overlap save method, Calculate the output y(n) of a filter whose impulse response is h(n) = {1, 1, 1} and input signal x(n) = {3, -1, 0, 1, 3, 2, 0, 1, 2, 1}. (8)

Or

(b) (i) Perform circular convolution for the sequence $x_1(n)=\{1, 1, 2, 1\}$ and $x_2(n)=\{1, 2, 3, 4\}$ using DFT and IDFT. Justify the result by computing in time domain. (8)

(ii) Estimate the 4-point IDFT of X(K) = {2, 1-j, 0, 1+j} using DIT FFT. (8)

12. (a) The specifications of the desired low pass filter is

$0.9 \le |H(e^{jw})| \le 1; \quad 0 \le \omega \le \pi/2$

$|H(e^{jw})| \le 0.2 \quad ; \quad 3\pi/4 \le \omega \le \pi$

Design a digital butter worth filter using bilinear transformation. Assume T=1sec. (16)

Or

(b) (i) Design a chebyshev low pass filter whose transfer function

$0.8 \le |H(e^{j\omega})| \le 1.0 \; ; \; 0 \le \omega \le 0.2\pi$

$H(e^{j\omega})| \le 0.2 \; ; \; 0.6\pi \le \omega \le \pi$

Find the order of the filter by using impulse invariance transformation. (6)

(ii) Show the parallel structure of the IIR digital filter transfer function

$H(z) = 3(2z^2+5z+4) / ((2z+1)(z+2)$. (10)

13. (a) Design a FIR filter with

$H_d(e^{j\omega}) = e^{-j3w}, \quad -\pi/4 \le w \le \pi/4$

$= 0, \quad \pi/4 \le |w| \le \pi$

Determine the $H(e^{j\omega})$ using hanning window function with N=7. (16)

Or

(b) (i) Show the FIR linear phase realization of the system function
$H(z) = (1+ ½ z^{-1} + z^{-2})(1+ ¼ z^{-1} + z^{-2})$. (8)

(ii) Summarize the design procedure for Linear phase FIR system using frequency sampling method. (8)

14. (a) A digital system is characterized by the difference equation y(n)= 0.95y(n-1) + x(n) with x(n)= 0.875, n=0. Assume b=4 bits. Find out limit cycle of oscillation and estimate the dead band of the system. (16)

Or

(b) (i) For the following system described equation y(n) = 0.8 y(n-1) + x(n). Solve the output noise power due to input quantization. Assume b=5 bits. (8)

(ii) Describe the different addressing modes of TMS320C5X with examples. (8)

15. (a) (i) Describe on sampling rate reduction by an integer factor 'I'. (8)

(ii) Explain the sub band coding of speech signal. (8)

Or

(b) (i) Illustrate about multi rate signal processing. (8)

(ii) Explain about poly phase realization of filter banks. (8)

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