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

Question Paper Code: 36401

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 2019

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. State the equation for forward and inverse DFT
2. Why Fast Fourier transform is needed?
3. Compare direct form I and direct form II realizations of IIR system.
4. Sketch the mapping of s-plane to Z-plane in bilinear transformation.
5. What are the advantages and disadvantages of FIR filters?
6. Define Gibb's phenomenon.
7. Distinguish the fixed point and floating point arithmetic.
8. Give some Recommendation to prevent overflow.
9. Draw the block diagram of sub coding.
10. Mention the applications of multirate signal processing

PART - B (5 x 16 = 80 Marks)

11. (a) (i) An 8-point sequence is given by x(n) = {0, 0, 0, 0, 1, 1, 1, 1}. Estimate 8 point DFT of x(n) is using radix- 2 DIT-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) Perform circular convolution for the sequence $x_1(n)=\{1, 1, 2, 1\}$ and $x_2(n)=\{4, 3, 2, 1\}$ using DFT and IDFT. Justify the result by computing in time domain. (16)

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

$0.8 \le |H(e^{jw})| \le 1; \quad 0 \le \omega \le \pi/2$

$|H(e^{jw})| \le 0.3 \quad ; \quad 3\pi/4 \le \omega \le \pi$

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

Or

(b) For the analog transfer function $H(s) = \frac{2}{s^2+3s+2}$. Determine *H(z)*using impulse invariant transformation. Assume *T*=1 second. (16)

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) Explain the characteristics of a limit cycle oscillation with respect to the system described by the difference equation y(n)=0.95y(n-1)+x(n).Determine the dead band of the system (16)

Or

(b) 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. (16)

15. (a) Derive the input output relationship in both time domain and frequency domain of the sampling rate decreased by an integer factor. (16)

Or

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

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