B.Tech III Year II Semester (R13) Regular & Supplementary Examinations May/June 2017

DIGITAL SIGNAL PROCESSING

(Common to ECE and EIE)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) What are the various methods of representing discrete time signal? Give examples.
(b) Define the frequency response of a discrete-time system.
(c) Why FFT is needed?
(d) Draw the flow graph of a two-point radix-2 DIF-FFT.
(e) Realize $y(n) + y(n+1) + \frac{1}{4}y(n-2) = x(n)$ in cascade form network.
(f) Write the procedure for FIR system design by frequency sampling method.
(g) Compare IIR filter and FIR Filter.
(h) List the characteristics of FIR filters designed using windows.
(i) What is the need for multistage structure implementation?
(j) Name the various methods of FIR filter design.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 (a) Compute the DFT of a sequence $(-1)^n$ for N = 4.
(b) Define the terms (i) Linearity. (ii) Time invariance. (iii) Causality as applied to a discrete time system.

OR

3 Determine and sketch the magnitude and phase sequence of $y(n) = \frac{1}{2}\{x(n) + x(n-2)\}$.

UNIT – II

4 Given $X(n) = 2^n$ and N = 8, find X(k) using DIT-FFT algorithm.

OR

5 Let x(n), $0 \le n \le N-1$ be a sequence with an N-point DFT X(k), $0 \le k \le N-1$

(a) if x(n) is symmetric satisfying the condition x(n) = x(N -1- n), show that $X(\frac{N}{2}) = 0$ for N even.
(b) if x(n) is antisymmetric satisfying the condition x(n) = -x(N -1- n), show that $X(0) = 0$ for N even.

UNIT – III

6 Obtain the direct form I, direct form II and cascade form from realization for the system:

y(n) = -0.1y(n-1)+0.2y(n-2)+3x(n)+3.6x(n-1)+0.6x(n-2)

OR

7 Given the system function $H(z) = \frac{2+8z^{-1}+6z^{-2}}{1+8z^{-1}+12z^{-2}}$ realize using ladder structure.

UNIT – IV

8 Convert the analog filter with system function $H_a(s)$ into digital filter using bilinear transformation.

$$H_a(s) = \frac{S+0.3}{(S+0.3)^2+16}$$

OR

9 Determine the coefficients of a linear-phase FIR filter of length N=15 which has a symmetric unit sample response and a frequency response that satisfies the conditions

$$H\left(\frac{2\pi k}{15}\right) = \begin{cases} 1 & ; \text{ for } k = 0,1,2,3 \\ 0.4 & ; \text{ for } k = 4 \\ 0 & ; \text{ for } k = 5,6,7 \end{cases}$$

UNIT – V

10 (a) Write notes on filter design and implementation for sampling rate conversion.
(b) State the advantages of multi rate digital signal processing.

OR

11 Implement a two-stage decimator for the following specifications,
Sampling rate of the input signal = 20000 Hz, M = 100,
Pass band = 0 to 40 Hz, Transition Band = 40 to 50 Hz
Pass band ripple = 0.01 and Stop band ripple = 0.002

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