Sub Code:REE053

Paper Id: 120506 **Roll No:**

B. TECH.
(SEM-V) THEORY EXAMINATION 2019-20
FUNDAMENTALS OF DIGITAL SIGNAL PROCESSING

Time: 3 Hours ***Total Marks: 70***

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. 2 x 7 = 14

a.	Explain some advantages and applications of digital signal processing.
b.	Discuss FFT algorithm using decimation in frequency technique.
c.	What are the advantages of Kaiser Window?
d.	Discuss the computation efficiency of FFT over DFT.
e.	How many numbers of addition, multiplication and memory locations are required to realize a system H(z) having M zeroes and N poles in Direct Form-II realization.
f.	A 4th order FIR filter has following two pairs of complex conjugate zeros. Z_1, Z_2= $e^{\pm j\pi/3}$ and Z_3, Z_4= $2e^{\pm j\pi/4}$. State whether the filter has linear phase property.
g.	What is called quantization noise?

SECTION B

2. Attempt any *three* of the following: 7 x 3 = 21

a.	Develop DIT FFT algorithms for algorithms for decomposition the DFT for N=6 and draw SFG for N=2.3 and *x (n)* = {1, 2, 3, 4, 5, 6}.
b.	Frequency response of a linear phase FIR filter is given by, $H(e^{jw}) = e^{j3w}(2+1.8\cos 3w+1.2\cos 2w+0.5\cos w)$. Find impulse response h(n) of a filter.
c.	Determine the output response y(n) if h(n) = {1,1,1,1}; x(n) = {1,2,3,1} by using (i) Linear convolution (ii) Circular convolution.
d.	Compare bilinear transformation and impulse invariant mapping.
e.	What is Hamming window function? Obtain its frequency-domain characteristics.

SECTION C

3. Attempt any *one* part of the following: 7 x 1 = 7

(a)	Design a chebyshev filter with a maximum pass band attenuation of 2.5 db; at Ωp=20 rad/sec and the stop band attenuation of 30 Db at Ωs=50 rad/sec.
(b)	Prove that the multiplication of the DFTs of two sequences is equivalent to the circular convolution of the two sequences in the time domain.

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4. Attempt any *one* part of the following: 7 x 1 = 7

(a)	Design a digital Chebyshev filter that satisfy the following constraints, using impulse invariant transformation: $0.8 \le \lvert H(e^{j\omega}) \rvert \le 1$ for $0 \le \omega \le \pi/4$; $\lvert H(e^{j\omega}) \rvert \le 0.2$ for $3\pi/4 \le \omega \le \pi$
(b)	(i) Compute 4 point DFT of the following sequence using linear transformation matrix $X(n)=\{2,2,-4,-4\}$ (ii) Find IDFT x(n) from x(k) calculated in part (i).

5. Attempt any *one* part of the following: 7 x 1 = 7

(a)	(i) Compute the circular convolution of following sequences and compare the results with linear convolution. $x(n)=\{1,1,1,1,-1,-1,-1,-1\}$ and $h(n)=\{0,1,2,3,4,3,2,1\}$ (ii) State and prove the Circular Convolution property of DFT.
(b)	Develop DIT FFT algorithms for algorithms for decomposition the DFT for N=6 and draw SFG for N=2.3 and $x(n) = \{1, 2, 3, 4, 5, 6\}$.

6. Attempt any *one* part of the following: 7 x 1 = 7

(a)	Obtain a ladder structure using continued fraction expansion method for the system function given $H(z)=(Z^{-2}+2Z^{-1}+1)/(3Z^{-2}+3Z^{-1}+1)$
(b)	Explain the Radix-2, Radix-4 algorithms with suitable examples.

7. Attempt any *one* part of the following: 7 x 1 = 7

(a)	Find the magnitude and phase response function of seventh order low pass linear phase FIR filter with cut-off frequency 1 rad/sec using Hanning window.
(b)	Explain the procedure for designing an FIR filter using the Hamming window.