Subject Code: REC503

PAPER ID-411236

Roll No:

B. TECH
(SEM-V) THEORY EXAMINATION 2021-22
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.	Write the Advantages of DSP over ASP
b.	Define linear convolution and its physical significance.
c.	Define DSP & draw its block diagram.
d.	Define circular convolution and its physical significance.
e.	What is down sampling and up sampling?
f.	Explain Frequency wraping effect?
g.	Differentiate between Analog and Digital filters

SECTION B

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

a.	Find the DFT of the sequence S(n) ={ 2,1,2,0,3,2,0,1} using Decimation in time FFT.
b.	Convert the analog filter with system function $H(s)=\frac{s+0.1}{(s+0.1)^2+9}$ into digital filter with a resonant frequency of $\omega_r=\frac{\pi}{4}$ of using bilinear transformation.
c.	Draw the parallel form network structure of the system with transfer function $H(z)=\frac{2z(z+3)}{z^2+0.3z+0.02}$
d.	What are the different window functions used for windowing? Explain frequency transformation with LPF to HPF conversion formula.
e.	Draw the ladder structure for the system defined by the following equation. y(n)=5x(n-2)+4x(n-1)+x(n)-3y(n-2)+2y(n-1)

SECTION C

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

(a)	The desired response of a low-pass filter is $H_d(e^{jw})=\begin{cases} e^{-j3w}, & \frac{-3\pi}{4}\le\omega\le\frac{3\pi}{4} \\ 0, & \frac{3\pi}{4}<\lvert\omega\rvert<\pi \end{cases}$ Determine $H(e^{jw})$ for M = 7 using a hamming window.
(b)	Calculate the circular convolution of $s_1(n)$ = {1, 2, 1, 2} and $s_2(n)$ = {1, 2, 3, 4} using stockham's method.

Subject Code: REC503

PAPER ID-411236

Roll No:

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

(a)	What are Gibbs Oscillations? How can they be reduced.
(b)	Explain the impulse invariance method for converting analog filter into digital filter.

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

(a)	What are linear phase FIR filters? How can the symmetry of these filters help to simplify the network Structure? A linear phase filter has the following unit sample response. Draw the signal flow graph for the system that requires the minimum number of multiplications
(b)	Design a digital chebyshev filter to satisfy the constraints

$h_{(n)}$	$h_{(0)}$	$h_{(1)}$	$h_{(2)}$	$h_{(3)}$	$h_{(4)}$	$h_{(5)}$	$h_{(6)}$
Value	–0.01	0.02	–0.10	0.40	–0.10	0.02	–0.01

$$0.707 \le |H(e^{j\omega})| \le 1 \qquad 0 \le \omega \le 0.2\pi$$
$$|H(e^{j\omega})| \le 0.1, \qquad 0.5\pi \le \omega \le \pi$$

Using bilinear transformation with T=1s

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

(a)	Explain Quadrature mirror filter. What are the advantages of MDSP.
(b)	Determine H(z) for a Butterworth filter satisfying the following constraints

$$\sqrt{0.5} \le |H(e^{j\omega})| \le 1 \qquad 0 \le \omega \le \frac{\pi}{2}$$
$$|H(e^{j\omega})| \le 0.2 \qquad \frac{3\pi}{4} \le \omega \le \pi$$

with T=1sec. Apply impulse invariant transformation

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

(a)	Compute the Linear convolution of two discrete time sequences $x_1(n) = \{1, 2, 1, 2\}$ and $x_2(n) = \{3, 2, 1, 4\}$
(b)	Explain the Interpolation process for an integer factor I with an example.