B.E. (Computer) (Sem-VII) (CBSGS)

Paper / Subject Code: 42101 / Digital Signal Processing

Date - 14/11/19

(3 Hours) **Total Marks: 80**

N.B: 1) Question **number 1** is compulsory.
2) Attempt **any three** out of remaining.
3) Assume suitable data if **necessary** and justify the assumptions.
4) Figures to the **right** indicate full marks.

Q.1 A) Determine Power and Energy of a Unit Step Signal. 05

B) Compare FIR systems with IIR Systems 05

05

C) Consider the analog signal
$X_a(t) = 3 \cos 2000 \Pi t + 5 \sin 6000 \Pi t + 10 \cos 12000 \Pi t$
a) Determine the minimum required sampling rate to avoid aliasing.
b) If Fs=5000 samples per unit time, what is the discrete time signal obtained after sampling?

D) For $x(n) = \{4, \underset{\uparrow}{2}, -1, 1, 3, 2, 4, 2\}$ find the following 05

1) $x(n-2)$
2) $x(1-n)$
3) $x(n+3)$
4) $x(n).u(n-1)$
5) $x(n-2) + \partial(n-1)$

Q.2 A) Perform the linear convolution between x(n) and h(n) given below in time domain. 12

i) $x(n) = \left(\frac{1}{3}\right)^n u(n-2)$, $h(n) = (3)^n u(-n)$

ii) $x(n) = \begin{cases} 1 & for\ n = -2, 0, 1 \\ 2 & for\ n = -1 \\ 0 & else\ where \end{cases}$

$$h(n) = \partial(n) - \partial(n-1) + \partial(n-2) - \partial(n-3)$$

B) Find the auto correlation of the signal x(n)= $\{3, \underset{\uparrow}{2}, 1, 2\}$ 08

Also, explain what is the significance of the value corresponding to origin?

Q.3 A) Given a 6 point sequence 10

$x(n) = 3\partial(n) + 4\,\partial(n-1) + 6\,\partial(n-3)$

a) $if\ P(K) = W_N^{3K}\,X(K)$, find p(n)
b) $if\ Q(K) = X(K-3)$, find q(n)
c) $if\ R(K) = Real\,\{X(K)\}$, find r(n)

B) Compute the Inverse DFT of the following 4 point sequence. 10

$X(K) = \{4, 1-j, -2, 1+j\}$

Q.4 A) Find the circular convolution of following two sequences using concentric circle method. 10

$x1(n) = \{1, -1, 2, -4, 2\}$
$x2(n) = \{1, 2, 3\}$

B) Apply DIT- FFT algorithm on the following 8 point sequence. 10
x(n)={ 1, 2, 3, 4, 4, 3, 2, 1 }

Q.5 A) Check whether the given system $y(n) = x(2n) - x(n-1)$ is 10

a) Static or dynamic
b) Linear or Non Linear
c) Stable or unstable
d) Causal or Non causal
e) Time variant or Time Invariant

B) Find the output y(n) whose impulse response is $h(n) = \{1, 1, 1\}$ and input signal $x(n) = \{3, -1, 0, 1, 3, 2, 0, 1, 2, 1\}$ using overlap add method. 10

Q.6 Attempt any two questions from the following 20

a) Explain in detail any five DFT properties.
b) Explain Carl's correlation coefficient algorithm with the help of suitable example.
c) Write a detailed note on biomedical application of DSP processor.
