Discrete Time Signal Processing Laboratory

T. E. Sem-VI (CBSGS) ENTC - DTSP

Q.P. Code : 588402

29/11/16

(3 Hours)

Total Marks : 80

N. B. : (1) Q.1 is compulsory.

(2) Solve any three questions from remaining 6 questions

(3) Assume suitable data if it is required.

Q.1 (a) Explain phase delay and group delay [20]

(b) What are the advantages of digital filter over analog filter?

(c) State and prove frequency shifting property of DFT

(d) Compare: FIR filter and IIR filter.

Q.2.(a)(i) x(n)={ 1 , 2, 3 ,4} find DFT X(k) [10]

(ii) Using results obtained in part (i) and otherwise find DFT of following sequences

a(n)={ 4,1,2,3} b(n)={2,3,4,1} c(n)={3,4,1,2} d(n)={4,6,4,6}

(b)A digital filter is described by the following differential equation [10]

y(n) =0.9y(n-1)+bx(n)

(i)Determine b such that $|H(0)| = 1$

(ii)Determine the frequency at which $|H(w)|=\frac{1}{\sqrt{2}}$

(iii) Identify the filter type based on the passband.

Q3 (a) If x(n)={ 1 0 2 0 3 0 4 0}, Find X(K) using DIFFFT .Compare computational complexity of [10]

above algorithm with DFT.

(b)Explain effect of aliasing in Impulse Invariant Technique

Using this method, determine H(Z) if $H(s) = \frac{3}{(s+2)(s+3)}$ if T =0.1 sec [10]

Q.4 (a) Design a Linear Phase FIR Low Pass filter of Length 7 and cut off frequency 1 rad/sec using

Hamming window. [10]

(b) if $x(n) = \{1,2,3,2\}$ and $h(n) = \{5,6\,7\,8\}$ [10]

a) Find circular convolution using time domain method.

b) Find circular convolution using DFT / IDFT method.

c) Find linear convolution using circular convolution.

Q.5(a) Design a digital Butterworth filter for following specifications using Bilinear Transformation Technique [10]

Attenuation in Pass band =1.93 dB, Pass band Edge frequency $=0.2\pi$
Attenuation in Stop band =13.97dB Stop band Edge frequency $=0.6\pi$

(b) With a suitable block diagram describe sub-band coding of speech signals. [10]

Q.6(a) Determine FIR lattice coefficient of system with transfer function [10]

$$H(Z) = 1+\frac{13}{24}Z^{-1}+\frac{5}{8}Z^{-2}+\frac{1}{3}Z^{-3}$$

(b) Write a note on Frequency Sampling realization of FIR Filter [10]

122-2