Student Exam No.....

GANPAT UNIVERSITY

B.Tech. Semester –V BIOMEDICAL & INSTRUMENTATION ENGINEERING

REGULAR EXAMINATION NOV – DEC 2011.

BME 505: BIOLOGICAL DIGITAL SIGNAL PROCESSING

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

Instructions:

1. **Answer to the questions must be written in separate answer books.**
2. **Figure to the right indicate marks.**
3. **Conventional terms / notations are used.**
4. **All the questions are compulsory.**

SECTION I

Que.1 **12**

A. Discuss Sampling Theorem & Aliasing effect in detail.
The analog signal is given x (t) =7cos250Πt+3sin650Πt. Calculate:

- Nyquist Sampling rate
- If the given x (t) is sampled at the rate fs =750Hz. What is the discrete time signal obtained after sampling? & Draw the Aliasing effect.

B. Define LTI system. & derive equation for Convolution Sum. Find out
Y(n)=x(n)*h(n), h(n)={1, 2, 1},x (n) = {-1,2,0, 1} by mathematical method.

OR

Que.1 **12**

A. The analog signal is given x (t) =7sin250Πt+3sin600Πt+4sin350Πt. Calculate:

1. Nyquist Sampling rate?
2. If the given x (t) is sampled at the rate fs =500Hz. What is the discrete time signal obtained after sampling?
3. What is analog signal y (t) we can reconstruct from the samples if ideal interpolation method is used.

& also write the MATLAB program for sub-question 1 & 2.

B. Perform convolution of h (n) = {2, 3, 0, 1} & x (n) = {1, -2, 3} by graphical method.

& also discuss the properties of convolution by taking any example using graphical method.

Que.2 **11**

A. What are the advantages of digital filter & enlist the types of it. Derive Impulse response of an ideal Low Pass filter.

B. Obtain requirements of FIR Low pass filter to meet the following specifications given below using Kaiser window. & write the program for it:

Pass band edge frequency	: 1.8 KHz	Stop band attenuation	: >40 dB
Pass band attenuation	: 0,01 dB	Stop band edge frequency	: 2.2 KHz
Sampling rate	: 08KHz		

C. Perform cross correlation of y (n) = {-2, 1, 0, 1} & x (n) = {1, -2, -1, 2}.

OR

Que.2

A. Derive Z-transform of Recursive system & Non-recursive system

B. Design a IIR Band pass filter is to be designed to meet the following specifications:

Pass band edge frequency : 0.26-0.30(normalized)
Transition width : 0.03(normalized)
Stop band deviation : 0.001 Pass band deviation : 0.04

i) Sketch tolerance scheme for filter.

ii) Express the filter band edge frequencies in standard unit of KHz, and stop band & pass band attenuation. Taking Fs=7.5 KHz

C. Obtain co-efficient of FIR High pass filter to meet the following specifications given below the window:

Pass band edge frequency: 1.5 KHz Stop band attenuation : >45 dB
Stop band edge frequency: 2.1 KHz Sampling rate : 0.115msec.

Que.3 **12**

A. Write the recursive equation of IIR filter & Using Pole-Zero placement method to calculate co-efficient of a notch filter. Obtain the transfer function of a notch filter

Notch frequency : 50Hz
A 3dB width of notch : 12Hz
Sampling period : 0.001sec.

B. Represent 2nd order IIR filter by suitable structure & Obtain co-efficient of IIR Band stop filter using BZT method:

Where, $H(s)= 1/(s+1)$
Pass band : 200-300 Hz
Sampling rate : 2000Hz

Section-II

Que.-4

A. Enlist the standard test signals & explain each in briefly. **6**

B. Determine the following systems are causal or non causal , time variant or time invariant, linear or non linear: **6**

i.)$y[n]=x[2-n]$, ii)$y[n]=7x[n]+5$,

OR

Que.-4

A. Differentiate between symmetric & anti symmetric signal. & also derive the equation for even & odd part of the signal x (t). **5**

B. What you understand by invertibility? Explain in brief. **4**

C. Explain the steps to find out the system is 'Linear 'or 'Non Linear'. **3**

Que.-5

A. Find the linear convolution using DFT method of sequence x(n)={1,2,3,0}, h(n)={2,1,0,0}. **7**

B. Find out the DFT of signal x (n) = {0, 1, 2, 3}. **4**

OR

Que.-5

A. Determine the IDFT by matrix method of given sequence X[k]={2,1+j,0,1-j} **4**

B. Determine the circular convolution of sequence **5**

x(n) =1 n=0 h(n)= 0.5 n=0

=0.5 n=1 = 1 n=1

=0 elsewhere =0 elsewhere

C. What is twiddle factor? Compute the value of W_8^2, W_8^{11}. **2**

Que.-6 **Attempt any two:** **12**

A. for a given sequence perform following operations by matrix method: x(n)={2,0,0,1}, y(n)={4,3,2,1}

i) Find 4 point DFT of x(n)

ii) Find 4 point DFT of h(n)

iii) Perform Y[k]=X[k].Y[k].

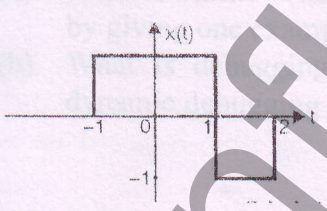
iv) Find IDFT of Y[k].

B. Find the Z transform of second order recursive filter whose impulse response

$h[n]= r^n \cos[w_0 n]$ n>= 0

= 0 elsewhere

C. Calculate even and odd part of given signal x(t) shown in fig.1



Fig(1)

END OF PAPER