b) Discuss computer aided design of IIR digital filters.

Unit - V

9. a) What are desirable and undesirable features of FIR filters? Differentiate between FIR filters and IIR filters.

   b) Determine the order of digital filter low pass filter satisfying the ahead specifications. If designed by using a KAISER window

   Maximum pass band ripple in frequency

   range – 0 to 1.5 rad/s : 0.1 dB

   Minimum stop band attenuation in frequency

   range – 2.5 to 5.0 rad/s : 40 dB

   sampling frequency : 10 rad/s.

OR

10. Realize the FIR filter transfer function

$H(z)=\left(1+0.8z^{-1}\right)^5$ in

i) Two different direct forms

ii) Cascade of first order section

iii) Cascade of one first order and two 2nd order section

iv) Cascade of one second order and minimum number of multiplier.

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Roll No .....

EX - 703

B.E. VII Semester

Examination, December 2013

Digital Signal Processing

Time : Three Hours

Maximum Marks : 70

Note: i) Attempt any one question from each unit.
ii) All questions carry equal marks.

Unit - I

1. a) What are continuous time and discrete time signals and systems? What do you mean by linearity and time invariance of these systems.

   b) Show that a relaxed linear system is causal if and only if, for any input $x(n)$ such that

$x(n)=0$ for $n<n_0 \Rightarrow y(n)=0$ for $n<n_0$

OR

2. a) Determine for each system defined below whether it is causal, linear, time invariant or BIBO stable

   i) $y(n)=ax(n+1)+bx(n-1)$

   ii) $y(n)=ax(n)\cdot x(n-1)$

b) Compute the convolution $y(n)$ of the signals

$$x(n)=\begin{cases}\alpha^n & -3\le n\le 5\\ 0 & \text{elsewhere}\end{cases}$$

$$h(n)=\begin{cases}1 & 0\le n\le 4\\ 0 & \text{elsewhere}\end{cases}$$

Unit - II

3. a) Determine the z-transform of the following :

i) $x(n)=(\cos w_0 n)u(n)$

ii) $x(n)=\left[3.(2^n)-4(3^n)\right]u(n)$

b) Explain and prove following properties of z-transform

i) Time reversal

ii) Convolution

OR

4. a) Show that z-transform of the sequence

$$x(n)=\begin{cases}\frac{a^n}{n!}, n\ge 0\\ 0\ , n<0\end{cases}$$

is $e^{\%}$ sketch the sequence for the first few values of n, for the case $a = 1$.

b) Compute the convolution $x(n)$ of signals using z-transform.

$x_1(n)=\{1,-2,1\}$

$$x_2(n)=\begin{cases}1 & 0\le n\le 5\\ 0 & \text{elsewhere}\end{cases}$$

Unit - III

5. a) State and prove following properties of DFT.

i) Even and odd properties

ii) Circular frequency shift

b) Compute the eight point DFT of the following

$x(n)=[1,2,3,4,5,6,7,8]$

OR

6. a) What do you understand by radix of FFT algorithm? Find the number of computations required for 2048 point DFT using normal method.

b) Discuss decimation in time algorithm for FFT and how it differs from the decimation in frequency algorithm. Draw the flow graph for decimation in time FFT algorithm for N = 8 using radix 2. Show various steps of decimation.

Unit - IV

7. a) Discuss impulse invariant transformation method for IIR filter design.

b) Using impulse variance with T = 1 second determine H(z) if:

$$H_a(s)=\frac{1}{(s+0.5)(s^2+0.5s+2)}$$

OR

8. a) Consider a continuous time system with system function

$$H_a(s)=\frac{s+a}{(s+a)^2+b^2}$$

Determine the system function $H(z)$ of a discrete system designed from this system on the basis of bilinear transformation.