TE/SemVI/Inst/CBGS/Digital signal processing/07-12-2016

QP Code : 598102

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

N.B. : 1. Question No. 1 is compulsory.
2. Attempt any three questions out of remaining five questions.
3. Assume suitable data if necessary.

1. Solve **any four :-** **20**
   (a) Draw and explain block diagram of DSP processor.
   (b) Determine the inverse DFT by using DITFFT
   $x(k) = [6, -1-j \;\; 0 \;\; -1+j]$
   (c) Compare between DFT and IDFT in no. of computations.
   (d) Draw the pole zero plot for all pass filters also write its difference equation.
   (e) Convert the analog Filter into digital filter by means of BLT where the resanant frequency $\omega r = \pi/2$

$$H(s) = \frac{(s+0.1)}{(s+0.1)^2 + 9}$$

2. (a) Find 8 point DFT of the given sequence using DIT FFT algorithm. **10**
   $x(n) = 2^n \;\; 0 \le n \le 7$

   (b) Perform the linear convolution of the following sequences using overlap save method. **10**
   $x(n) = \{ 2, 1, -3, 4, -1, -2, 0, 1, 2, 4 \}$
   $h(n) = \{ 5, 1, 2 \}$

3. (a) One of the zeros of the causal FIR Filter lies at $z = 1/2$. Find the location of other zeros if the system is symmetric and even length. Find the transfer function and its impulse response. **10**

   (b) Obtain Linear Phase realization of following transfer function. **10**
   $H(z) = (1 + \frac{1}{2} z^{-1} + z^{-2}) (1 + \frac{1}{4} z^{-1} + z^{-2})$

   (c) Find the DFT of following sequences by using DFT only ones not otherwise **10**
   $x(n) = [7, 3, 2, 1]$ $h(n) = [4, 6, 1, 5,]$

4. (a) Realize the system using Direct Form - II, cascade and parallel. **10**
   $y(n) = -0.1y(n-1) + 0.2y(n-2) + 3x(n) + 3.6x(n-1) + 0.6\, x(n-2)$

[TURN OVER]

(b) Design IIR butterworth filter to satisfy the following condition using Impulse invariance method Assume T = 1sec. **10**

$0.8 < |H(e^{j\omega})| \leq 1$ for $0 \leq \omega \leq 0.1\pi$

$|H(e^{j\omega})| \leq 0.2$ for $0.6\pi \leq \omega \leq \pi$

5. (a) Determine the frequency response. Plot magnetude and phase response for frequency. **10**

$\omega = 0, \pi/4, \pi/2, 3\pi/4$ & π

$y(n) = x(n) + 0.9\,x(n-2) - 0.4y(n-2)$

(b) A Linear phase FIR filter has desired response. **10**

$Hd(e^{j\omega}) = 0$ for $-\pi/4 \leq \omega \leq \pi/4$

$= e^{-j2\omega}$ for $\pi/4 \leq |\omega| \leq \pi$

Design the filter using Hamming window also Draw linear Phase realization.

6. (a) Derive the DIT FFT algorithm for $N = 6 = 2.3$. **10**

(b) Write a short note on Interpalation. **5**

(c) Write a difference between IIR and FIR filter. **5**