NEW SCHEME

Fifth Semester B.E. Degree Examination, July 2006
Electrical and Electronics
Digital Signal Processing

Time : 3 hrs.] [Max. Marks : 100

Note : ***1. Answer any FIVE full questions.***

1 a. Define the DFT and IDFT of a discrete time sequence x(n) of length N; Find x(0), $x(\frac{N}{2})$ and x(N-k) if x(n) is real **(10 Marks)**

b. Give the periodic sequences x(n) = {1,3,5,7} and y(n) = {2,4,6,8} find their convolution using stockham's methods. **(10 Marks)**

2 a. $X_1(k)$ and $X_2(k)$ are the DFTS of the discrete time sequences $x_1(n)$ and $x_2(n)$ respectively, each of length N.
If $X_3(k) = X_1(k)\, X_2(k)$, show that

$$x_3(n) = \sum_{m=0}^{N-1} x_1(m) x_2((n-m))_N, \quad m = 0 \text{ to } N\text{-}1.$$ **(10 Marks)**

b. Given and infinite sequence input:
X(n) = { 1,2,3,4,1,3,5,7,2,4,6,8,.....}
and h(n) = {1,2,1}. Find the output y(n) using overlap – add method considering x(n) is made up of segments of length 4. **(10 Marks)**

3 a. What are FFT algorithms? Find the number of computations required to find the DFT of an n point sequence using:
i) Direct method ii) DITFFT Algorithm
If N = 64, N = 68. **(10 Marks)**

b. Write a note on Butterfly structure as used in DITFFT and DIFFFT algorithms, with relevant equations represented by them. **(10 Marks)**

4 Given x(n) = {1,3,5,7,2,4,6,8} draw the SFG for finding its DFT using:
i) DITFFT Algorithm ii) DIFFFT Algorithm.
Hence find the DFT of x(n) by both the methods. **(20 Marks)**

5 a. Explain the development of structures of realization using:
i) Direct Form I ii) Direct Form II.
Hence obtain there structures for a system described by the difference equation.
2y(n) + 0.2y(n-a) + 0.4y (n-2) + 0.6y (n-3) = 0.8x(n) + x(n-1) + 1.2x(n-2). **(10 Marks)**

b. Given $H(z) = \frac{3(2z^2 + 5z + 4)}{(2z+1)(z+2)}$ for an IIR system, obtain the parallel form of realization. **(10 Marks)**

6 a. What is linear Phase Characteristic? Show that a system for which h(n) = h(N-1-n), Exhibits such a characteristic. **(10 Marks)**

b. Give $H(z) = (1 + z^{-1})(\frac{1}{2} - \frac{1}{4}z^{-1} + \frac{1}{2}z^{-2})$ for an FIR system, obtain the realization in
i) Direct Form ii) Cascade Form. **(10 Marks)**

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7 a. The desired frequency response for a linear phase FIR system having an impulse response of finite length N, N being odd, is given by

$H_d(w) = e^{j\tau w}$ for $w \le w_c \le \pi$

$= o$ otherwise, with $\tau = \frac{N-1}{2}$.

Show that $h_d(n) = \frac{\sin((n-\tau)w_c)}{(n-\tau)\pi}$. **(10 Marks)**

b. Explain the concept of 'windowing' in FIR filter design and describe the modified rectangular window and the Hamming window. **(10 Marks)**

8 a. Establish the Bilinear transformation between the 's' domain and the 'z' domain. Hence show that the region outside the unit circle in the domain corresponds to the right half of 's' plane. **(10 Marks)**

b. Determine the order and poles of a Butter worth low pass filter that has a-3db bandwidth of 500Hz and an attenuation of 40 db at 1000 Hz. **(10 Marks)**

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