(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2488 Roll No. | | | | | | | | | | |

B. Tech.

(SEM. VI) THEORY EXAMINATION 2010-11

DIGITAL SIGNAL PROCESSING

Time : 3 Hours *Total Marks : 100*

Note : (1) Attempt **all** questions.

(2) All questions carry equal marks.

(3) Be precise in your answer. No second answer book will be provided.

1. Attempt any **four** parts of the following : **(4×5=20)**

(a) Give any three properties of Butterworth Low Pass Filters.

(b) Give the expression for the location of poles and zeros of Chebysev type II filter.

(c) How one can design Digital Filter from Analog Filters ?

(d) What are advantages and disadvantages of Bilinear Transformation ?

(e) Distinguish between Recursive realization and Non Recurise realization. Also write the name of different types of structure for realization of IIR system.

(f) Prove that physically realizable IIR Filter can not have linear phase.

2. Attempt any two parts of the following : (10×2=20)

(a) Given the specification $\alpha p = 1$ db, $\alpha s = 30$ db, $\Omega p = 200$ rad/sec, $\Omega s = 600$ rad/sec. Determine the order of the Butterworth Filter where Ωp and Ωs are the pass band and stop band frequency and αp and αs are pass band and stop band attenuation.

(b) Obtain the direct form I realization for the system described by the difference equation :

$$Y(n) = 0.5Y(n-1) - 0.25Y(n-2) + X(n) + 0.4X(n-1).$$

(c) (i) How many number of addition, multiplication and memory locations are required to realize a system H(z) having M zeros and N poles in (i) Direct Form I realization (ii) Direct Form II realization.

(ii) Determine the order and poles of low pass Butterworth filter having 3 dB attenuation at 500 Hz and attenuation of 40 Db at 1000 Hz.

3. Attempt any two parts of the following : (10×2=20)

(a) What is the reason that FIR Filters are always stable ? Also write the properties of FIR Filter. Explain the Parallel and Cascade form realization of IIR Filters.

(b) What is the principle of designing FIR filter using Windows ?

(c) What is Gibbs phenomenon ? Compare Hamming Window with Kaiser Window.

4. Attempt any **four** parts of the following: **(4×5=20)**

(a) What is Zero Padding ? What are its uses ?

(b) Distinguish between the following :

(i) Fourier Transform and Fourier series.

(ii) Linear convolution and Circular convolution.

(c) Obtain the Circular Convolution of the following :

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

(d) Determine the Four Point DFT of the Sequence :

$X(n) = \{1, 1, 0, 1\}$.

(e) Find the circular convolution of the two sequence :

$X(n) = \{1, 2, 2, 1\}$ and $Y(n) = \{1, 2, 3, 1\}$ using Matrix method.

(f) List the Four properties of DFT.

5. Attempt any **two** parts : **(2×10=20)**

(a) Write the advantages of FFT over DFT. Calculate the number of multiplications needed in the calculation of DFT using FFT algorithm.

(b) Distinguish between DIT and DIF algorithm. Draw the flow graph of a two point radix-2 DIF and DIT FFT.

(c) Compute the DFT of the sequence $X(n) = \cos(n\pi)/2$ whose $N = 4$ using DIF FFT algorithm.