

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

PAPER ID : 2488

Roll No.

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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 Recurse 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 Ω_p and Ω_s are the pass band and stop band frequency and α_p and α_s 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.