

18252(M)

B. Tech 6th Semester Examination

Digital Signal Processing (CBS)

EC-604

Time : 3 Hours www.epaper.tk **Max. Marks : 60**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt one question from each section (I-IV) and Section V is compulsory.

SECTION - I

1. Derive the expression for Discrete Fourier Transform (DFT) with proper frequency domain sampling concept. (10)

OR

2. Determine the (a) Linear convolution using circular convolution (b) Circular convolution using DFT and IDFT and (c) Cross-Correlation of the two sequences given by-

$$x(n) = \{4,5,6\} \text{ and } h(n) = \{4,4,3,2\} \quad (10)$$

SECTION - II

3. If $x(n) = \{1,2,3,2,1,2,3,2\}$, find the $X(k)$ by using DIT-FFT and verify the result using DIF-FFT algorithm. Also draw the proper butterfly graph for both algorithms. (10)

OR

4. Explain finite word length effect with proper example. (10)

SECTION - III

5. Determine the direct form I, direct form II and transposed direct form II structure for the system given by-

$$y(n) = \frac{1}{2}y(n-1) - \frac{1}{4}y(n-2) + x(n) + x(n-1) \quad (10)$$

OR

6. Explain the design of IIR filter using Impulse Invariance method with its s to z plane mapping and also state its limitation. (10)

SECTION - IV

7. What is a windowing technique? Explain Kaiser window in detail. (10)

OR

8. What is the need of multirate signal processing? Explain aliasing in decimation process? Explain how it is avoided with proper figure and example. (10)

SECTION - V

9. Tick the most appropriate answer of the following multiple choice type questions.

(i) IIR filters

- (a) use feedback
- (b) are sometimes called recursive filters
- (c) can oscillate if not properly designed
- (d) all of the above

(ii) A Blackman window can eliminate ripple in FIR filters. The tradeoff is

- (a) larger transition bandwidth
- (b) smaller transition bandwidth
- (c) a non-linear phase response
- (d) possible instability

- (iii) The output of two digital filters can be added. Or, the same effect can be achieved by
- (a) Adding their coefficients
 - (b) subtracting their coefficients
 - (c) Convolving their coefficients
 - (d) averaging their coefficients and then using a Blackman window
- (iv) Coefficient symmetry is important in FIR filters because it provides
- (a) A smaller transition bandwidth
 - (b) less passband ripple
 - (c) Less stopband ripple
 - (d) a linear phase response
- (v) Lattice structure can be implemented in
- (a) FIR filter
 - (b) IIR filter
 - (c) FIR and IIR filter
 - (d) None of the above
- (vi) Which of the following is used to alter FIR filter coefficients so they smoothly approach zero at both ends?
- (a) Rectangular window
 - (b) Blackman window
 - (c) Laplace window
 - (d) Hilbert window
- (vii) Circular convolution of two sequences both of length N in time domain is equivalent to
- (a) Convolution of their spectra in frequency domain
 - (b) Multiplication of their spectra in frequency domain

- (c) Circular Convolution of their spectra in frequency domain
- (d) Exponential product of their spectra in frequency domain
- (viii) N-point DFT requires _____ number of multiplication
(a) N^2 (b) N (c) $N/2$ (d) N^3
- (ix) In FIR filter design using Hamming and Hanning window, we assume
(a) Pass band and stop band ripple are equal
(b) Only Pass band contains ripple
(c) Only stop band contains ripple
(d) Pass band and stop band ripple are not equal
- (x) Speed improvement factor in calculating 64-point DFT using direct computation and FFT algorithm is
(a) 192 (b) 21.33 (c) 64 (d) 3

(10×2=20)