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Total No. of Pages : 02

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B.Tech.(Electronics Engg.) (2012 Onwards)
B.Tech (ECE/ETE) (2011 Onwards)   (Sem.–5)
DIGITAL SIGNAL PROCESSING
Subject Code : BTEC-502
Paper ID : [A2104]

Time : 3 Hrs.   Max. Marks : 60

INSTRUCTION TO CANDIDATES :
1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION–A

1. Write briefly :

a) What is autocorrelation and cross correlation?

b) State whether the system whose impulse response is given by $h(n) = 4^n u(n)$ is stable or unstable.

c) Give the properties of linear time-invariant discrete time system.

d) Give the relation between Z-transform and discrete fourier transform (DFT).

e) What do you mean by 'Twiddle factor' of DFT & show how it is cyclic?

f) What are the advantages of bilinear transformation method for the design of IIR filter?

g) What are the three quantization errors due to finite word length registers in digital filters?

h) What are the advantages of representing a digital filter in the block diagram form?

i) What do you mean by symmetric and anti symmetric FIR filters?

j) Write the desirable features of DSP processors.

SECTION-B

2. Determine the Z-transform of the signal $x(n) = (-1)^n 2^{-n} u(n)$.

3. Discuss Linear filtering approach for the computation of DFT.

4. The system function of the analog filter is given as $H_a(S) = \dfrac{s+0.1}{(s+0.1)^2 + 16}$

   Obtain the system function of IIR digital filter by using bilinear transformation method which is resonant at $\omega_r = \dfrac{\pi}{2}$.

5. A LTI system is characterized by the transfer function :

$$H(z) = \frac{3 - 4Z^{-1}}{1 - 3.5Z^{-1} + 1.5Z^{-2}}$$

   Determine the $h(n)$ for the following conditions :

   a) The system is stable.

   b) The system is causal.

6. Obtain the direct form 1, cascade & parallel structure for the following system $y(n) = 0.7\,y(n-1) - 0.12\,y(n-2) + x(n-1) + x(n-2)$.

SECTION-C

7. The desired frequency response of a low pass filter is

$$H_d(\omega) = \begin{cases} e^{-j5\omega}, & -5\pi/4 \le \omega \le 5\pi/4 \\ 0, & 5\pi/4 < |\omega| \le \pi \end{cases}$$

   Determine $H(e^{j\omega})$ for M = 11 using a Hamming window.

8. With the help of N = 8, explain radix-2 decimation-in-frequency (DIF) FFT algorithm for computation of DFT. Give the computational efficiency of FFT over DFT.

9. Write short note on the following :

   a) Fixed and floating point representation of numbers

   b) Architecture of ADSP series of digital signal processors