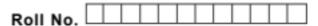


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Total No. of Pages : 03

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B.Tech.(Electronics & Computer Engg.) (2011 Onwards) (Sem.-6) DIGITAL SIGNAL PROCESSING Subject Code : BTEC-502 M.Code : 71164

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

- SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
- SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
- SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

1 Answer briefly :

- a) What are the advantages of digitial signal processing?
- b) Calculate DTFT of the sequence $x(n) = \left(\frac{1}{3}\right)^n U(n-2)$.
- c) What is the z-transform of the sequence x(n) = Aδ (n m + p), where n, m and p are integers?
- d) Match the following for the window functions.

| Window function | Peak of the sidelobe |
|-----------------|----------------------|
| Rectangular | -58dB |
| Hamming | -32dB |
| Hanning | -43dB |
| Bartlett | -27dB |
| Blackman | -13dB |

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- e) Define infinite impulse response and finite impulse response filters and compare.
- f) What are the limitations of impulse invariant method ?
- g) What is frequency warping? How it will arise?
- h) Find the frequency response of a rectangular window.
- i) What are the advantages of DSP processors over conventional processors?
- j) List the status register bits of TMS320C5X and their functions.

SECTION-B

- An FIR filter has the unit impulse response sequence h (n) = {1, -3, 1}. Determine the output sequence in response to the input sequence x (n) = {1, 3, 4, -7, -1, 1, 4, -5, 4, 2, -9, 3, 4} using overlap add method.
- 3. Determine the 8-point DFT of the signal $x(n) = \{1, 1, 1, 1, 1, 1\}$.
- Determine the z-transform of the following sequences :

a)
$$x(n) = \frac{1}{2}n\left(\frac{1}{3}\right)^{n-1}U(n-1)$$

b)
$$x(n) = -\alpha^{n}U(-n-3)$$

- 5. Determine the causal signal x(n) if its z-transform X(z) is given by $X(z) = \frac{z^{-6} + z^{-7}}{1 z^{-1}}$.
- A low-pass filter is to be designed with the following desired frequency response :

$$Hd(e^{fw}) = \begin{cases} e^{-2fw}, & for -\frac{\pi}{4} \le w \le \frac{\pi}{4} \\ 0, & for -\frac{\pi}{4} \le |w| \le \pi \end{cases}$$

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Determine the filter coefficients h(n) if the window function is defined as :

$$w(n) = \begin{cases} 1, & 0 \le n \le 4 \\ 0, & otherwise \end{cases}$$

SECTION-C

Consider an FIR filter with system function

 $(z) = 1 + 2.88z^{-1} + 3.4048 z^{-2} + 1.74 z^{-3} + 0.4 z^{-4}$

Sketch the direct-form and lattice realizations of the filter and determine in detail the corresponding input-output equations.

- a) What is bilinear transformation technique? Obtain the mapping formula and discuss the stability for this transformation technique.
 - b) Transform the analog filter with the transfer function H(s) into a digital filter using backward difference for the derivative technique.

$$H(s) = \frac{1}{(s+2)(s+3)}$$

- Write short notes on :
 - a) Goertzel algorithm
 - b) Region of convergence
 - c) Effect of round off noise in digital filters

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.

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