2124

B.E. (Electronics and Communication Engineering)
Fifth Semester
EC-502: Digital Signal Processing

Time allowed: 3 Hours   **Max. Marks: 50**

NOTE: *Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Section.*

x-x-x

1.   Answer in brief:

   a)   Define the pole location of LTI stable analog and digital systems.
   b)   Define sampling theorem and aliasing. Discuss their relation.
   c)   What is wavelet transform? Discuss the type of signal it can analyse.
   d)   What is impulse response? Discuss how the transfer function can be obtained from it.
   e)   Explain why the FIR filter has linear phase response.   2x5

SECTION-A

2.   a)   Compute the 8-point DFT of sequence $x(n)$ by using the DIF-FFT algorithm.
$$x(n) = \begin{cases} 1 & -1 \le n \le 4 \\ 0 & \text{Otherwise} \end{cases}$$
Show all of the intermediate and final values on the flow diagram.   6
     b)   Write a technical note on 'JPEG Coding'.   4

3.   a)   Differentiate between linear and circular convolution. With the help of a suitable example, explain how you will obtain the result of linear convolution using process of circular convolution.   6
     b)   Obtain the zero-input response of the system described by
$$y(n) = 5\, y(n\text{-}1) - y(n-2) + x(n)$$ 4

4.   a)   Determine the impulse response of causal system described by
$$H(z) = \frac{z(z+2)}{(z-0.2)(z+0.6)}$$ 5
     b)   Write a technical note on 'Wavelet Transform'.   5

SECTION-B

5.   a)   Obtain the direct form II and cascade structures of the system described by
$$y(n)=0.1y(n\text{-}1)+0.2y(n\text{-}2)+3x(n)+3.6x(n\text{-}1)+0.6x(n\text{-}2).$$ 6
     b)   Write a technical note on 'Ideal filter vs. practical filter'.   4

6.   a)   Determine the transfer function of a high pass Butterworth filter to meet the following specifications: Pass band gain = 0.9, pass band frequency = 80 Hz, stop band attenuation = 0.2, stop band frequency = 50 Hz.   6
     b)   What is 'finite word length' effect? Discuss its impact on the design of digital filters and their structures.   4

7.   a)   Draw the internal architecture of TMS 320XX and discuss the function and significance of each block.   5
     b)   Design a Low-pass FIR filter using frequency-sampling method to meet the following specifications:
   Passband edge frequency = 1.5kHz,   Transition width = 0.5kHz,   5
   Sampling frequency = 8kHz,   Length of filter = 11

x-x-x