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BIEL-010

B.Tech. – VIEP – ELECTRONICS AND COMMUNICATION ENGINEERING (BTECVI)

Term-End Examination

00504

June, 2017

BIEL-010 : DIGITAL SIGNAL PROCESSING

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any* **seven** *questions. All questions carry equal marks. Use of scientific calculator is permitted. Missing data may be suitably assumed.*

1. (a) State the relationship between DFT and Z-transform. 4

   (b) Find the DFT values of the given sequence x(n) by using basic equation 6

   $$x(n) = [1, 0, 2, 2, 1]$$

2. (a) Explain linear phase FIR structures. What are the advantages of such structures ? 4

   (b) Determine the frequency response of FIR filter defined by

   $$y(n) = 0{\cdot}25x(n) + x(n-1) + 0{\cdot}25x(n-2).$$

   Calculate the phase delay and group delay. 6

3. (a) Find the IDFT of Y(k) = {1, 0, 0, 1} using DIF algorithm. *5*

(b) Find the output of an LTI system having h(n) = [1, 2, 3] for an input x(n) = [1, 0, 2, 2] by using circular convolution. *5*

4. Discuss chirp Z-algorithm and state its use in linear filtering. *10*

5. What is windowing technique for designing FIR filter ? Compare different windows. *10*

6. Design a high-pass filter satisfying the following specifications :

$$-0{\cdot}04 < |H(e^{j\omega})| < 0{\cdot}04 \qquad 0 \leq |\omega| \leq 0{\cdot}2\pi$$

$$0{\cdot}995 < |H(e^{j\omega})| < 1{\cdot}005 \qquad 0{\cdot}3\pi \leq |\omega| \leq \pi$$

The filter will be designed using the bilinear transformation and T = 2 ms. *10*

7. Obtain the cascade and parallel form realization for the system

$$y(n) = -0{\cdot}1y(n-1) + 0{\cdot}2y(n-2) + 3x(n) + 3{\cdot}6x(n-1) + 0{\cdot}6x(n-2).$$ *10*

8. Explain the IIR filter design using the bilinear transformation scheme. State its limitations. *10*

9. A system is represented by a transfer function

$$H(z) = 3 + \frac{4z}{z - \frac{1}{2}} - \frac{z}{z - \frac{1}{4}}.$$

(a) Does this H(z) represent an FIR or IIR filter ? State the reason.

(b) Realize the above H(z) using direct form-I and direct form-II realization techniques. *10*

10. Design an ideal high-pass filter with a frequency response

$$H_d(e^{j\omega}) = \begin{cases} 1 \text{ for } & \pi/4 \le |\omega| \le \pi \\ 0 \text{ for } & |\omega| \le \pi/4 \end{cases}.$$

(a) Find the values of h(n) for N = 11 using the Hamming window concept.

(b) Find H(z) and determine the magnitude response. *10*
