01375

B. Tech. IN ELECTRONICS AND COMMUNICATION ENGINEERING

Term-End Examination

June, 2012

BIEL-010 : DIGITAL SIGNAL PROCESSING

Time : 3 Hours *Maximum Marks : 70*

Note : *Attempt **any seven** questions. Each question carries **ten** marks. Use of scientific calculator is permitted.*

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1. What is DFT ? Summarise its properties and write the supporting mathematical derivations. **10**

2. Describe the relationship of Discrete Fourier transform with Fourier transform, Z-transform and Fourier series coefficients. **10**

3. What is an FFT Algorithm ? How does it improve the computation efficiency of DFT ? Briefly explain a direct computation method of the DFT. **10**

4. Explain the characteristics of a Butterworth filter. **5+5**

   Determine the order and the poles of a low pass butterworth filter that has a - 3 db bandwidth of 500 Hz and an attenuation of 40 db at 1000 Hz.

5. Convert the single pole low-pass Butterworth filter with system function **10**

$$H(z) = \frac{0.245\,(1 + z^{-1})}{1 - 0.509\, z^{-1}}$$

into a bandpass filter with the upper and lower cut-off frequencies w_u and w_l respectively. The low-pass filter has 3 db bandwidth $w_p = 0.2\pi$.

6. Determine the cascade and parallel realizations for the system described by the system function. **10**

$$H(z) = \left[\frac{10\left(1 - \frac{1}{2} Z^{-1}\right)\left(1 - \frac{2}{3} Z^{-1}\right)\left(1 + 2 Z^{-1}\right)}{\left(1 - \frac{3}{4} Z^{-1}\right)\left(1 - \frac{1}{8} Z^{-1}\right)\left[1 - \left(\frac{1}{2} + J\frac{1}{2}\right)Z^{-1}\right]\left[1 - \left(\frac{1}{2} - J\frac{1}{2}\right)Z^{-1}\right]}\right]$$

7. Explain a Divide and Conquer Approach for computation of the Discrete Fourier Transform. **10**

8. Explain the following methods with respect to Linear filtering. **5+5**

   (a) Overlap Save method

   (b) Overlap add method

9. Explain the following structures in details with respect to FIR system. **3+3+4**

   (a) Direct form structure

   (b) Cascade form structures

   (c) Lattice structures

10. Write a short note on ***any two*** : **2x5=10**

(a) Goertzel Algorithm

(b) Circular convolution

(c) Parseval's Theorem
