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B. Tech. IN ELECTRONICS AND COMMUNICATION ENGINEERING

Term-End Examination

December, 2011

BIEL-010 : DIGITAL SIGNAL PROCESSING

Time : 3 hours *Maximum Marks : 70*

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

1. What do you understand by DFT ? Prove that the Inverse Discrete Fourier transform is given by **3+7**

$$x[n] = \frac{1}{N} \sum_{k=0}^{N-1} x\,[k]\, W_N^{-kn}, 0 \le n \le N-1$$

2. Consider the signal $x(n) = a^n u(n)$, $0 < a < 1$. **10**

The spectrum of this signal is sampled at frequencies $W_k = 2\pi k/N$, $k = 0, 1, ..., N-1$.

Determine the reconstructed spectra for $a = 0.8$, when $N = 5$ and $N = 50$.

3. Explain the role of FFT Algorithms for **5+5**

(a) Efficient computation of DFT of two real sequences.

(b) Linear Filtering and correlation.

4. Explain circular convolution for the sequences x_1 (n) and x_2 (n) **3+7**

By means of DFT and IDFT, determine the sequence x_3 (n) corresponding to the circular convolution of the sequences x_1 (n) and x_2 (n), where :

x_1 (n) = {2, 1, 2, 1}
↑

x_2 (n) = {1, 2, 3, 4}
↑

5. Explain the design of FIR filters using Rectangular Window. Write the relevant expressions and explain Gibbs phenomenon. **10**

6. Determine the order of a type - I low pass chebyshev filter that has a 1 db ripple in the passband, a cut - off frequency $\Omega_p = 1000\pi$, a stopband frequency of 2000 π and an attenuation of 40 db or more for $\Omega \geq \Omega_s$ Also Find its poles. **10**

7. Explain the characteristics of a chebyshev filter. Draw its characteristics and define its types. **10**

8. Explain an FIR filter design method using Frequency Sampling Technique. **10**

9. Explain the following properties with respect to a Discrete Fourier Transform **10**

(a) Time reversal of a sequence

(b) Circular Time Shift of a sequence

(c) Circular Frequency Shift

10. Write short notes on ***any two.*** **2x5=10**

(a) Chirp Z Algorithm

(b) Radix - 2 FFT Algorithm

(c) Matched Z transform