

Code No: C6103, C6503

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH I - SEMESTER EXAMINATIONS, APRIL/MAY-2012
ADVANCED DIGITAL SIGNAL PROCESSING
(COMMON TO COMMUNICATION SYSTEMS, WIRELESS AND MOBILE COMMUNICATIONS)

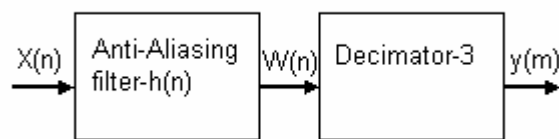
Time: 3hours

Max. Marks: 60

Answer any five questions
All questions carry equal marks

- - -

- 1.a) Explain about the computational requirements (real and Complex multiplications and additions) for the Direct Computation of N-Point DFT of a sequence $x(n)$.
- b) Find the 4-Point DFT of the sequence $x(n) = \delta(n) + \delta(n-3)$.
- 2.a) The 4 point DFT of a sequence $x(n)$ is given by $X(k) = \{2, 1+j, 0, 1-j\}$. Find the corresponding periodic signal $x(n)$.
- b) State and prove the circular convolution property of DFT.
- 3.a) Justify that when the unit sample response of a discrete LTI system of duration "N"(even) is symmetric, the phase response of the system is a linear function of frequency.
- b) Compute $x(n)$ by using Decimation in Frequency IFFT algorithm, if the corresponding DFTR is $x(k) = [7, 0, 1, 3, 1]$.
4. Design a low pass Butterworth filter using Bilinear Transformation to satisfy the following Constraints: Pass band = 0.162 rad.; stop band = 1.63rad; pass band ripple = 3dB; stop band attenuation = 30dB; sampling frequency = 8KHz.
5. A one stage decimator is characterized as: Decimation factor = 3; Anti aliasing filter coefficients: $h(0) = h(4) = -0.06$; $h(1) = h(3) = 0.3$; $h(2) = 0.62$. The input for the system is $x(n) = \{6, -2, -3, 8, 6, 4, -2\}$. Find $w(n)$ and $y(m)$ for the system shown as below.



- 6.a) Find the mean and Autocorrelation of the sequence $x(n) = w(n) - 2w(n-1) + w(n-2)$, where $w(n)$ is a white noise process with variance σ^2 .
- b) Distinguish between AR, MA, and ARMA processes.
- 7.a) The analog input signal for a B-bit ADC has an rms value of ' σ ' volts. The input range of ADC is ' $\pm 3\sigma$ ' volts. Find the expression for Signal to Quantization Noise ratio in dB for the converter.
- b) Explain various data types in which a number is stored in fixed pint data format.
- 8.a) Explain about a prediction error filter.
- b) State and prove the properties of Auto correlation function of a WSS random process.

* * * * *