GANPAT UNIVERSITY

B. Tech. Sem. VI (EC)
Regular Examination May-June 2012
EC602: Digital Signal Processing

Time: 3 Hours **Total Marks: 70**

Instructions:

1. Attempt all questions.
2. Answers to the two sections must be written in separate answer books.
3. Figures to the right indicate full marks.
4. Assume suitable data, if necessary.

SECTION-I

1	(A)	Derive the equation of DIT algorithm up to first stage decimation for 8 point DFT and draw the complete butterfly structure	6
	(B)	Explain Goertzel algorithm with application	6
		OR	
1	(A)	Obtain DFT of the following sequence: x(n)= (0.5,0.5,0.5,0.5,0,0,0,0) using decimation in frequency FFT algorithm	8
	(B)	The first five DFT points of real and even sequence x(n) of length eight are given below. X(k)={5,1,0,2,3,….}, Determine remaining three points.	4
2	(A)	DFT of a sequence x(n) is given by X(k)={4,1+2j,j,1-3j} using DFT property only, determine DFT of x*(n) if x*(n) is complex conjugate of x(n).	4
	(B)	A DT LTI system has impulse response, h(n)={2,2,1}. Determine the response, y(n) to the input signal, x(n)={3,0,-2,0,2,1,0,-2,-1,0} using overlap add method	7
		OR	
2	(A)	Given a real finite length sequence, x(n)={4,3,2,1,0,0,1,1} y(n) is a sequence related to x(n) such that, $Y(k)=W_8^{4k}$ where X(k) is 8 point DFT of x(n). Obtain y(n)	5
	(B)	Explain Chirp-Z algorithm	6
3	(A)	Find IFFT of sequence x(n)=(6,-2,6,-2) using DIF algorithm.	6
	(B)	Find 4 point sequence x(n) using DIT FFT algorithm if its 4 point DFT is X(k)={54,-14+28j,-18,-14-28j}	6

SECTION-II

4 **(A)** Obtain direct form-I and II structure of a system function given by **6**

$$H(Z) = \frac{0.5(1 - Z^{-2})}{1 + 1.3Z^{-1} + 0.36Z^{-2}}$$

(B) Obtain parallel form structure of a system function given by **6**

$$H(Z) = \frac{1 - Z^{-1}}{1 - 0.2Z^{-1} - 0.15Z^{-2}}$$

OR

4 **(A)** Obtain parallel form structure of a system function given by **6**

$$H(Z) = \frac{(1 + \frac{1}{2}Z^{-1})(1 + \frac{1}{4}Z^{-1})}{(1 - \frac{1}{2}Z^{-1})(1 - \frac{1}{4}Z^{-1})(1 - \frac{1}{8}Z^{-1})}$$

(B) Obtain direct form-I and Direct form-II realization of a system given by **6**

$$y(n) - \frac{3}{4}y(n-1) + \frac{1}{8}y(n-2) = x(n) + \frac{1}{2}x(n-1)$$

5 **(A)** Obtain the impulse response of ideal Highpass filter and design a Highpass FIR filter for the following specification; sampling frequency 2000Hz, cutoff frequency 0.5KHz, Order of filter 5. **5**

(B) Calculate the filter coefficient for 5 tap (filter coefficient) FIR Bandpass filter with lower cutoff frequency =2000Hz, Higher cutoff frequency =24000Hz and Sampling frequency = 8000Hz. Make use of Blackman window. **6**

OR

5 **(A)** Explain different window function for FIR filter design. **5**

(B) Design a five tap Finite impulse response band reject filter using hamming window with lower cutoff frequency of 2000Hz and upper cutoff frequency 2400Hz, Sampling frequency 8000Hz. **6**

6 **(A)** Determine filter transfer function H(z) using the impulse invariant method if the sampling rate = 10Hz for the Laplace transfer function $H(s) = \frac{2}{s+2}$. **4**

(B) Design a first order digital highpass Chebyshev filter using BLT with a cutoff frequency of 3KHz and 1dB ripple on passband using a sampling frequency of 8000Hz. **4**

(C) Explain Lattice structure for FIR filter. **4**

END OF PAPER