B.E - SEM - VII - EXTC - DTSP

15/5/15

QP Code : 8416

(3 Hours) **[Total Marks : 100**

Instruction: 1. Question No. 1 is cumpolsory

2. Out of remaining question attempt any four questions.

3. In all five question to be attempted.

4. Figures to the right indicate full marks.

Q 1. a) One of zeros of a causal linear phase FIR filter is at $0.5\,e^{-i\pi/3}$. Show the locations of the zeros and hence find the transfer function and impulse response of the filter 05

b) Determine Zeros of the following FIR systems and indicate when the system is minimum phase maximum phase and mixed phase.

1. $H[z] = 6 + Z^{-1} + Z^{-2}$ 2. $H[z] = 1 - Z^{-1} - 6Z^{-2}$ 05

c) Find the number of complex multiplications and complex additions required to find DFT for 32 point sequence. Compare them with number of computation required if FFT algorithm is used. 05

d) What is linear phase filters. Define group delay and phase delay. 05

Q. 2. A) Derive Radix – 2 Decimation in Time Fast Fourier Transform and draw its signal flow graph. [10]

B) X[k] = { 36, -4+ j 9.656, -4 + j4, -4 +j1.656, -4, -4 - j1.656, -4 – j4, -4 - j 9.656}

Find x[n] using IFFT algorithm (use DIT IFFT) [10]

Q. 3 a) An 8 point sequence x[n] = {1, 2, 3, 4, 5, 6, 7. 8}

i) Find X[k] using DIF-FFT algorithm

ii) Let $x_1[n]$ = {5, 6, 7, 8, 1, 2, 3. 4} using appropriate DFT property and result of part (i) determine $X_1[k]$ [10]

b) Explain up sampling by non-integer factor, with a neat diagram and waveforms. [10]

Q.4 a) Design a Chebyshev i bandstop digital filter with the following specifications:

Passsband range. 0 to 275Hz and 2KHz to ∞

Stopband range: 550 to 1000Hz.

Sampling frequency: 8KHz

Passband attenuation: 1dB

Stopband attenuation: 15dB

[TURN OVER

Use BLT and assume T= 1sec. [10]

b) Design a Butterworth filter satisfying the following constraints:

$0.75 \le |H(w)| \le 1$ for $0 \le w \le \pi/2$

$|H(w)| \le 0.2$ for $3\pi/4 \le w \le \pi$

Use Bilinear Transformation Method [10]

Q. 5 a) Design FIR digital highpass filter with a frequency response

$H(w) = 1 \quad \pi/4 \le |w| \le \pi$

$= 0 \quad |w| \le \pi/4$

Use Hamming window. N = 7. [10]

b) With a neat diagram describe frequency sampling realization of FIR filters. [10]

Q. 6 a) An FIR filter is given by the difference equation

$$y[n] = 2x[n]\} + \frac{4}{5}x[n-1] + \frac{3}{2}x[n-2] + \frac{2}{3}x[n-3]$$

Determine the lattice form [10]

b) Using linear convolution find y[n] for the sequences x[n] = {1,2,-1,2,3,-2,-3,-1,1,2,-1} and h[n] = {1, 2}.Compare the result by solving the problem using overlap save method [10]

Q. 7 Write Short Notes on [20]

1. Digital Resonator
2. Parseval's Energy theorem and its significance
3. Goertzel Algorithm
4. Application of signal processing in RADAR