Anna University Exams Nov/Dec 2015 – Regulation 2013
Rejinpaul.com Unique Important Questions – 5th Semester BE/BTECH
IT6502-Digital Signal Processing

UNIT I

Check whether the following systems are static or dynamic, linear or nonlinear, time variant or invariant, causal or noncausal , stable or unstable.

$$y(n) = \cos[x(n)]$$
$$y(n) = x(-n+2)$$
$$y(n) = x(2n)$$
$$y(n) = x(n)\cos(w_0 n)$$

A casual system is represented by the following difference equation

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

Find the system transfer function H(z) ,unit sample response , magnitude and phase function of the system.

Find the inverse Z transform for X(z)=$\frac{1}{(1+z^{-1})(1-z^{-1})^2}$.

UNIT II

Find DFT for {1,1,2,0,1,2,01,} using DIT FFT and DIF FFT butterfly algorithm and plot the spectrum.

Compute the FFT of the sequence $x(n) = n^2 + 1$ for $0 \le n \le N-1$, where N=8 using DIT algorithm

Using radix 2 DIT FFT algorithm, determine DFT of the given sequence for N=8

UNIT III

Determine the system function of the IIR digital filter for the analog transfer function

$$H(s) = \frac{10}{(S^2 + 7s + 10)}$$

With T=0.2 second using invariance method

Design a digital butterworth filter satisfying the constraints

$$0.707 \le |H(e^{jw})| \le 1; 0 \le \omega \le \frac{\pi}{2}$$
$$|H(e^{jw})| \le 0.2\ ; \frac{3\pi}{4} \le w \le \pi$$

With T=1 sec using bilinear transformation method

The specification of the desired lowpass digital filter is

$$0.9 \le |H(e^{jw})| \le 1.0; 0 \le \omega \le 0.25\pi$$
$$|H(e^{jw})| \le 0.24\ ; 0.5\pi \le w \le \pi$$

Design a chebyshev digital filter using impulse invariant transformation

UNIT IV

Design and obtain the coefficients of a 15 tap linear phase FIR low pass filter using Hamming window to meet the given frequency response

$$H_d(w) = \begin{cases} 1 \ for \ |w| \le \frac{\pi}{6} \\ 0 \ for \ \frac{\pi}{6} \le |w| \le \pi \end{cases}$$

2. Determine the coefficients of a linear phase FIR filter of length M=15 which has a symmetric unit sample response and a frequency response that satisfies the conditions

$$H_r\left(\frac{2\pi k}{15}\right) = \begin{cases} 1 & k = 0, 1, 2, 3 \\ 0.4 & k = 4 \\ 0 & k = 5, 6, 7 \end{cases}$$

UNIT V

1. Explain the characteristics of a limit cycle oscillation with respect to the system described by the equation

$$y(n) = 0.85y(n-2) + 0.72y(n-1) + x(n)$$

Determine the dead band of the filter $x(n) = \left(\frac{3}{4}\right)\delta(n)$

2. Explain the various formats of fixed point representation.
3. Discuss about quantization noise and derive the equation for finding quantization noise power.
4. Explain in detail about Finite word length effects in digital filters.
5. Explain the limit cycle oscillations due to product round off and overflow errors.

IT6402-Digital Signal Processing Two Mark Questions

UNIT I SIGNALS AND SYSTEM

PART A

1. What are the advantages of DSP?
2. Define impulse signal and unit step signal.
3. Determine whether the following sinusoids are periodic; if periodic then compute their fundamental period.
   (a) $\cos(0.01\pi n)$
   (b) $sin\left(\frac{62\pi n}{10}\right)$
4. Distinguish between power and energy signal with an example.
5. State sampling theorem, and find Nyquist rate of the signal $x(t) = 5\sin 250\pi t + 6\cos 300\pi t$
6. What is quantization error?
7. What is time invariant system or shift invariant system ?
8. Find the energy and power of $x(n) = Ae^{j\omega n}u(n)$.
9. Define ROC in Z-transform.
10. Determine Z transform of x(n) = a^nu(n)

UNIT II FREQUENCY TRANSFORMATIONS

PART A

1. List any four properties of DFT.
2. Calculate the DFT sequence $x(n) = \{1, 1, -2, -2\}$

3. What is phase factor or twiddle factor?
4. Write down DFT pair of equations.
5. What is meant by radix-2 FFT?
6. Draw the basic butterfly diagram for the computation in the radix-2 decimation in frequency FFT algorithm
7. Differentiate between DIT and DIF FFT algorithm.
8. Define Zero padding.

UNIT III IIR FILTERS
PART A

1. Compare digital and analog filter.
2. Sketch the mapping of S-plane and Z-plane in bilinear transformation.
3. Define Bilinear Transformation with expressions.
4. Mention the properties of Butterworth filter
5. Compare bilinear and impulse invariant transformation
6. What is meant by warping or frequency warping?
7. What are the limitation of impulse invariance method?
8. Compare Butterworth,Chebyshev filters.
9. Compare IIR and FIR filters.

$$H(s) = \frac{1}{S^2 + 1}$$

UNIT IV – FIR FILTERS
PART A

1. What are Gibbs oscillations?
2. State any two important properties of FIR filter
3. What is the reason that FIR filter is always stable
4. List out the conditions for the FIR filter to be linear phase
5. Write procedure for designing FIR filter using windows
6. Draw the direct form realization of FIR system.
7. Determine the transversal structure of the system function

$$H(z) = 1 + 2z^{-1} - 3z^{-2} - 4z^{-3}$$

8. What are FIR filter?

UNIT V-FINITE WORD LENGTH EFFECT
PART A

1. Define finite word length effect.
2. What are the different formats of fixed pint representation?
3. What is quantization error?
4. What is meant by limit cycle oscillations?
5. What is dead band of a filter?
6. What are Zero I/P and overflow limit cycle?