Code No: V3218 **R07** **Set No: 1**

III B.Tech. II Semester Supplementary Examinations, November/December - 2012

DIGITAL SIGNAL PROCESSING

(Common to Electrical and Electronics Engineering, Electronics and Communication Engineering, Electronics and Instrumentation Engineering, Instrumentation and Control Engineering)

Time: 3 Hours **Max Marks: 80**

Answer any FIVE Questions

All Questions carry equal marks

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1. (a) List out the properties of DFT with necessary expressions.
   (b) State & Prove the Following Properties of Z-Transforms. (i) frequency Shifting (ii) Differentiation in Z-domain

2. (a) State and Prove the following properties of DFT
      i. Periodicity ii) Linearity iii) Symmetry
   (b) Compute the Eight point Circular Convolution for the following sequence
      $x_1(n) = \{1,1,1,1,0,0,0,0\}$ $x_2(n) = \sin(3\pi/8)\, n$, $0 \le n \le 7$.

3. (a) Compute the FFT for the Sequence $x(n) = \{1,1,1,1,1,0,0,0,\}$
   (b) Explain 8-point DIT-FFT algorithm with Butterfly diagram.

4. (a) State the Initial and Final value Theorem of Z-Transform.
   (b) Verify whether the following systems are linear and time invariant or not
      i) $y(n) = a(n)x(n)$ ii) $y(n) = ax(n-1) + bx(n-2)$.

5. (a) Compare and Contrast Bilinear & Impulse Invariant transformation technique
   (b) Design a Digital Butterworth LPF using Bilinear transformation technique for the following specifications
      $0.707 \le |H(w)| \le 1$; $0 \le w \le 0.2\pi$
      $|H(w)| \le 0.08$; $0.4\pi \le w \le \pi$

6. (a) What is meant by symmetric & anti symmetric concept in FIR filters? Explain in detail.
   (b) Design a High Pass FIR filter whose cut-off frequency is 1.2 radians/sec and N = 9 using Hamming Window and draw the frequency response curve.

7. (a) What is the importance of Multirate Signal Processing and hence define Decimation and Interpolation.
   (b) Discuss the process of decimation with a neat block diagram and explain how the aliasing effect can be avoided.

8. (a) Discuss various data addressing modes of TMS320C54xx processors
   (b) Explain six stage pipeline architecture of TMS320C54xx processor.

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Code No: V3218 **R07** **Set No: 2**

III B.Tech. II Semester Supplementary Examinations, November/December - 2012

DIGITAL SIGNAL PROCESSING

(Common to Electrical and Electronics Engineering, Electronics and Communication Engineering, Electronics and Instrumentation Engineering, Instrumentation and Control Engineering)

Time: 3 Hours **Max Marks: 80**

Answer any FIVE Questions

All Questions carry equal marks

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1. (a) A second order discrete time system is characterized by the difference equation y(n)-0.1y(n-1)-0.02y(n-2)=2 x(n)-x(n-1). Determine y(n) for n≥0 when x(n) = u(n) and the initial conditions are y(-1)= 10 and y(-2) = 5.
   (b) Define Linearity, Time invariant, Stability and Causality

2. compute the circular convolution of the following sequences and compare it with linear convolution
   x(n)={1,-1,1,-1}; h(n)={1,2,3,4}
   x(n)={1,1,-1,-1}; h(n)={4,3,2,1}

3. Derive the necessary expressions for computing FFT using DIT Algorithm and hence Compute FFT of the given sequence x(n) = {1,1,1,1,4,3,2,1} using Radix-2 DIT FFT Algorithm.

4. (a)Determine H(e^{jw}) from H(z) for the system
   y(n) - 1/4 y(n-1)=x(n) - x(n-1).
   (b)Obtain the Direct Form – I, Direct form - II and cascade form realization of the given LTI system governed by the difference equation
   y(n) - 5/6 y(n-1) + 1/6 y(n-2) = x(n) + 2 x(n-1)

5. Design a Digital Butterworth LPF with T=1sec using impulse invariance transformation technique for the following specifications
   $0.75 \le |H(e^{jw})| \le 1 ; 0 \le w \le 0.5\pi$
   $|H(e^{jw})| \le 0.2 ; \frac{3\pi}{2} \le w \le \pi$

6. (a) Compare various windowing techniques w.r.t sidelobes and beamwidth
   (b) Design an FIR Digital High pass filter using Hamming window whose cutoff freq is 1.2 rad/s and length of window N=9.

7. (a) What are the drawbacks in multi-stage implementations?
   (b) Explain the decimation process with an example.

8. Explain following with reference to Digital signal processors.
   (a) Barrel Shifter (b) Harvard architecture.

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Code No: V3218 **R07** **Set No: 3**

III B.Tech. II Semester Supplementary Examinations, November/December - 2012

DIGITAL SIGNAL PROCESSING

(Common to Electrical and Electronics Engineering, Electronics and Communication Engineering, Electronics and Instrumentation Engineering, Instrumentation and Control Engineering)

Time: 3 Hours **Max Marks: 80**

Answer any FIVE Questions

All Questions carry equal marks

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1. (a) Determine the step response of the following system.
   y(n) - 3 y(n-1) + 0.2 y(n-2) = x(n) - x(n-1).
   (b) Perform convolution for the given data sets graphically.
   x(n)={1,-1,2,-1}; h(n)={1,3,2,4}
2. (a) Determine the IDFT of the following
   (i)X(k)={1,1-j2,-1,1+j2} (ii) X(k)={1,0,1,0}
   (b) determine 8-point DFT of the signal x(n)={1,1,1,1,1,0,0,0}

3. (a) Derive the necessary expressions for computing FFT using DIF Algorithm
   (b) Compute FFT of the given sequence x(n) = {1,1,1,1,4,3,2,1} using Radix-2 DIT FFT Algorithm.

4. (a) find the solution of the difference equation
   y(n+2)+0.8y(n+1)+0.16y(n) =2u(n) due to y(-1)=y(-2)=0
   (b) Define Z- Transform. Determine the impulse response for the systems given by the difference equation y(n) +3y(n-1)+2y(n-2) = 2x(n)-x(n-1)

5. For the constraints
   $0.8 \le |H(e^{jw})| \le 1 ; 0 \le w \le 0.25\pi$
   $|H(e^{jw})| \le 0.1 ; \frac{\pi}{2} \le w \le \pi$
   Design Digital chebyshav filter with T=1sec using impulse invariance transformation technique

6. (a) Draw the magnitude responses, |W(*w*) | versus ω, for nine-term for windows of the following types:
   (i) Rectangular window. (b) Hamming window.
   (b) What are the different design techniques available for the FIR filters?

7. What is the need for Multirate Digital Signal Processing.
   Consider a signal x(n) = a^n , n >0
   = 0 otherwise
   (i) Obtain a signal with a decimation factor `3'
   (ii) Obtain a signal with a interpolation factor `3'.

8. (a) What are advantages of DSP Processors Over Conventional Microprocessors?
   (b) Explain how Decimation & Interpolation Concept is used to change Sampling rate with example.

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Code No: V3218 **R07** **Set No: 4**

III B.Tech. II Semester Supplementary Examinations, November/December - 2012

DIGITAL SIGNAL PROCESSING

(Common to Electrical and Electronics Engineering, Electronics and Communication Engineering, Electronics and Instrumentation Engineering, Instrumentation and Control Engineering)

Time: 3 Hours **Max Marks: 80**

Answer any FIVE Questions

All Questions carry equal marks

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1. (a) What is a causal system? Why non-causal systems are unrealizable?
   (b) Determine the step response of the following system.
   y(n) - 3 y(n-1) + 0.2 y(n-2) = x(n) - x(n-1).

2. determine 8-point DFT of the following signals
   (a)x(n)={1,1,1,1,1,0,0,0}
   (b)x(n)=cos($\frac{n\pi}{2}$), 0<n<7

3. (a) Compute the FFT for the Sequence x(n) = {1,1,1,1,1,0,0,0,} using DIT
   (b) Explain 8-point DIF-FFT algorithm with Butterfly diagram.

4. Obtain the Direct Form – I,and Direct form - II realization of the given LTI system governed by the difference equation
   (i) y(n) - 5/6 y(n-1) + 1/6 y(n-2) = x(n) + 2 x(n-1)
   (ii) y(n) = y(n-1) - 1/2 y(n-2)+ 1/4y(n-3)+ x(n) -x(n-1)+x(n-2)
   7.For the constraints
   $0.8 \le |H(e^{jw})| \le 1$; $0 \le w \le 0.25\pi$
   $0.9 |H(e^{jw})| \le 0.1$; $\frac{\pi}{2} \le w \le \pi$

5. Design Digital Butterworth filter with T=1sec using impulse invariance transformation technique

6. (a)What are the Characteristics of FIR Digital Filters
   (b)Compare IIR & FIR filters.

7. (a) What are advantages of DSP Processors Over Conventional Microprocessors?
   (b) Explain how Decimation & Interpolation Concept is used to change Sampling rate with example.

8. (a) Discuss various interrupt types supported by TMS320C5X processor.
   (b) Discuss various status register bits in TMS320C5X processor and their functions.

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