NR/RR:320402 **NR/RR** Set No. 2

III B.Tech II Semester Examinations,December 2010
DIGITAL SIGNAL PROCESSING
Common to Electronics And Telematics, Electronics And Control Engineering, Electronics And Instrumentation Engineering, Electronics And Communication Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) An LTI system is described by the equation y(n)=x(n)+0.81x(n-1)-0.81x(n-2)-0.45y(n-2). Determine the transfer function of the system. Sketch the poles and zeroes on the Z-plane.
   (b) Define stable and unstable system. Test the condition for stability of the first-order IIR filter governed by the equation y(n)=x(n)+bx(n-1). [8+8]

2. (a) Find the impulse and step responses for the given system:
   y(n)+y(n-1) = x(n)-2x(n-1)
   (b) Test the following systems for linearity, time invariance, causality and stability.
      i. $y(n) = a^{|x(n)|}$
      ii. y(n) = $sin(2nf\pi/F)x(n)$ [8+8]

3. (a) Explain the factors that influence the choice of structure for realisation of a LTI system.
   (b) An LTI system is described by the difference equation $y(n) = a_1 y(n-1) + x(n) + b_1 x(n-1)$
   Realize it in direct form I structure and convert it to direct form II structure. [4+12]

4. (a) Implement the decimation in time FFT algorithm for N=16.
   (b) In the above Question how many non - trivial multiplications are required. [10+6]

5. Design a band pass filter to pass frequencies in the range 1-2 radians/second using hanning window N=5. Draw the filter structure and plot its spectrum. [16]

6. (a) Prove the following properties
      i. $arg[X(K)] = -arg[X((-K)_N)R_N(K)]$
      ii. $Im[X(K)] = -Im[X((-K))_N R_N(K)]$
   (b) If X(K) denotes the N-point DFT of N-Point sequence x(n), show that with N even and if x(n) = x(N-1-n) then X(N/2)=0. [8+8]

7. (a) Let x(n) and $X(e^{jw})$ denote a sequence and its Fourier transform. Show that
   $\sum_{n=-\infty}^{\infty} x(n)\, x*(n) = {}^{1}/_{(2\pi)} \int_{-\pi}^{\pi} X(e^{j\omega})\, d\omega$
   This is one form of Parseval's theorem

(b) For a real sequence show that magnitude spectrum is even and phase spectrum is odd. [8+8]

8. (a) Discuss impulse invariance method of deriving IIR digital filter from corresponding analog filter.

(b) Use the Bilinear transformation to convert the analog filter with system function $H(S) = S + 0.1/(S + 0.1)^2 + 9$ into a digital IIR filters. Select T = 0.1 and compare the location of the zeros in H(Z) with the locations of the zeros obtained by applying the impulse invariance method in the conversion of H(S). [8+8]

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NR/RR:320402 **NR/RR** Set No. 4

III B.Tech II Semester Examinations,December 2010
DIGITAL SIGNAL PROCESSING
Common to Electronics And Telematics, Electronics And Control Engineering, Electronics And Instrumentation Engineering, Electronics And Communication Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Let x(n) and $X(e^{jw})$ denote a sequence and its Fourier transform. Show that $\sum_{n=-\infty}^{\infty} x(n)\ x*(n) = {}^{1}/_{(2\pi)} \int_{-\pi}^{\pi} X(e^{j\omega})\, d\omega$
   This is one form of Parseval's theorem
   (b) For a real sequence show that magnitude spectrum is even and phase spectrum is odd. [8+8]
2. (a) Implement the decimation in time FFT algorithm for N=16.
   (b) In the above Question how many non - trivial multiplications are required. [10+6]
3. (a) Find the impulse and step responses for the given system:
   y(n)+y(n-1) = x(n)-2x(n-1)
   (b) Test the following systems for linearity, time invariance, causality and stability.
      i. $y(n) = a^{|x(n)|}$
      ii. $y(n) = sin(2nf\pi/F)x(n)$ [8+8]
4. (a) Explain the factors that influence the choice of structure for realisation of a LTI system.
   (b) An LTI system is described by the difference equation $y(n) = a_1 y(n-1) + x(n) + b_1 x(n-1)$
   Realize it in direct form I structure and convert it to direct form II structure. [4+12]
5. Design a band pass filter to pass frequencies in the range 1-2 radians/second using hanning window N=5. Draw the filter structure and plot its spectrum. [16]
6. (a) An LTI system is described by the equation y(n)=x(n)+0.81x(n-1)-0.81x(n-2)-0.45y(n-2). Determine the transfer function of the system. Sketch the poles and zeroes on the Z-plane.
   (b) Define stable and unstable system. Test the condition for stability of the first-order IIR filter governed by the equation y(n)=x(n)+bx(n-1). [8+8]
7. (a) Prove the following properties
      i. $arg[X(K)] = -arg[X((-K)_N)R_N(K)]$

ii. $Im[X(K)] = -Im[X((-K))_N R_N(K)]$

(b) If X(K) denotes the N-point DFT of N-Point sequence x(n), show that with N even and if x(n) = x(N-1-n) then X(N/2)=0. [8+8]

8. (a) Discuss impulse invariance method of deriving IIR digital filter from corresponding analog filter.

(b) Use the Bilinear transformation to convert the analog filter with system function $H(S) = S + 0.1/(S + 0.1)^2 + 9$ into a digital IIR filters. Select T = 0.1 and compare the location of the zeros in H(Z) with the locations of the zeros obtained by applying the impulse invariance method in the conversion of H(S). [8+8]

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NR/RR:320402 **NR/RR** Set No. 1

III B.Tech II Semester Examinations,December 2010
DIGITAL SIGNAL PROCESSING
Common to Electronics And Telematics, Electronics And Control Engineering, Electronics And Instrumentation Engineering, Electronics And Communication Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Discuss impulse invariance method of deriving IIR digital filter from corresponding analog filter.
   (b) Use the Bilinear transformation to convert the analog filter with system function $H(S) = S + 0.1/(S + 0.1)^2 + 9$ into a digital IIR filters. Select T = 0.1 and compare the location of the zeros in H(Z) with the locations of the zeros obtained by applying the impulse invariance method in the conversion of H(S). [8+8]

2. Design a band pass filter to pass frequencies in the range 1-2 radians/second using hanning window N=5. Draw the filter structure and plot its spectrum. [16]

3. (a) Let x(n) and $X(e^{jw})$ denote a sequence and its Fourier transform. Show that $\sum_{n=-\infty}^{\infty} x(n)\ x\ *\ (n) = 1/(2\pi) \int_{-\pi}^{\pi} X(e^{j\omega})\, d\omega$
   This is one form of Parseval's theorem
   (b) For a real sequence show that magnitude spectrum is even and phase spectrum is odd. [8+8]

4. (a) Find the impulse and step responses for the given system:
   y(n)+y(n-1) = x(n)-2x(n-1)
   (b) Test the following systems for linearity, time invariance, causality and stability.
      i. $y(n) = a^{|x(n)|}$
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5. (a) Explain the factors that influence the choice of structure for realisation of a LTI system.
   (b) An LTI system is described by the difference equation $y(n) = a_1 y(n-1) + x(n) + b_1 x(n-1)$
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   (b) In the above Question how many non - trivial multiplications are required. [10+6]

7. (a) Prove the following properties

i. $arg[X(K)] = -arg[X((-K)_N)R_N(K)]$
ii. $Im[X(K)] = -Im[X((-K))_N R_N(K)]$

(b) If X(K) denotes the N-point DFT of N-Point sequence x(n), show that with N even and if x(n) = x(N-1-n) then X(N/2)=0. [8+8]

8. (a) An LTI system is described by the equation y(n)=x(n)+0.81x(n-1)-0.81x(n-2)-0.45y(n-2). Determine the transfer function of the system. Sketch the poles and zeroes on the Z-plane.

(b) Define stable and unstable system. Test the condition for stability of the first-order IIR filter governed by the equation y(n)=x(n)+bx(n-1). [8+8]

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NR/RR:320402 **NR/RR** Set No. 3

III B.Tech II Semester Examinations,December 2010
DIGITAL SIGNAL PROCESSING
Common to Electronics And Telematics, Electronics And Control Engineering, Electronics And Instrumentation Engineering, Electronics And Communication Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Find the impulse and step responses for the given system: y(n)+y(n-1) = x(n)-2x(n-1)
   (b) Test the following systems for linearity, time invariance, causality and stability.
      i. $y(n) = a^{|x(n)|}$
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2. (a) Explain the factors that influence the choice of structure for realisation of a LTI system.
   (b) An LTI system is described by the difference equation $y(n) = a_1 y(n-1) + x(n) + b_1 x(n-1)$
   Realize it in direct form I structure and convert it to direct form II structure. [4+12]

3. (a) An LTI system is described by the equation y(n)=x(n)+0.81x(n-1)-0.81x(n-2)-0.45y(n-2). Determine the transfer function of the system. Sketch the poles and zeroes on the Z-plane.
   (b) Define stable and unstable system. Test the condition for stability of the first-order IIR filter governed by the equation y(n)=x(n)+bx(n-1). [8+8]

4. (a) Let x(n) and $X(e^{jw})$ denote a sequence and its Fourier transform. Show that $\sum_{n=-\infty}^{\infty} x(n)\, x*(n) = {}^{1}/_{(2\pi)} \int_{-\pi}^{\pi} X(e^{j\omega})\, d\omega$
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5. (a) Discuss impulse invariance method of deriving IIR digital filter from corresponding analog filter.
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6. (a) Prove the following properties

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8. (a) Implement the decimation in time FFT algorithm for N=16.
(b) In the above Question how many non - trivial multiplications are required. [10+6]

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