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Code.No: NR410201 | NR | SET-1

IV B.TECH – I SEM EXAMINATIONS, NOVEMBER - 2010
DIGITAL SIGNAL PROCESSING
(COMMON TO EEE, CSIT)

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

Answer any FIVE questions
All questions carry equal marks

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1. Discuss on the classification of Digital signals and systems. [16]

2. a) Verify the following system for linearity, causality, time – invariance and stability
   i) $y(n)=a^{|x(n)|}$ ii) $y(n)=ne^{|x(n)|}$ iii) $y(n)=ax(n-1)+bx(n)$
   b) A digital system is characterized by the following difference equation:
   $y(n)=\left(1/2\right)x(n)+9y(n-1)$, assuming that the system is relaxed initially, determine its impulse response. [8+8]

3. a) State and prove the frequency shifting property of Fourier transform.
   b) A discrete system is characterized by the following difference equation.
   $y(n)-y(n-1)=x(n)+x(n-1)$ Where, $x(n)$ is the input and $y(n)$ is the output. Determine its magnitude and phase response as a function of frequency. [8+8]

4. a) State and prove the Parseval's relation for DFT, also give its physical interpretation.
   b) Using DFT approach, compute the circular convolution of the sequences.
   $x_1(n)=\{0,1,2,2,\}$ and $x_2(n)=\{2,2,2,1\}$ [8+8]

5. a) Explain the step by step procedure of implementing Radix -2, DI T FFT algorithm.
   b) Compute the 8 point DFT of $x(n)$ by radix-2 DIT FF algorithm. Also sketch the magnitude and phase spectrum. Where $x(n)$ is given by $x(n)=\{1,2,1,2,1,2,1,2\}$ [8+8]

6. a) Explain the impulse invariance method of deriving IIR digital filter from corresponding analog filter.
   b) Convert the analog filter with system function given by $H(s)=s+\frac{0.1}{(s+0.1)^2}+16$ using impulse invariance method. [8+8]

7. a) Compare FIR and IIR filters.
   b) Design a FIR filter with a frequency response given by
   $H\left(e^{jw}\right)=0 \quad for \quad |w|<3.5 \ rad/\sec$
   $1 \quad for \quad 3.5\le|w|\le 6 \ rad/\sec$
   Assume w_s = 10 rad/sec, N=11 and Hamming window. Also draw the structure of the filter. [8+8]

8. a) Explain the different structures for realizing I I R system.
   b) Realize the following FIR system in direct form structure.
   $H(z)=1+z^{-1}+z^{-2}+z^{-3}+\frac{1}{5}z^{-4}+\frac{1}{10}z^{-5}$
   c) Realize the following system with minimum number of multiples
   $H(z)=\left[1+\frac{1}{5}z^{-1}+z^{-2}\right]\left[1+z^{-1}+\frac{1}{5}z^{-2}\right]$ [16]

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IV B.TECH – I SEM EXAMINATIONS, NOVEMBER - 2010
DIGITAL SIGNAL PROCESSING
(COMMON TO EEE, CSIT)

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

Answer any FIVE questions
All questions carry equal marks

- - -

1. a) State and prove the frequency shifting property of Fourier transform.
   b) A discrete system is characterized by the following difference equation.
   $y(n)-y(n-1)=x(n)+x(n-1)$ Where, $x(n)$ is the input and $y(n)$ is the output. Determine its magnitude and phase response as a function of frequency. [8+8]

2. a) State and prove the Parseval's relation for DFT, also give its physical interpretation.
   b) Using DFT approach, compute the circular convolution of the sequences.
   $x_1(n)=\{0,1,2,2,\}$ and $x_2(n)=\{2,2,2,1\}$ [8+8]

3. a) Explain the step by step procedure of implementing Radix -2, DI T FFT algorithm.
   b) Compute the 8 point DFT of $x\ (n)$ by radix-2 DIT FF algorithm. Also sketch the magnitude and phase spectrum. Where $x\ (n)$ is given by $x\ (n)=\{1,2,1,2,1,2,1,2\}$ [8+8]

4. a) Explain the impulse invariance method of deriving IIR digital filter from corresponding analog filter.
   b) Convert the analog filter with system function given by $H(s)=s+\dfrac{0.1}{(s+0.1)^2}+16$ using impulse invariance method. [8+8]

5. a) Compare FIR and IIR filters.
   b) Design a FIR filter with a frequency response given by
   $H\left(e^{jw}\right)=0 \quad for \quad |w|<3.5 \ rad/\sec$
   $1 \quad for \quad 3.5\le|w|\le 6 \ rad/\sec$
   Assume w_s = 10 rad/sec, N=11 and Hamming window. Also draw the structure of the filter. [8+8]

6. a) Explain the different structures for realizing I I R system.
   b) Realize the following FIR system in direct form structure.
   $H(z)=1+z^{-1}+z^{-2}+z^{-3}+\dfrac{1}{5}z^{-4}+\dfrac{1}{10}z^{-5}$
   c) Realize the following system with minimum number of multiples
   $H(z)=\left[1+\dfrac{1}{5}z^{-1}+z^{-2}\right]\ \left[1+z^{-1}+\dfrac{1}{5}z^{-2}\right]$ [16]

7. Discuss on the classification of Digital signals and systems. [16]

8. a) Verify the following system for linearity, causality, time – invariance and stability
   i) $y(n)=a^{|x(n)|}$ ii) $y(n)=ne^{|x(n)|}$ iii) $y(n)=ax(n-1)+bx(n)$
   b) A digital system is characterized by the following difference equation:
   $y(n)=\left(1/2\right)x(n)+9y(n-1)$, assuming that the system is relaxed initially, determine its impulse response. [8+8]

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Code.No: NR410201 | NR | SET-3

IV B.TECH – I SEM EXAMINATIONS, NOVEMBER - 2010
DIGITAL SIGNAL PROCESSING
(COMMON TO EEE, CSIT)

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

Answer any FIVE questions
All questions carry equal marks

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1. a) Explain the step by step procedure of implementing Radix -2, DI T FFT algorithm.
   b) Compute the 8 point DFT of $x(n)$ by radix-2 DIT FF algorithm. Also sketch the magnitude and phase spectrum. Where $x(n)$ is given by $x(n)=\{1,2,1,2,1,2,1,2\}$ [8+8]

2. a) Explain the impulse invariance method of deriving IIR digital filter from corresponding analog filter.
   b) Convert the analog filter with system function given by $H(s)=s+\frac{0.1}{(s+0.1)^2}+16$ using impulse invariance method. [8+8]

3. a) Compare FIR and IIR filters.
   b) Design a FIR filter with a frequency response given by

$$H(e^{jw})=0 \quad for \quad |w|<3.5 \ rad/\sec$$
$$1 \quad for \quad 3.5\le|w|\le 6 \ rad/\sec$$

   Assume w_s = 10 rad/sec, N=11 and Hamming window. Also draw the structure of the filter. [8+8]

4. a) Explain the different structures for realizing I I R system.
   b) Realize the following FIR system in direct form structure.

$$H(z)=1+z^{-1}+z^{-2}+z^{-3}+\frac{1}{5}z^{-4}+\frac{1}{10}z^{-5}$$

   c) Realize the following system with minimum number of multiples

$$H(z)=\left[1+\frac{1}{5}z^{-1}+z^{-2}\right]\left[1+z^{-1}+\frac{1}{5}z^{-2}\right]$$ [16]

5. Discuss on the classification of Digital signals and systems. [16]

6. a) Verify the following system for linearity, causality, time – invariance and stability
   i) $y(n)=a^{|x(n)|}$ ii) $y(n)=ne^{|x(n)|}$ iii) $y(n)=ax(n-1)+bx(n)$
   b) A digital system is characterized by the following difference equation:
   $y(n)=\left(1/2\right)x(n)+9y(n-1)$, assuming that the system is relaxed initially, determine its impulse response. [8+8]

7. a) State and prove the frequency shifting property of Fourier transform.
   b) A discrete system is characterized by the following difference equation.
   $y(n)-y(n-1)=x(n)+x(n-1)$ Where, $x(n)$ is the input and $y(n)$ is the output. Determine its magnitude and phase response as a function of frequency. [8+8]

8. a) State and prove the Parseval's relation for DFT, also give its physical interpretation.
   b) Using DFT approach, compute the circular convolution of the sequences.
   $x_1(n)=\{0,1,2,2,\}$ and $x_2(n)=\{2,2,2,1\}$ [8+8]

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Code.No: NR410201 | NR | SET-4

IV B.TECH – I SEM EXAMINATIONS, NOVEMBER - 2010
DIGITAL SIGNAL PROCESSING
(COMMON TO EEE, CSIT)

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

Answer any FIVE questions
All questions carry equal marks

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1. a) Compare FIR and IIR filters.
   b) Design a FIR filter with a frequency response given by

$$H\left(e^{jw}\right)=0 \quad for \quad |w|<3.5 \ rad/\sec$$

$$1 \quad for \quad 3.5\le|w|\le 6 \ rad/\sec$$

Assume w_s = 10 rad/sec, N=11 and Hamming window. Also draw the structure of the filter. [8+8]

2. a) Explain the different structures for realizing I I R system.
   b) Realize the following FIR system in direct form structure.

$$H(z)=1+z^{-1}+z^{-2}+z^{-3}+\frac{1}{5}z^{-4}+\frac{1}{10}z^{-5}$$

   c) Realize the following system with minimum number of multiples

$$H(z)=\left[1+\frac{1}{5}z^{-1}+z^{-2}\right]\left[1+z^{-1}+\frac{1}{5}z^{-2}\right]$$ [16]

3. Discuss on the classification of Digital signals and systems. [16]

4. a) Verify the following system for linearity, causality, time – invariance and stability
   i) $y(n)=a^{|x(n)|}$ ii) $y(n)=ne^{|x(n)|}$ iii) $y(n)=ax(n-1)+bx(n)$
   b) A digital system is characterized by the following difference equation:
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   $x_1(n)=\{0,1,2,2,\}$ and $x_2(n)=\{2,2,2,1\}$ [8+8]

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