Code No: R05320201 **R05** **Set No. 2**

III B.Tech II Semester Examinations,December 2010
DIGITAL SIGNAL PROCESSING
Common to ICE, ETM, E.CONT.E, EIE, ECE, EEE

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

Answer any FIVE Questions
All Questions carry equal marks

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1. Obtain the poly phase decomposition of the IIR system with transfer function H(z)=(1-3Z^{-1})/(1+4Z^{-1}). [16]

2. (a) Let $X\left(e^{jw}\right)$ denote the DTFT of a real sequence. If $Y\left(e^{jw}\right) = \frac{1}{2}\left[X\left(e^{\frac{jw}{2}}\right) + X\left(-e^{\frac{jw}{2}}\right)\right]$, determine the inverse DTFT of Y(e^{jw}).
   (b) State and prove time scaling and time reversal propeties of DTFT. [8+8]

3. (a) Determine the stability of region for the causal system $H(z) = \frac{1}{1+a_1z^{-1}+a_2z^{-2}}$ by computing its poles and restricting them to be inside the unit circle.
   (b) Determine the zero - response of the system: y(n) = ½ y(n -1) + 4x(n) + 3x(n - 1) to the input $x(n) = e^{jw_0n}.u(n)$. [8+8]

4. Consider the finite length sequence
   x(n)= δ(n)+2δ(n-5)
   (a) Find the 10-point DFT of x(n)
   (b) Find the sequence that has a DFT
   $Y(k) = e^{j2k.\frac{2\pi}{10}}.X(k)$
   where X(k) is the 10-point DFT of x(n)
   (c) Find the 10-point sequence y(n) that has a DFT Y(K)=X(K)W(K) where X(K)is the 10-point DFT of the sequence
   $$\begin{aligned} w(n) &= 1\ , \quad 0 \le n \le 6 \\ &= 0\ , \quad otherwise \end{aligned}.$$
   [4+6+6]

5. Develop a radix -2 DIF / FFT algorithm for evaluating the DFT for N=8 and hence determine the 8-point DFT of the sequence x(n) = { 0, 1, 0, 1, 0, 1, 0, 1}. [16]

6. (a) What are the advantages of DSP processors over conventional microprocessors?
   (b) Explain the Implementation of convolver with single multiplier/adder. [8+8]

7. (a) Describe digital IIR filter characterization in Z domain.
   (b) Find H(Z) using Impulse Invariant method for given analog system.
   H(s) = 1/(s + 0.5) (s^2 +0.5s+2) [6+10]

8. Design a band pass filter with frequency response

$H_d(e^{j\omega}) = e^{-j2\omega n_o}$ $\omega_{c1} \leq |\omega| \leq \omega_{c2}$
$= 0$ otherwise
Design a filter for N = 7 and cut off frequency $\omega_{c1}=\pi/4$ and $\omega_{c2}=\pi/2$
Using

(a) Hanning window.

(b) Hamming window. [16]

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Code No: R05320201 **R05** **Set No. 4**

III B.Tech II Semester Examinations,December 2010
DIGITAL SIGNAL PROCESSING
Common to ICE, ETM, E.CONT.E, EIE, ECE, EEE

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

Answer any FIVE Questions
All Questions carry equal marks

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1. Obtain the poly phase decomposition of the IIR system with transfer function H(z)=(1-3Z^{-1})/(1+4Z^{-1}). [16]

2. (a) Determine the stability of region for the causal system $H(z) = \frac{1}{1+a_1z^{-1}+a_2z^{-2}}$ by computing its poles and restricting them to be inside the unit circle.
   (b) Determine the zero - response of the system: y(n) = ½ y(n -1) + 4x(n) + 3x(n - 1) to the input $x(n) = e^{jw_0n}.u(n)$. [8+8]

3. (a) Describe digital IIR filter characterization in Z domain.
   (b) Find H(Z) using Impulse Invariant method for given analog system.
   H(s) = 1/(s + 0.5) (s^2 +0.5s+2) [6+10]

4. Consider the finite length sequence
   x(n)= δ(n)+2δ(n-5)
   (a) Find the 10-point DFT of x(n)
   (b) Find the sequence that has a DFT
   $Y(k) = e^{j2k.\frac{2\pi}{10}}.X(k)$
   where X(k) is the 10-point DFT of x(n)
   (c) Find the 10-point sequence y(n) that has a DFT Y(K)=X(K)W(K) where X(K)is the 10-point DFT of the sequence
   $$\begin{aligned} w(n) &= 1, \quad 0 \le n \le 6 \\ &= 0, \quad otherwise \end{aligned}.$$
   [4+6+6]

5. (a) Let $X(e^{jw})$ denote the DTFT of a real sequence. If $Y(e^{jw}) = \frac{1}{2}\left[X\left(e^{\frac{jw}{2}}\right) + X\left(-e^{\frac{jw}{2}}\right)\right]$, determine the inverse DTFT of Y(e^{jw}).
   (b) State and prove time scaling and time reversal propeties of DTFT. [8+8]

6. Design a band pass filter with frequency response

   $$\mathrm{H_d(e^{j\omega}) = e^{-j2\omega n_o}} \qquad \omega_{c1} \le |\omega| \le \omega_{c2}$$
   $$= 0 \qquad \text{otherwise}$$
   Design a filter for N = 7 and cut off frequency $\omega_{c1}=\pi/4$ and $\omega_{c2}=\pi/2$
   Using
   (a) Hanning window.
   (b) Hamming window. [16]

7. (a) What are the advantages of DSP processors over conventional microprocessors?

   (b) Explain the Implementation of convolver with single multiplier/adder. [8+8]

8. Develop a radix -2 DIF / FFT algorithm for evaluating the DFT for N=8 and hence determine the 8-point DFT of the sequence x(n) = { 0, 1, 0, 1, 0, 1, 0, 1}. [16]

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Code No: R05320201 **R05** **Set No. 1**

III B.Tech II Semester Examinations,December 2010
DIGITAL SIGNAL PROCESSING
Common to ICE, ETM, E.CONT.E, EIE, ECE, EEE

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

Answer any FIVE Questions
All Questions carry equal marks
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1. Design a band pass filter with frequency response

   $H_d(e^{j\omega}) = e^{-j2\omega n_o}$ $\omega_{c1} \leq |\omega| \leq \omega_{c2}$
   $= 0$ otherwise
   Design a filter for N = 7 and cut off frequency $\omega_{c1}=\pi/4$ and $\omega_{c2}=\pi/2$
   Using

   (a) Hanning window.
   (b) Hamming window. [16]

2. (a) Let $X(e^{jw})$ denote the DTFT of a real sequence. If $Y(e^{jw}) = \frac{1}{2}\left[X\left(e^{\frac{jw}{2}}\right) + X\left(-e^{\frac{jw}{2}}\right)\right]$, determine the inverse DTFT of $Y(e^{jw})$.
   (b) State and prove time scaling and time reversal propeties of DTFT. [8+8]

3. Develop a radix -2 DIF / FFT algorithm for evaluating the DFT for N=8 and hence determine the 8-point DFT of the sequence x(n) = { 0, 1, 0, 1, 0, 1, 0, 1}. [16]

4. (a) Describe digital IIR filter characterization in Z domain.
   (b) Find H(Z) using Impulse Invariant method for given analog system.
   $H(s) = 1/(s + 0.5)\ (s^2 + 0.5s + 2)$ [6+10]

5. (a) Determine the stability of region for the causal system $H(z) = \frac{1}{1+a_1z^{-1}+a_2z^{-2}}$ by computing its poles and restricting them to be inside the unit circle.
   (b) Determine the zero - response of the system: y(n) = ½ y(n -1) + 4x(n) + 3x(n - 1) to the input $x(n) = e^{jw_0n}.u(n)$. [8+8]

6. (a) What are the advantages of DSP processors over conventional microprocessors?
   (b) Explain the Implementation of convolver with single multiplier/adder. [8+8]

7. Obtain the poly phase decomposition of the IIR system with transfer function $H(z)=(1-3Z^{-1})/(1+4Z^{-1})$. [16]

8. Consider the finite length sequence
   $x(n)= \delta(n)+2\delta(n-5)$

   (a) Find the 10-point DFT of x(n)

(b) Find the sequence that has a DFT
$Y(k) = e^{j2k.\frac{2\pi}{10}}.X(k)$
where X(k) is the 10-point DFT of x(n)

(c) Find the 10-point sequence y(n) that has a DFT Y(K)=X(K)W(K) where X(K)is the 10-point DFT of the sequence
$$w(n) = 1, \quad 0 \le n \le 6$$
$$= 0, \quad otherwise.$$
[4+6+6]

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Code No: R05320201 **R05** **Set No. 3**

III B.Tech II Semester Examinations,December 2010
DIGITAL SIGNAL PROCESSING
Common to ICE, ETM, E.CONT.E, EIE, ECE, EEE

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

Answer any FIVE Questions
All Questions carry equal marks

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1. Design a band pass filter with frequency response

   $H_d(e^{j\omega}) = e^{-j2\omega n_o}$ $\omega_{c1} \leq |\omega| \leq \omega_{c2}$
   $= 0$ otherwise
   Design a filter for N = 7 and cut off frequency $\omega_{c1}=\pi/4$ and $\omega_{c2}=\pi/2$
   Using

   (a) Hanning window.
   (b) Hamming window. [16]

2. (a) Describe digital IIR filter characterization in Z domain.
   (b) Find H(Z) using Impulse Invariant method for given analog system.
   $H(s) = 1/(s + 0.5)\ (s^2 + 0.5s+2)$ [6+10]

3. (a) What are the advantages of DSP processors over conventional microprocessors?
   (b) Explain the Implementation of convolver with single multiplier/adder. [8+8]

4. (a) Let $X(e^{jw})$ denote the DTFT of a real sequence. If $Y(e^{jw}) = \frac{1}{2}\left[X\left(e^{\frac{jw}{2}}\right) + X\left(-e^{\frac{jw}{2}}\right)\right]$, determine the inverse DTFT of $Y(e^{jw})$.
   (b) State and prove time scaling and time reversal propeties of DTFT. [8+8]

5. (a) Determine the stability of region for the causal system $H(z) = \frac{1}{1+a_1z^{-1}+a_2z^{-2}}$ by computing its poles and restricting them to be inside the unit circle.
   (b) Determine the zero - response of the system: y(n) = ½ y(n -1) + 4x(n) + 3x(n - 1) to the input $x(n) = e^{jw_0n}.u(n)$. [8+8]

6. Develop a radix -2 DIF / FFT algorithm for evaluating the DFT for N=8 and hence determine the 8-point DFT of the sequence x(n) = { 0, 1, 0, 1, 0, 1, 0, 1}. [16]

7. Consider the finite length sequence
   $x(n)= \delta(n)+2\delta(n-5)$

   (a) Find the 10-point DFT of x(n)
   (b) Find the sequence that has a DFT
   $Y(k) = e^{j2k.\frac{2\pi}{10}}.X(k)$
   where X(k) is the 10-point DFT of x(n)

(c) Find the 10-point sequence y(n) that has a DFT Y(K)=X(K)W(K) where X(K)is the 10-point DFT of the sequence

$$w(n) = 1\ ,\quad 0 \le n \le 6$$
$$= 0\ ,\quad otherwise\ .$$

[4+6+6]

8. Obtain the poly phase decomposition of the IIR system with transfer function $H(z)=(1-3Z^{-1})/(1+4Z^{-1})$. [16]

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