Code No: R05221902 **R05** **Set No. 2**

II B.Tech II Semester Examinations,December 2010
SIGNALS AND SYSTEMS
Common to Instrumentation And Control Engineering, Electronics And Computer Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Find Z transform of the following:
   i. n(n-1)u(n)
   ii. n^2u(n)
   (b) Find inverse z transform of the following: [8+8]
   i. $\frac{1}{\left[1-\frac{1}{2}z^{-1}\right]^2}$
   ii. 3+2 z^{-1} +6z^{-4}

2. The signal $V(t) = \cos 5\Pi t + 0.5 \cos 10\,\Pi t$ is instantaneously sampled. The interval between samples is T_S.
   (a) Find the maximum allowable value for T_S.
   (b) To reconstruct the signal V_s(t) is passed through a rectangular low pass filter. Find the minimum filter bandwidth to reconstruct the signal without distortion.
   (c) Explain signal recovery through holding. [4+6+6]

3. (a) Derive polar Fourier series from the exponential Fourier series representation and hence prove that $D_n = 2\,|C_n|$
   (b) Show that the magnitude spectrum of every periodic function is Symmetrical about the vertical axis passing through the origin. [8+8]

4. (a) Show that whether x(t) = A $e^{-\alpha(t)}$ u(t), α >0 is an energy signal or not.
   (b) Prove that the complex exponential functions are orthogonal functions. [8+8]

5. (a) Compute the convolution of the following pair of signals x(t) and h(t) by calculating X(ω) and H(ω) using the convolution property and inverse transforming $x(t) = e^{-t}u(t)$, $h(t) = e^{t}u(-t)$.
   (b) Suppose that $x(t) = e^{-(t-2)}u(t-2)$ *and* $h(t)$ is as depicted in figure 4b. Verify the convolution property for this pair of signals by showing that the Fourier transform of $y(t) = x(t) * h(t)$ equals $X(\omega)H(\omega)$. [8+8]

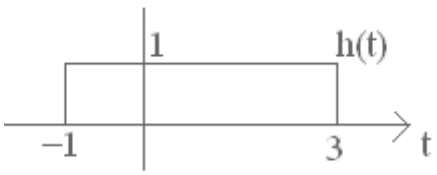

Figure 4b

6. (a) State the properties of the ROC of L.T.

   (b) Determine the function of time x(t) for each of the following laplace transforms and their associated regions of convergence. [8+8]

   i. $\frac{(s+1)^2}{s^2-s+1}$ $\quad \mathrm{Re}\{S\} > 1/2$

   ii. $\frac{s^2-s+1}{(s+1)^2}$ $\quad \mathrm{Re}\{S\} > -1$

7. (a) Find the Fourier Transform of the waveform shown figure 5a.

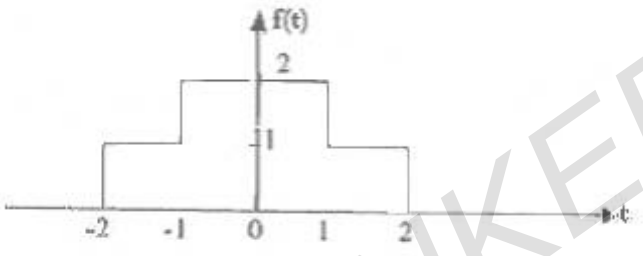

Figure 5a

   (b) Find the Fourier Transform of the signal given below [8+8]

$$y(t) = \begin{cases} \cos 10t, & -2 \le t \le 2 \\ 0, & otherwise \end{cases}$$

8. (a) Explain the difference between the following systems.

   i. Linear and non-linear systems.

   ii. Time variant and time invariant systems.

   (b) Consider a causal LTI system with frequency response $H(jw) = \frac{1}{3+jw}$. For a particular input x(t) this system is observed to produce the output $y(t) = e^{-3t}u(t) - e^{-4t}u(t)$. Find x(t). [8+8]

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Code No: R05221902 **R05** **Set No. 4**

II B.Tech II Semester Examinations,December 2010
SIGNALS AND SYSTEMS
Common to Instrumentation And Control Engineering, Electronics And Computer Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

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1. The signal $V(t) = \cos 5\Pi t + 0.5 \cos 10\,\Pi t$ is instantaneously sampled. The interval between samples is T_S.
   (a) Find the maximum allowable value for T_S.
   (b) To reconstruct the signal V_s(t) is passed through a rectangular low pass filter. Find the minimum filter bandwidth to reconstruct the signal without distortion.
   (c) Explain signal recovery through holding. [4+6+6]

2. (a) Derive polar Fourier series from the exponential Fourier series representation and hence prove that $D_n = 2\,|C_n|$
   (b) Show that the magnitude spectrum of every periodic function is Symmetrical about the vertical axis passing through the origin. [8+8]

3. (a) Compute the convolution of the following pair of signals x(t) and h(t) by calculating X(ω) and H(ω) using the convolution property and inverse transforming $x(t) = e^{-t}u(t),\ \ h(t) = e^{t}u(-t)$.
   (b) Suppose that $x(t) = e^{-(t-2)}u(t-2)$ *and* $h(t)$ is as depicted in figure 4b. Verify the convolution property for this pair of signals by showing that the Fourier transform of $y(t) = x(t) * h(t)$ equals $X(\omega)H(\omega)$. [8+8]

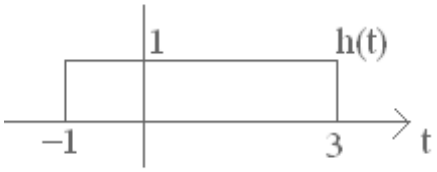

Figure 4b

4. (a) Find the Fourier Transform of the waveform shown figure 5a.

Code No: R05221902 **R05** **Set No. 4**

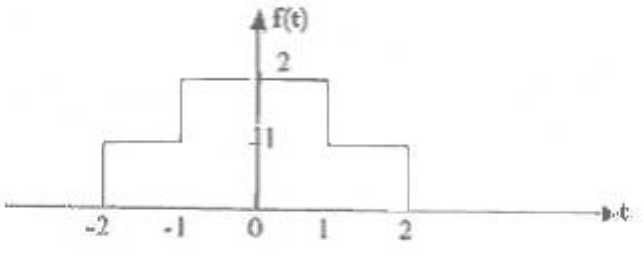

Figure 5a

(b) Find the Fourier Transform of the signal given below [8+8]

$$y(t) = \begin{cases} \cos 10t, & -2 \leq t \leq 2 \\ 0, & otherwise \end{cases}$$

5. (a) State the properties of the ROC of L.T.

(b) Determine the function of time x(t) for each of the following laplace transforms and their associated regions of convergence. [8+8]

i. $\frac{(s+1)^2}{s^2-s+1}$ $\quad \mathrm{Re}\{S\} > 1/2$

ii. $\frac{s^2-s+1}{(s+1)^2}$ $\quad \mathrm{Re}\{S\} > -1$

6. (a) Find Z transform of the following:

i. n(n-1)u(n)

ii. n^2u(n)

(b) Find inverse z transform of the following: [8+8]

i. $\frac{1}{\left[1-\frac{1}{2}z^{-1}\right]^2}$

ii. $3+2\ z^{-1}+6z^{-4}$

7. (a) Explain the difference between the following systems.

i. Linear and non-linear systems.

ii. Time variant and time invariant systems.

(b) Consider a causal LTI system with frequency response $H(jw) = \frac{1}{3+jw}$. For a particular input x(t) this system is observed to produce the output $y(t) = e^{-3t}u(t) - e^{-4t}u(t)$. Find x(t). [8+8]

8. (a) Show that whether x(t) = A $e^{-\alpha(t)}$ u(t), $\alpha > 0$ is an energy signal or not.

(b) Prove that the complex exponential functions are orthogonal functions. [8+8]

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Code No: R05221902 **R05** **Set No. 1**

II B.Tech II Semester Examinations,December 2010
SIGNALS AND SYSTEMS
Common to Instrumentation And Control Engineering, Electronics And Computer Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Compute the convolution of the following pair of signals x(t) and h(t) by calculating X(ω) and H(ω) using the convolution property and inverse transforming $x(t) = e^{-t}u(t),\ \ h(t) = e^{t}u(-t)$.
   (b) Suppose that $x(t) = e^{-(t-2)}u(t-2)$ *and* $h(t)$ is as depicted in figure 4b. Verify the convolution property for this pair of signals by showing that the Fourier transform of $y(t) = x(t) * h(t)$ equals $X(\omega)H(\omega)$. [8+8]

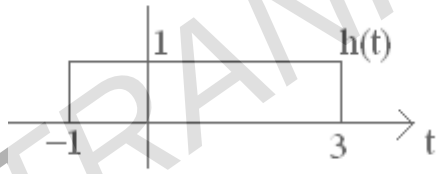

Figure 4b

2. (a) Explain the difference between the following systems.
      i. Linear and non-linear systems.
      ii. Time variant and time invariant systems.
   (b) Consider a causal LTI system with frequency response $H(jw) = \frac{1}{3+jw}$. For a particular input x(t) this system is observed to produce the output $y(t) = e^{-3t}u(t) - e^{-4t}u(t)$. Find x(t). [8+8]

3. (a) Show that whether x(t) = A $e^{-\alpha(t)}$ u(t), α >0 is an energy signal or not.
   (b) Prove that the complex exponential functions are orthogonal functions. [8+8]

4. (a) State the properties of the ROC of L.T.
   (b) Determine the function of time x(t) for each of the following laplace transforms and their associated regions of convergence. [8+8]
      i. $\frac{(s+1)^2}{s^2-s+1}$ $\quad \mathrm{Re}\{S\} > 1/2$
      ii. $\frac{s^2-s+1}{(s+1)^2}$ $\quad \mathrm{Re}\{S\} > -1$

5. (a) Find the Fourier Transform of the waveform shown figure 5a.

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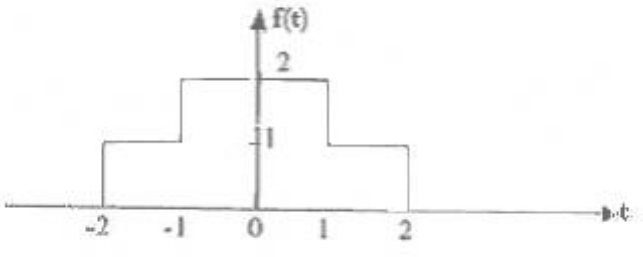

Figure 5a

(b) Find the Fourier Transform of the signal given below [8+8]

$$y(t) = \begin{cases} \cos 10t, & -2 \leq t \leq 2 \\ 0, & otherwise \end{cases}$$

6. (a) Derive polar Fourier series from the exponential Fourier series representation and hence prove that $D_n = 2|C_n|$

(b) Show that the magnitude spectrum of every periodic function is Symmetrical about the vertical axis passing through the origin. [8+8]

7. The signal $V(t) = \cos 5\Pi t + 0.5 \cos 10\Pi t$ is instantaneously sampled. The interval between samples is T_S.

(a) Find the maximum allowable value for T_S.

(b) To reconstruct the signal V_s(t) is passed through a rectangular low pass filter. Find the minimum filter bandwidth to reconstruct the signal without distortion.

(c) Explain signal recovery through holding. [4+6+6]

8. (a) Find Z transform of the following:

i. n(n-1)u(n)

ii. n^2u(n)

(b) Find inverse z transform of the following: [8+8]

i. $\frac{1}{\left[1-\frac{1}{2}z^{-1}\right]^2}$

ii. 3+2 z^{-1} +6z^{-4}

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Code No: R05221902 **R05** **Set No. 3**

II B.Tech II Semester Examinations,December 2010
SIGNALS AND SYSTEMS
Common to Instrumentation And Control Engineering, Electronics And Computer Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Show that whether x(t) = A $e^{-\alpha(t)}$ u(t), α >0 is an energy signal or not.
   (b) Prove that the complex exponential functions are orthogonal functions. [8+8]

2. (a) State the properties of the ROC of L.T.
   (b) Determine the function of time x(t) for each of the following laplace transforms and their associated regions of convergence. [8+8]
   i. $\frac{(s+1)^2}{s^2-s+1}$ $\quad \mathrm{Re}\{S\} > 1/2$
   ii. $\frac{s^2-s+1}{(s+1)^2}$ $\quad \mathrm{Re}\{S\} > -1$

3. The signal $V(t) = \cos 5\Pi t + 0.5 \cos 10\Pi t$ is instantaneously sampled. The interval between samples is T_S.
   (a) Find the maximum allowable value for T_S.
   (b) To reconstruct the signal V_s(t) is passed through a rectangular low pass filter. Find the minimum filter bandwidth to reconstruct the signal without distortion.
   (c) Explain signal recovery through holding. [4+6+6]

4. (a) Compute the convolution of the following pair of signals x(t) and h(t) by calculating X(ω) and H(ω) using the convolution property and inverse transforming $x(t) = e^{-t}u(t)$, $h(t) = e^{t}u(-t)$.
   (b) Suppose that $x(t) = e^{-(t-2)}u(t-2)$ *and* $h(t)$ is as depicted in figure 4b. Verify the convolution property for this pair of signals by showing that the Fourier transform of $y(t) = x(t) * h(t)$ equals $X(\omega)H(\omega)$. [8+8]

Figure 4b

5. (a) Find the Fourier Transform of the waveform shown figure 5a.

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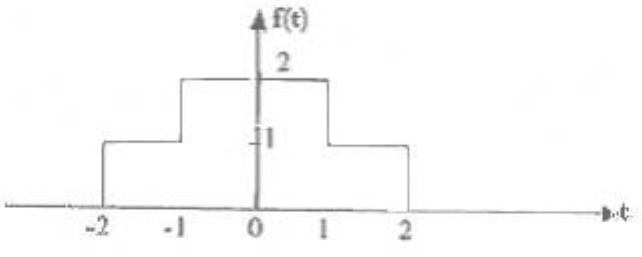

Figure 5a

(b) Find the Fourier Transform of the signal given below [8+8]

$$y(t) = \begin{cases} \cos 10t, & -2 \leq t \leq 2 \\ 0, & otherwise \end{cases}$$

6. (a) Find Z transform of the following:
   i. n(n-1)u(n)
   ii. n^2u(n)

   (b) Find inverse z transform of the following: [8+8]
   i. $\frac{1}{\left[1-\frac{1}{2}z^{-1}\right]^2}$
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7. (a) Derive polar Fourier series from the exponential Fourier series representation and hence prove that $D_n = 2\,|C_n|$

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