SIGNALS & SYSTEMS

Date: **29.04.2010**   **Max. Marks: 50**
Time: **2 Hrs**

Note: Answer all questions
All questions carry equal marks

1. (a) Define Hilbert transform and list out its properties.   (4)
    (b) State central limit theorem.   (2)
    (c) Define region of convergence and specify its importance.   (2.5)
    (d) Define cumulative distribution function and list out its properties.   (4)

2. (a) Find the Fourier transform of $f(t) = e^{-a|t|}$, state and prove the   (12.5)
         following properties: (i) Convolution   (ii) Time differentiation
         (iii) Time shift

                                  (OR)

    (b) Obtain the Fourier transform for the following functions: (12.5)
         (i) sgn(t)   (ii) $\cos \omega_0 t$ (iii) $te^{-at} u(t)$

3. (a) Define (i) random variable   (ii) statistical independence   (6)
         (iii) statistical average (iv) correlations

    (b) Obtain the Z-Transform and specify the ROC   for the following   (6.5)
         sequences:
         (i) $x_2(n) = x_1(n-2)$ (ii) $x_3(n) = x_1(n+2)$ where $x_1(n) = \{1,2,5,7,0,1\}$
                                  (OR)

    (c) State and prove the following Z-Transform properties: (6)
           (i) Convolution (ii) Time reversal (iii) Time differentiation

    (d) Find the inverse Z-Transform   (6.5)
         (i) $X(z) = \dfrac{z}{(z-1)\,(z-2)}$ using residue method

         (ii) $X(z) = \dfrac{z(z+1)}{(z-1)^3}$ using long division method

4   (a) Realize the digital network described by the difference equation,   (12.5)
         $y(n) = x(n) + 0.5x(n-1) - 0.6\,y(n-1) - 0.7y(n-2)$ in Direct Form-I and
         Direct Form –II realization structures.

                                  (OR)

    (b) Obtain the cascade and parallel realization forms for the   (12.5)
         following system function:

$$\frac{Y(z)}{X(z)} = \frac{1+0.5\,z^{-1}}{(1-z^{-1}+0.25\ z^{-2})\,(1-z^{-1}+0.5\ z^{-2})}$$

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SIGNALS & SYSTEMS

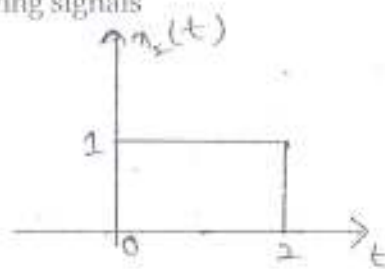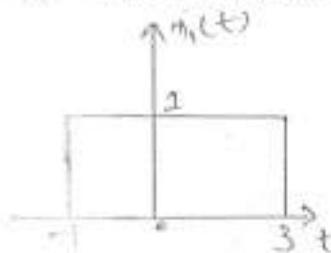Date: 21.04.2011   Max. Marks: 50
Time: 2 Hours

NOTE: 1.   Answer all questions

1. (a)   Define Region of convergence (ROC) and specify its importance?   (4)
    (b)   Find the Hilbert Transform of Sinwot?   (3)
    (c)   Define initial and final value theorems in Z- domain?   (3)
    (d)   Define parseval's theorem?   (4)

2. (a)   Find the convolution of following signals   (12)

OR

    (b)   Prove the following properties of fourier transform?
          i)   Time shift   (6)
          ii) Time differentiation
    (c)   Find the fourier transform of the following signals?   (6)
          i) $e^{-2t} u(t-1)$
          ii) $e^{-|t|}$

3. (a)   Find the Z-transform of the following signals?   (8)
          i) $(1/2)^n u(-n)$

          ii) $r^n \sin w_o n\, u(n)$

    (b)   Prove the following properties of Z- transform?   (4)
          i)   Convolution
          ii) Multiplication by n

(OR)

    (c)   Define i) random variable   ii)statistical independence   (8)
          iii) correlation   iv) Statistical average

    (d)   State central limit theorem & Rayleigh energy theorem   (4)

4. (a) Realize the digital system described by the following difference (7)
equation in Direct form –I and Direct form -II.
y (n)-1/4 y (n-1)-1/8 y(n-2)=x(n)+3x(n-1)+2x(n-2).

(b) Find the convolution of following sequences (5)
$x_1[n]=[1,-2,1]$ $x_2[n]=\{1,1,1,1,1\}$

(OR)

(c) Find the convolution of the signals where $x_1(t) =e^{-at} u(t)$, (6)
$x_2(t) =e^{-bt} u(t)$ using fourier transform

(d)

Determine all possible signals of x(n) associated with Z-transform (6)
i) $X(Z)= 5Z^{-1}/(1-2Z^{-1})(1-3Z^{-1})$

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Paper set by

E. Suresh
S.P. Girija
M. Raghu Ram
B. Shashi kanth

SIGNALS AND SYSTEMS

Date: 24.02.2011   Max.Marks: 50

Time: 2 Hrs

Note: Answer All Questions

1. (a) Check periodicity of the following Signals: (4)

(i) $x(t) = \sin(2\pi/3)t + \cos(\pi/2)t$

(ii) $x(t) = 2u(t) + 2\sin 2t$

(b) Write short notes on Singularity functions.   (4)

(c) Sketch the following signals

(i) $e^{-2t} u(-2+t)$ (ii) $x(t) \cos(\omega t)$ (6)

(iii) $(t-2) u(t-2) \cdot \text{sgn}(t)$.

2. (a) Write short notes on classification of Signals. (7)
Explain in detail with Suitable examples.

(b) Determine Energy/power of the following Signals (5)

(i) $x(t) = u(t) - u(t-10)$ (ii) $e^{-5t} u(t)$

(OR)

(c) Write short notes on classification of Systems (7)

(d) Differentiate Periodic and Aperiodic Signals. (5)

3.(a) Represent the following signals using Singularity (8)
functions:

(i) $(t-4) [u(t-2) - u(t-4)]$ (ii) $r(t) \cdot r(t)$
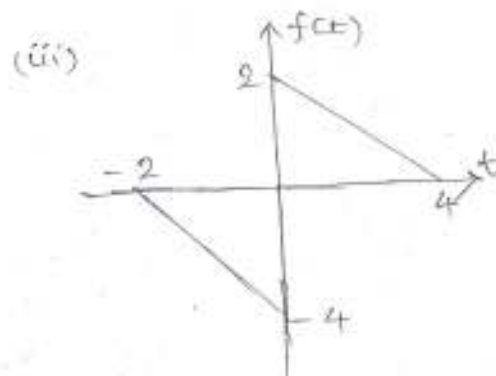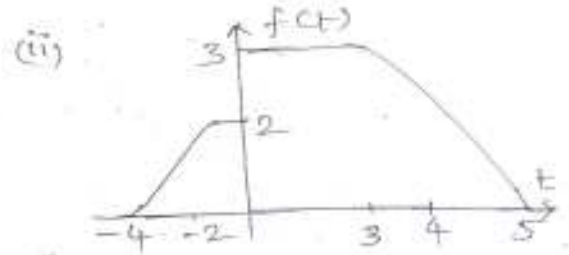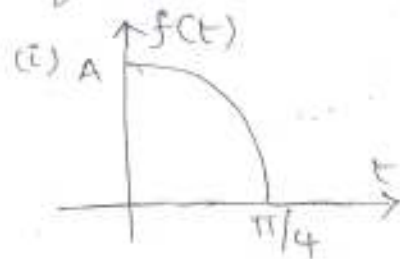
(iii) $r(-t-1) u(t-4)$ (iv) $e^{-a|t|}$

(b) Evaluate following integrals   (4)

(i) $\int_{-\infty}^{\infty} \delta(1-t)(t^3+4) \cdot dt$ (ii) $\int_{-\infty}^{\infty} \delta(t) e^{-j\omega t} \cdot dt$
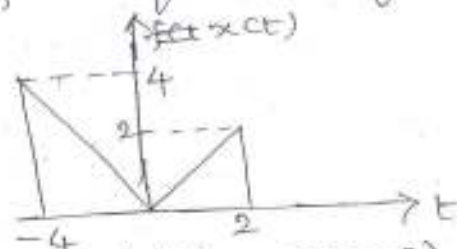
(OR)

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(c). Express the following signals using singularity (9)
functions.

(i)

(ii)

(iii)

(d) Write the properties of impulse function   (3)

4 (a). If $x(t) =$ (12)

Sketch $x(2-t), x(t/4), x(2t-3), 2x\left(\frac{1-t}{2}\right)$

(OR)

(b). Find the Fourier Series representation of (12)
half-wave rectified sinusoidal signal.

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Paper Set by
Smt. S. P. Girija
Sri. E. Suresh
Sri. M. RaghuRam
Sri. B. Shashikanth

KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE::WARANGAL-506015
II/IV B.Tech(Common to E&I , ECE & EEE) II-Semester, II-Mid Examination
EC 225 – SIGNALS & SYSTEMS
Date: 20.04.2012   Max.Marks: 50
Time: 2hrs

Note: Answer All Questions

1. (a) Obtain the relationship between Trigonometric and Exponential Fourier series   (3)
   coefficients?
   (b) State and prove Parseval's theorem?   (4)
   (c) Write the conditions for existence of Fourier series?   (3)
   (d) Determine the convolution of given two sequences   (4)
   x1[n]={2,3,4} and x2[n]={3,1}

2. (a) Find the Exponential Fourier series of the following half wave signal $f(t)$:   (6)
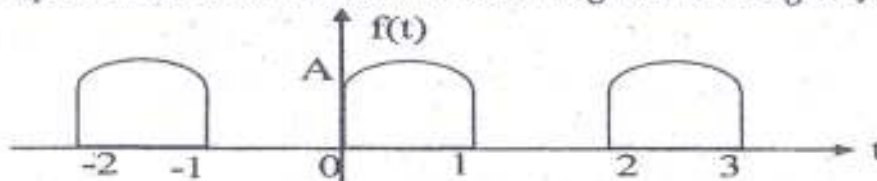
   (b) Find the Fourier Transform of   (6)
   (i) Signum function   (ii) Constant function
                                        (OR)
   (c) State and prove the following Fourier Transform properties: (6)
       (i) Time Scaling   (ii) Frequency Differentiation
   (d) Obtain the Fourier Transform of the following: (6)
   (i) $x(t) = e^{-at} * e^{-bt}$ (ii) $x(t) = \delta(t+2) + \delta(t+1) + \delta(t-1) + \delta(t-2)$

3. (a) Obtain the Hilbert transform of x(t)=cosω₀t. Also list out the properties of Hilbert   (6)
   transformation.
   (b) Consider a system with input denoted by x[n] and output denoted by y[n] and is   (6)
   given by   y[n]= (n+3) x[n-3]
   Test the system for (i) Linearity (ii) Time invariant (iii) Causality
                                        (OR)
   (c) Find the Z–transform of $x[n] = 2^n u[-n] + (1/4)^n u[n-1]$ and specify the ROC.   (5)
   (d) Find the Inverse Z-transform using Residue method   (4)

   $$X[z] = \frac{z}{(z-1)(z-2)}$$

   (e) Define Initial and Final value theorems in Z-domain.   (3)

4. (a) The input and output of a causal LTI system described by the differential equation   (12)

   $$\frac{d^2y(t)}{dt^2} + 3\frac{dy(t)}{dt} + 2y(t) = x(t)$$

   (i) Find the Fourier Transfer function of the system
   (ii) Obtain the Impulse response of the system
   (iii) Obtain the response of the system if $x(t) = e^{-t}u(t)$ is given as input.
                                        (OR)
   (b) Realize the digital network described by the difference equation,   (12)
   $y[n] = 2x[n] + 0.5x[n-1] - 0.8y[n-1] - 4y[n-2]$ in Direct form-I and Direct form-II
   Realization structures.

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Date: 21.02.2012   Max.Marks: 50
Time: 2hrs

Note: Answer All Questions
All Questions carry equal marks
Question 1. is compulsory

1. (a) Check the periodicity of the following signals   (4)
    (i) $\cos t + \sin \sqrt{2} t$
    (ii) $2e^{j16\pi t} + 3e^{-j7\pi t}$

   (b) Sketch the following signals   (6)
        (i) $(t-4)[u(t-2)-u(t-4)]$
        (ii) $u(\cos t)$

   (c) Define Orthogonality of a function   (2 ½)

2. (a) Define and sketch unit impulse function, unit step function and unit ramp function.   (5)
       What is the inter-relation among them?

   (b) Sketch the following signals with indicated transformations   (7 ½)
       (i) sketch x(2-t), x(2t), x(t/4)
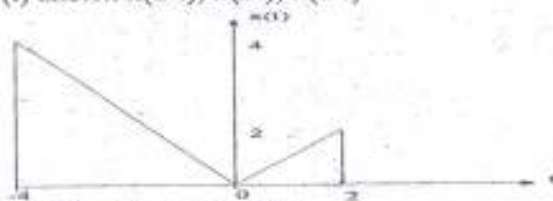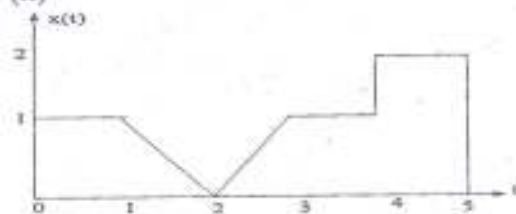

       (ii) Sketch x(t/3), x(3t)

(OR)
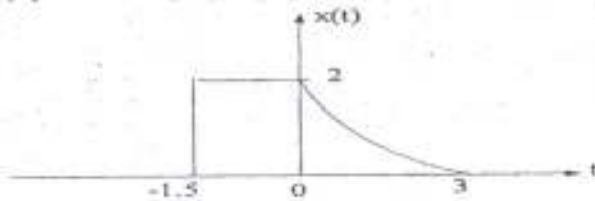
   (c) Write short notes on classification of signals, giving two examples each.   (6 ½)
   (d) Represent the following signals using singularity functions.   (6)
       (i)

       (ii)

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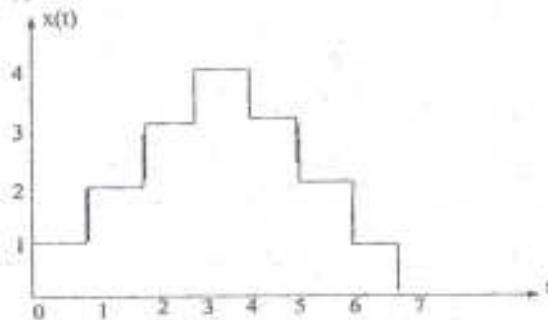
3   (a)   Evaluate the following integrals   (4)

(i) $\int_{-2}^{1}(t+t^2)\delta(t-3)dt$

(ii) $\int_{-\infty}^{\infty}\delta(1-t)(t^3+4)dt$

(iii) $\int_{0}^{3}e^{t-2}\delta(2t-4)dt$

(iv) $\int_{-\infty}^{\infty}x(t)\delta(at)dt$

(b)   Write short notes on classification of systems, giving an example each   (4 ½)
(c)   Verify linearity, causality, time invariance and stability of the following systems.   (4)
      (i) y(t)=tx(t)

OR

(d)   Find which of the following signals are energy signal? Which are power signals?   (6)
      (i) $e^{-5t}u(t)$ (ii) u(t)-u(t-1)   (iii) r(t)
(e)   State and explain the properties of convolution   (4)
(f)   State and derive the condition on impulse response of an LTI system for it to be   (2 ½)
      stable

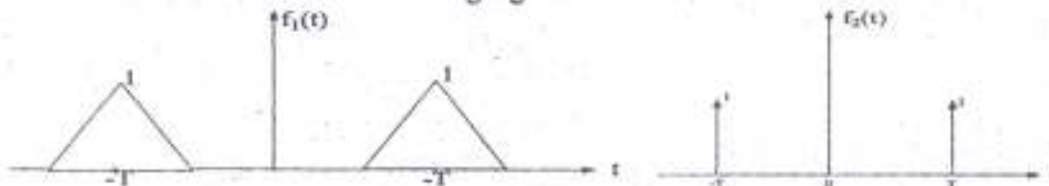4. (a)   Find the convolution of $x_1(t)$ and $x_2(t)$ for the following signals
      (i) $x_1(t)$=tu(t); $x_2(t)$=u(t)   (5)

      (ii) $x_1(t)=\begin{cases} t; 0 \le t \le 2 \\ (4-t); 2 \le t \le 4 \end{cases}$ $x_2(t)=\begin{cases} 2; 0 \le t \le 2 \\ 0; otherwise \end{cases}$ (7 ½)

(OR)
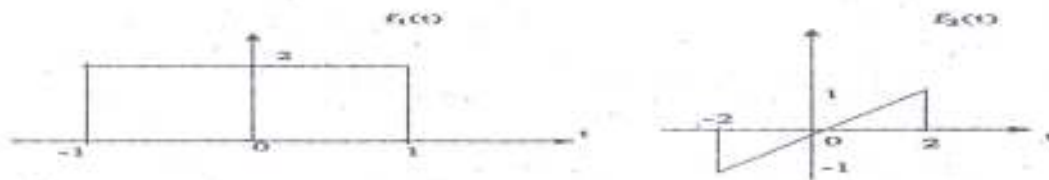
(b)   Find the convolution of the following signals
(i)   (5)

(ii)   (7 ½)

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SIGNALS & SYSTEMS

Date: 24.01.2013   Max. Marks : 50
Duration: 2 hours

Note: Answer all questions.

1   (a)   Sketch the following Signals.   (3)
           i. $x(t) = r(t+1) - r(t) - r(t-2) + r(t-3)$
           ii. $x(t) = -u(t+3) + 2u(t+1) - 2u(t-1) + u(t-3)$
     (b)   Find the energy / Power of the following Signals.   (4)
           i. $x(t) = u(t) - u(t-10)$ ii) $x(t) = A \sin(w_0 t + \theta)$
     (c)   Explain the properties of convolution.   (3)
     (d)   Determine the causality and stability of the following LTI system   (4)
           with impulse response given by $h(t) = e^{-2t} u(t-1)$

2   (a)   Represent the following signals in terms of singularity functions   (6)
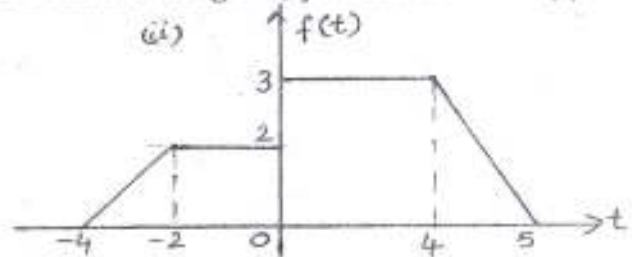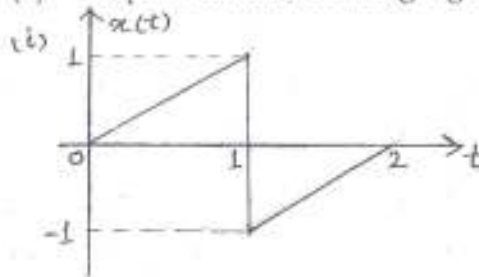
     (b)   Determine whether the following Systems are linear, causal, Time   (6)
           Invariant
           i) $y(t) = at^2 x(t) + bx(t-2)$
           ii) $y(t) = x(t+10) + x^2(t)$

                                           (OR)

     (c)   Explain briefly the classification of Signals and systems.   (10)
     (d)   Evaluate the following integrals using impulse function properties   (2)

           i) $\int_{-\infty}^{\infty} \delta(t-2) \sin t\, dt$ ii) $\int_{0}^{5} \cos(2\pi t)\, \delta(t-2) dt$

3   (a)   Evaluate the convolution by Graphical method for the following pair (12)
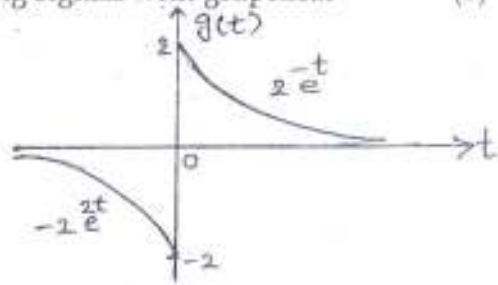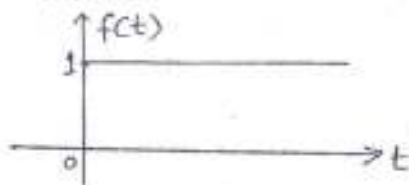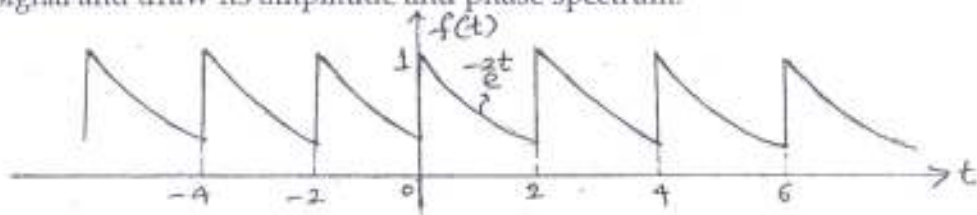   of signals
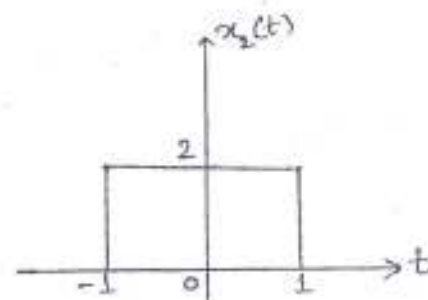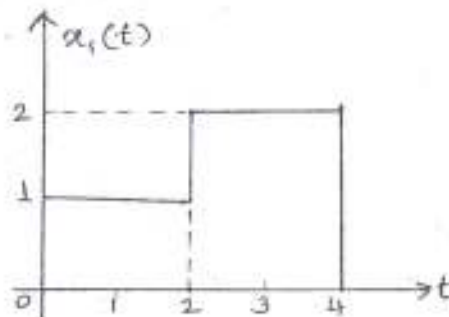
(b) Find the convolution of the following signals by Analytical/Direct (6)
method

    i) $x_1(t) = e^{-2t}u(t)$ ii) $x_2(t) = e^{-t}u(t)$

(c) Obtain the convolution of the following signals with graphical (6)
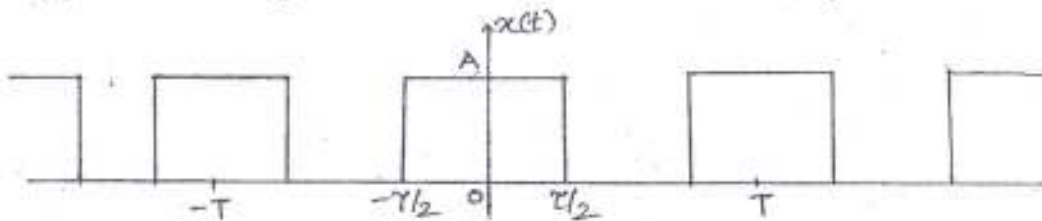method

4   (a) Obtain the exponential Fourier Series representation of the following (12)
signal and draw its amplitude and phase spectrum.

(OR)

(b) Find the Trigonometric Fourier series of the following function. (12)