

Code No: 07A3EC12

**R07****Set No. 2**

**II B.Tech I Semester Examinations, MAY 2011**  
**SIGNALS AND SYSTEMS**  
 Common to BME, ETM, E.CONT.E, EIE, ECE

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions  
 All Questions carry equal marks

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1. (a) State and Prove Properties of cross correlation function.  
 (b) If  $v(f) = AT \frac{\sin 2\pi fT}{2\pi fT}$  find the energy contained in  $V(t)$ . [8+8]
2. (a) Obtain the Trigonometric Fourier series for the function  $f(t)$  as shown in figure 6a

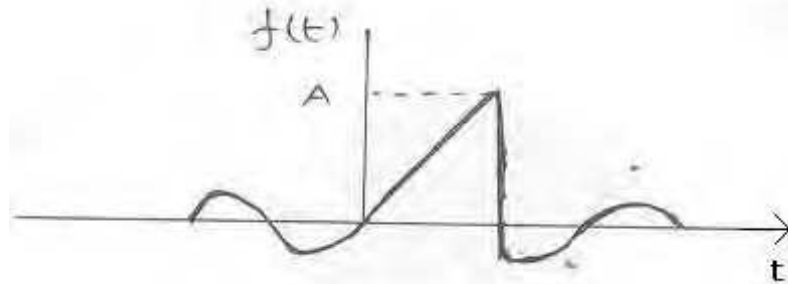


Figure 6a

- (b) Use the definition of the Fourier series to determine the time domain representation signals represented by the following Fourier series coefficients.
  - i.  $C_n = j\delta(n+1) - j\delta(n-1) + j\delta(n-3) + j\delta(n+1)$  and  $\omega_0 = 4\pi$
  - ii.  $C_n = \left(-\frac{1}{5}\right)^{|n|}$ ,  $\omega_0 = 1$ . [8+8]
3. (a) When is a function  $f(t)$  is said to be laplace transformable.  
 (b) What do you mean by region of convergence?  
 (c) List the advantages of Laplace transform.  
 (d) If  $\delta(t)$  is a unit impulse function find the laplace transform of  $d^2/dt^2 [\delta(t)]$ . [4+4+4+4]
4. (a) Determine the Nyquist rate corresponding to each of the following signals.
  - i.  $x(t) = 1 + \cos 2000 \pi t + \sin 4000 \pi t$
  - ii.  $x(t) = (\sin 4000 \pi t) / \pi t$
- (b) The signal,  $Y(t)$  is generated by convolving a band limited signal  $X_1(t)$  with another band limited signal  $X_2(t)$  that is  
 $Y(t) = X_1(t) * X_2(t)$   
 Where,  
 $X_1(j\omega) = 0$  for  $|\omega| > 1000\pi$   
 $X_2(j\omega) = 0$  for  $|\omega| > 2000\pi$   
 Impulse train sampling is performed on  $y(t)$  to obtain

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$$y_p(t) = \sum_{n=-\infty}^{\infty} y(nT) \delta(t - nT)$$

Specify the range of values for sampling period  $T$  which ensures that  $y(t)$  is recoverable from  $Y_p(t)$ . [8+8]

5. (a) Find the Z transform of  $t^2 e^{-at}$ .  
 (b) Find the final value and initial value of  $x(n)$  for  $X(z) = \frac{z^2}{(z-1)(z-0.2)}$ . [8+8]
6. (a) Find the Fourier Transform for the following functions shown in figure 1a.

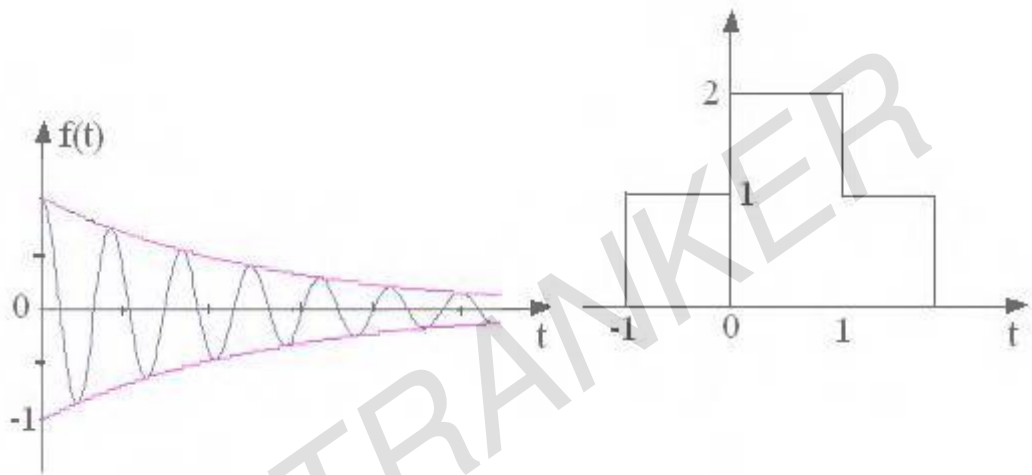


Figure 1a

- (b) Find the total area under the function  $g(t) = 100 \sin c((t-8)/30)$ . [10+6]
7. (a) Explain the Graphical Evaluation of a component of one function in other function.  
 (b) Sketch the single sided and double sided spectra of the following signal:  
 $x(t) = 4 \sin(10\pi t - \frac{\pi}{6})$ . [10+6]
8. (a) The transfer function of an ideal low pass filter is given by  
 $H(j\omega) = KG_w(\omega) e^{-j\omega t_0}$   
 Evaluate the unit step response of this filter.  
 (b) Find the output voltage  $V(t)$  of a network shown in figure 7b. when the voltage applied to the terminals ab is given by  $t e^{-t} u(t)$

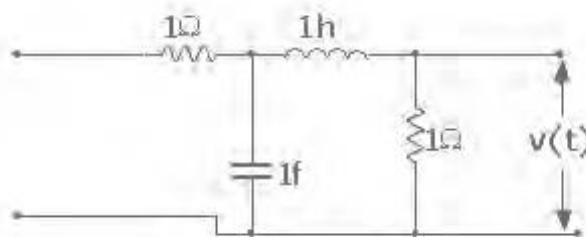


Figure 7b

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1. (a) State and Prove Properties of cross correlation function.  
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2. (a) When is a function  $f(t)$  is said to be laplace transformable.  
 (b) What do you mean by region of convergence?  
 (c) List the advantages of Laplace transform.  
 (d) If  $\delta(t)$  is a unit impulse function find the laplace transform of  $d^2/dt^2 [\delta(t)]$ . [4+4+4+4]
3. (a) Explain the Graphical Evaluation of a component of one function in other function.  
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 $x(t) = 4 \sin \left( 10\pi t - \frac{\pi}{6} \right)$ . [10+6]
4. (a) Determine the Nyquist rate corresponding to each of the following signals.  
 i.  $x(t) = 1 + \cos 2000 \pi t + \sin 4000 \pi t$   
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 (b) The signal,  $Y(t)$  is generated by convolving a band limited signal  $X_1(t)$  with another band limited signal  $X_2(t)$  that is  
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 Where,  
 $X_1(j\omega) = 0$  for  $|\omega| > 1000\pi$   
 $X_2(j\omega) = 0$  for  $|\omega| > 2000\pi$   
 Impulse train sampling is performed on  $y(t)$  to obtain  
 $y_p(t) = \sum_{n=-\infty}^{\infty} y(nT) \delta(t - nT)$   
 Specify the range of values for sampling period  $T$  which ensures that  $y(t)$  is recoverable from  $Y_p(t)$ . [8+8]
5. (a) Find the Z transform of  $t^2 e^{-at}$ .  
 (b) Find the final value and initial value of  $x(n)$  for  $X(z) = \frac{z^2}{(z-1)(z-0.2)}$ . [8+8]
6. (a) The transfer function of an ideal low pass filter is given by  
 $H(j\omega) = KG_w(\omega) e^{-j\omega t_0}$   
 Evaluate the unit step response of this filter.

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- (b) Find the output voltage  $V(t)$  of a network shown in figure 7b. when the voltage applied to the terminals ab is given by  $t e^{-t} u(t)$

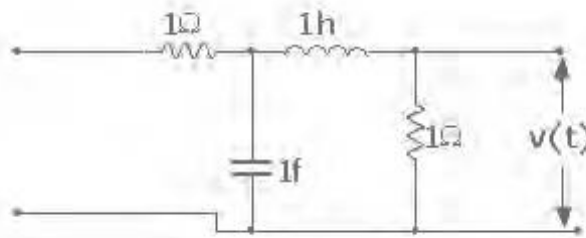


Figure 7b

7. (a) Find the Fourier Transform for the following functions shown in figure 1a.

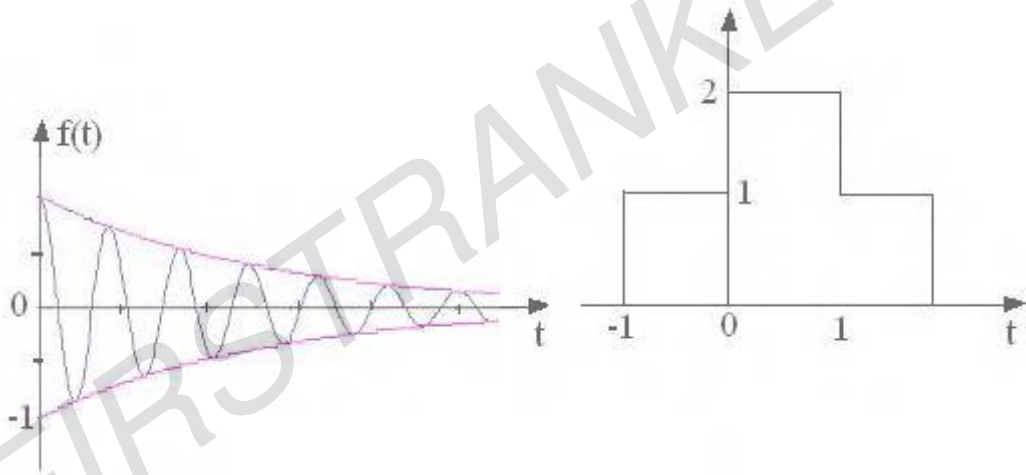


Figure 1a

- (b) Find the total area under the function  $g(t) = 100 \text{Sin} c ((t-8)/30)$ . [10+6]
8. (a) Obtain the Trigonometric Fourier series for the function  $f(t)$  as shown in figure 6a

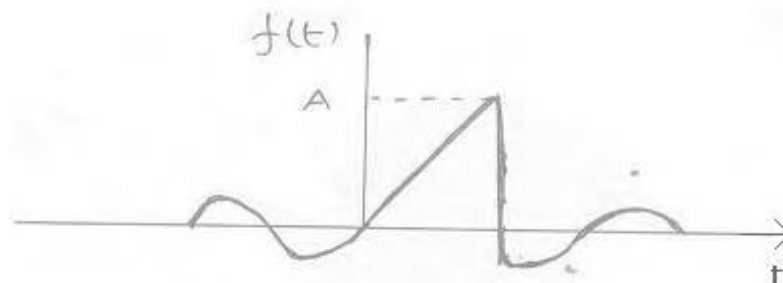


Figure 6a

- (b) Use the definition of the Fourier series to determine the time domain representation signals represented by the following Fourier series coefficients.
- $C_n = j\delta(n+1) - j\delta(n-1) + j\delta(n-3) + j\delta(n+1)$  and  $\omega_0 = 4\pi$
  - $C_n = (-\frac{1}{5})^{|n|}$ ,  $\omega_0 = 1$ . [8+8]

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FIRSTRANKER

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R07

Set No. 1

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1. (a) The transfer function of an ideal low pass filter is given by  $H(j\omega) = KG_w(\omega)e^{-j\omega t_0}$   
Evaluate the unit step response of this filter.
- (b) Find the output voltage  $V(t)$  of a network shown in figure 7b. when the voltage applied to the terminals ab is given by  $t e^{-t} u(t)$

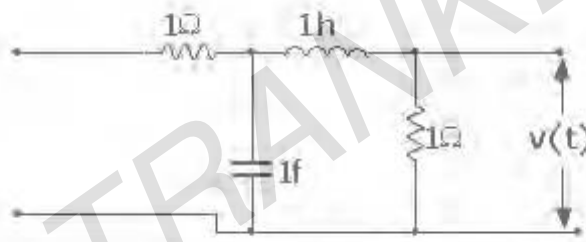


Figure 7b

2. (a) Find the Z transform of  $t^2 e^{-at}$ .
- (b) Find the final value and initial value of  $x(n)$  for  $X(z) = \frac{z^2}{(z-1)(z-0.2)}$ . [8+8]
3. (a) Explain the Graphical Evaluation of a component of one function in other function.
- (b) Sketch the single sided and double sided spectra of the following signal:  
 $x(t) = 4 \sin\left(10\pi t - \frac{\pi}{6}\right)$ . [10+6]
4. (a) Obtain the Trigonometric Fourier series for the function  $f(t)$  as shown in figure 6a

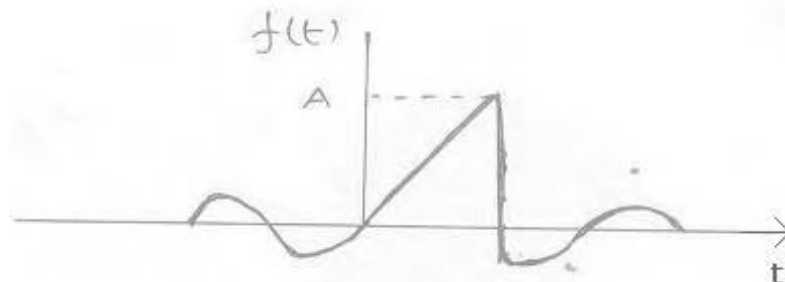


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- (b) Use the definition of the Fourier series to determine the time domain representation signals represented by the following Fourier series coefficients.

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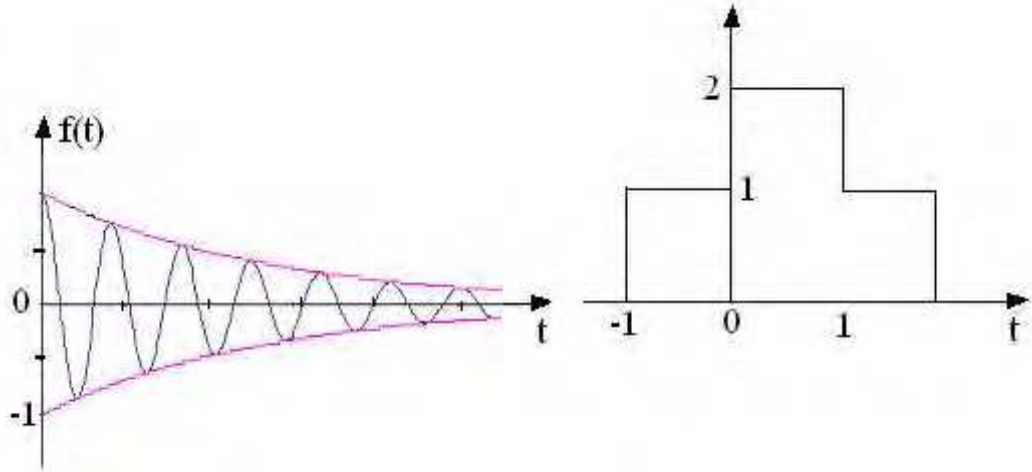


Figure 1a

- (b) Find the total area under the function  $g(t) = 100 \sin c((t-8)/30)$ . [10+6]
6. (a) State and Prove Properties of cross correlation function.  
 (b) If  $v(f) = AT \frac{\sin 2\pi f T}{2\pi f T}$  find the energy contained in  $V(t)$ . [8+8]
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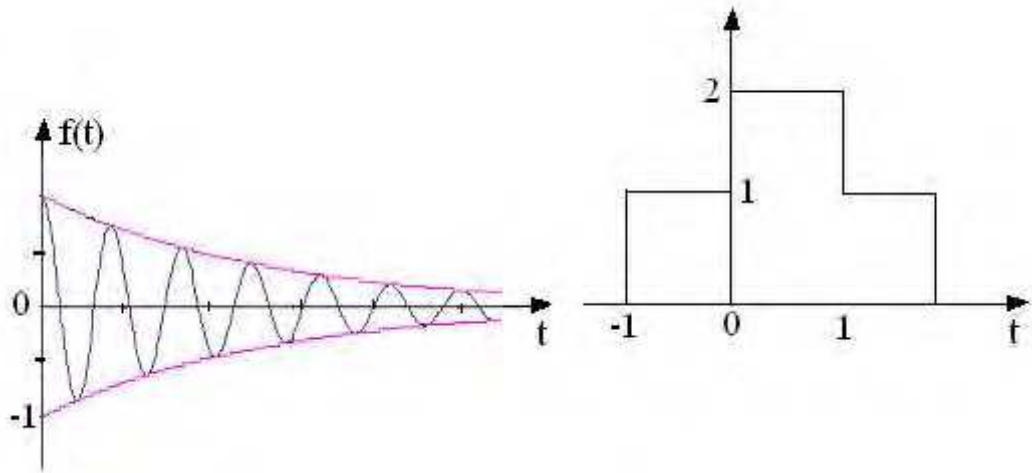


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4. (a) Find the Z transform of  $t^2 e^{-at}$ .  
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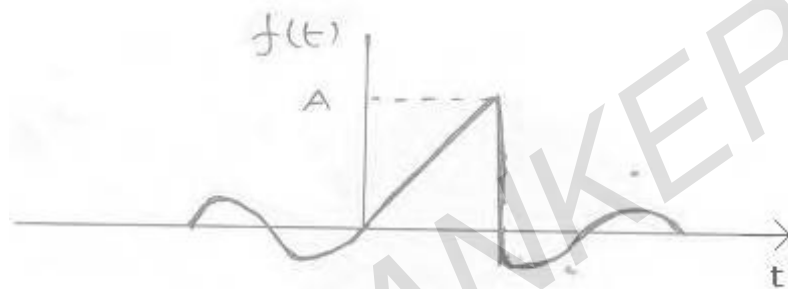


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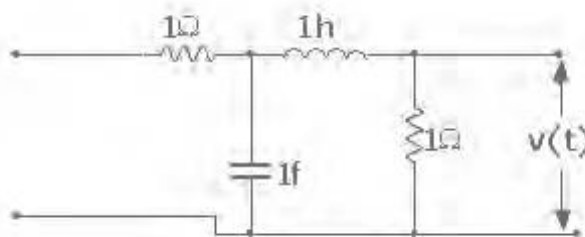


Figure 7b

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