

II B.Tech I Semester Supplementary Examinations, November 2005
SIGNALS & SYSTEMS

(Common to Electronics & Communication Engineering, Electronics &
 Instrumentation Engineering, Electronics & Control Engineering and
 Electronics & Telematics)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Write the significance of spectral analysis in communication systems. [4M]
 (b) Explain how a function can be approximated by a set of orthogonal functions. [6M]
 (c) Derive the expression by which the Mean square error can be evaluated. [6M]
2. (a) Deduce the Fourier series for the waveform of a positive going rectangular pulse train the following figure1. [10M]

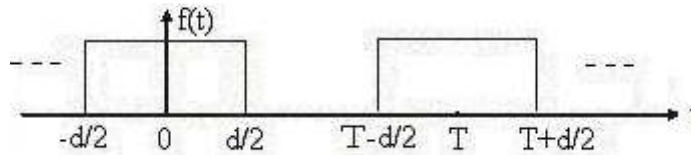


Figure 1:

- (b) Distinguish between the expression form of Fourier series and Fourier transform. What is the nature of the “transform pair” in the above two cases? [6M]
3. (a) Find the Fourier transform of a gate pulse of unit height, unit width and centered at $t=0$ [8M]
 (b) Find the Fourier Transform. of $f(t) = t \cos 2t$. [8M]
4. Determine the maximum bandwidth of signals that can be transmitted through the lowpass RC filter shown in the figure2., if over this bandwidth the gain variation is to be within 10 percent and the phase variation is to be within 7 percent of the ideal characteristics. [16M]
5. (a) A power signal $g(t)$ has a PSD $S_g(\omega) = N/(A^2)$ $-2\pi B \leq \omega \leq 2\pi B$., shown in the figure3. Where A and N are constants. Determine the PSD and the mean square value of its derivative $d(g(t))/dt$. [5+5=10M]
 (b) Derive the relation between power and power density spectrum.
6. Determine the cross correlation function $R_{12}(\lambda)$ of rectangular pulse $g_1(t)$ and triplet pulse $g_2(t)$ show in the figure4 and sketch it. What is the value of $R_{21}(\lambda)$? Are these signals orthogonal? Why? [10+2+4=16M]

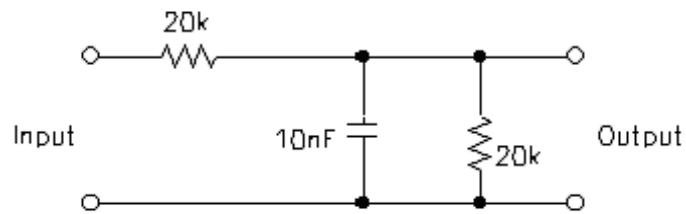


Figure 2:

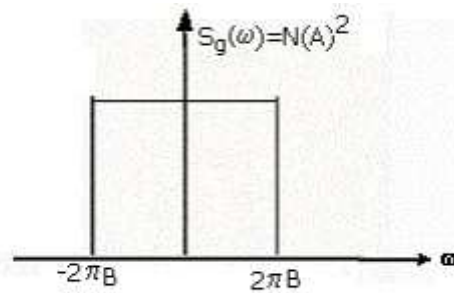


Figure 3:

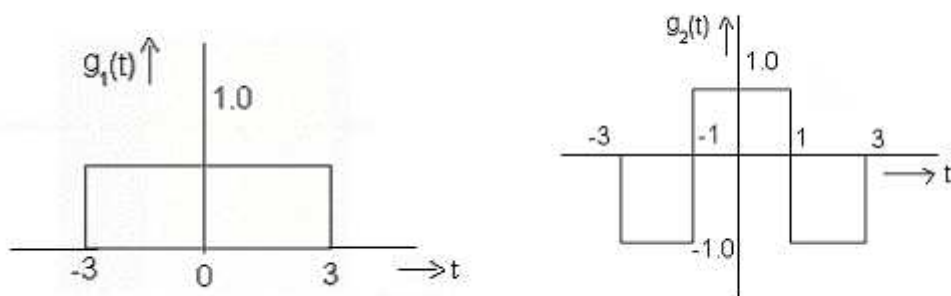


Figure 4:

7. (a) Explain the time shifting property of Laplace transform. [6M]
(b) Suppose the Following facts are given about the signal $x(t)$ with Laplace transform $X(s)$: [10M]

- i. $x(t)$ is real and even
- ii. $X(s)$ has four poles and no zeros in a finite s-plane
- iii. $X(s)$ has pole at $s=(1/2)e^{j\pi/4}$
- iv. $\int_{-\infty}^{\infty} x(t)dt = 4$

Determine $X(s)$ and ROC

8. (a) Given $H(z) = \{z+1\} / [3(z^2)-4z+1]$, find $h(n)$ by partial fraction method. R.O.C. $|z| > 1$. [10M]
(b) Prove the differentiation property of z-transaction. [6M]
