Code No: NR210403 **NR**

II B.Tech I Semester Supplementary Examinations, May 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

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1. (a) A rectangular function defined by
$f(t)=\begin{cases} 1 & 0<t<\pi \\ -1 & \pi<t<2\pi \end{cases}$
Approximate above rectangular function by a single sinusoid sin t,Evaluate Mean square error in this approximation. Also show what happens when more number of sinusoidal are used for approximations.
   (b) Discuss GIBB'S Phenomena in the above problem.

2. With regard to Fourier series representation, justify the following statement.
   (a) Odd functions have only sine terms.
   (b) Even functions have no sine terms.
   (c) Functions with half-wave symmetry have only odd harmonics.

3. (a) Find out the Fourier transform of the periodic pulse train shown in the following figure1.

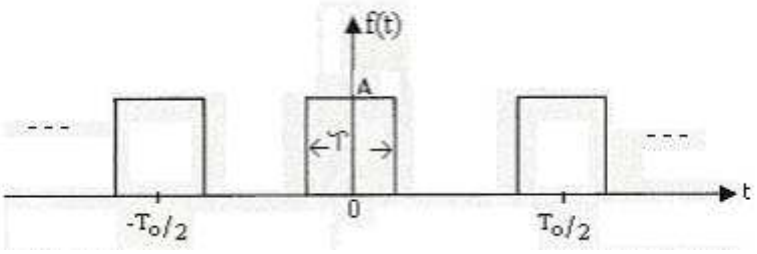

Figure 1:

   (b) Find out the Fourier transform of the Cosine wave x(t)=A Cos($2\pi f_c t$) u(t). Hence plot its amplitude spectrum.

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 with in 10 percent and the phase variation is to be within 7 percent of the ideal characteristics.

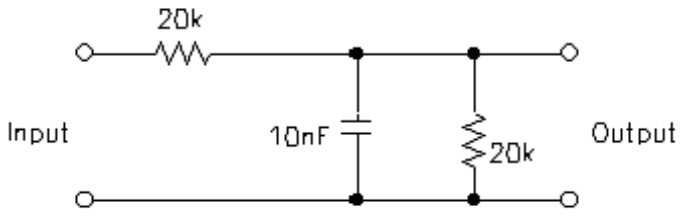

Figure 2:

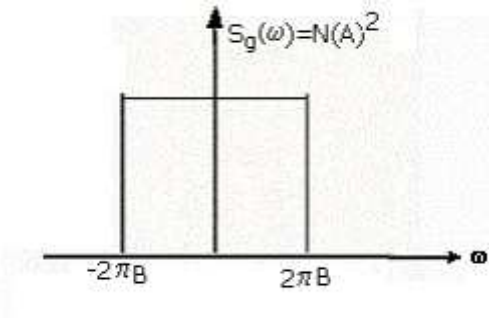

Figure 3:

5. (a) A power signal g(t) has a PSD $S_g(\omega)$ = N/(A^2) -2πB ≤ ω ≤ 2πB ., 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.
   (b) Derive the relation between power and power density spectrum.

6. Determine the cross correlation function $R_{12}(\lambda)$ of two signals $g_1(t)$ and $g_2(t)$ defined by
   $g_1(t) = \begin{cases} ACos(2\pi f_1 t + \theta_1), 0 \le t \le T \\ 0, \quad elsewhere \end{cases}$ $g_2(t) = \begin{cases} ACos(2\pi f_2 t + \theta_2), 0 \le t \le T \\ 0, \quad elsewhere \end{cases}$
   How does varying the frequency difference | f_1-f_2| affect this cross-correlation function?

7. (a) For the signal given below, find the Fourier transform from the Laplace transform, if possible. If it is not possible give the reason: X(s)=$\frac{(s+2)}{(s+1)(s+5)}$.
   (b) State and prove convolution and differentiation properties of Laplace transform

8. (a) Explain in detail, the contour integration method of finding inverse z transform.
   (b) For the given signal as under,
      i. Determine the parameter values for which z transform will exist
      ii. Find the z transform (c) Plot ROC
      x (n) = - (bˆn) u (-n-1) + (0.5ˆn) u (n)

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