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BIEL-007

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B.Tech. IN ELECTRONICS AND COMMUNICATION ENGINEERING (BTECVI)

Term-End Examination

June, 2011

BIEL-007 : SIGNALS AND SYSTEMS

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt **any seven** questions.*
*All questions carry **equal** marks.*
Use of calculator is allowed.

1. A discrete time signal is as shown in figure 1 sketch the following : **10**

(a) $x(n-3)$

(b) $x(3-n)$

(c) $x(2n)$

(d) $x(n)u(3-n)$

(e) $x[(n-1)^2]$

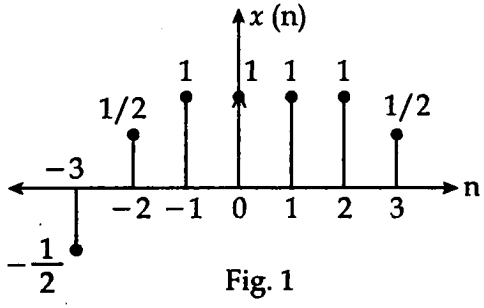

Fig. 1

2. Write the steps to find the convolution sum of two sequences and also find the convolution of following sequences. 10

$x(n) = 1 \; ; \; n = -2, 0, 1$

$= 2 \; ; \; n = -1$

$= 0$ else where

$h(n) = \delta(n) - \delta(n-1) + \delta(n-2) - \delta(n-3)$

3. (a) Determine whether or not each of the following signals is periodic. If a signal is periodic, specify its fundamental period. 5

(i) $x(n) = e^{j6\pi n}$

(ii) $x(n) = e^{j\frac{3}{5}(n + \frac{1}{2})}$

(iii) $x(n) = \cos\left(\frac{2\pi}{3}\right)n$

(iv) $x(n) = \cos\frac{\pi}{3}n + \cos\frac{3\pi}{4}n$

(b) Determine if the system described by the following input - output equations is linear or nonlinear. 5

(i) $y(n) = x^2(n)$ (ii) $y(n) = nx(n)$

4. Figure 2 shows a periodic square wave signal. Obtain its fourier series representation. **10**

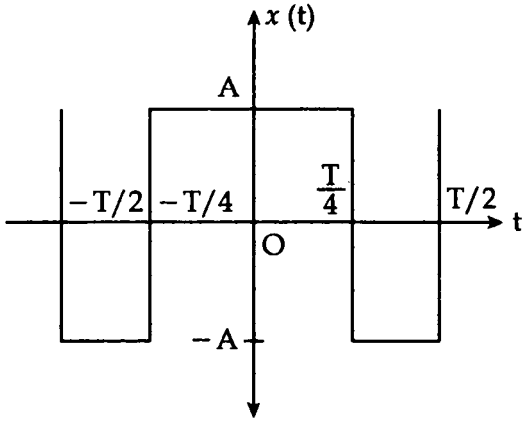

Fig. 2

5. Consider an arbitrary signal $x(n)$ with fourier transform $X(e^{j\omega})$. Express the fourier transform of the following signals in terms of $X(e^{j\omega})$. **10**

(a) $y(n) = x(2n)$

(b) $y(n) = \begin{cases} x(n/2) & n, \text{even} \\ 0 & n, \text{odd} \end{cases}$

6. Find the fourier transform of the following : **10**

(a) $x(t) = \begin{cases} \dfrac{t+b}{b-a} & -b < t < -a \\ 1 & -a < t < b \\ \dfrac{t-b}{b-a} & a < t < b \end{cases}$

(b) $x(n)=\left(\frac{1}{2}\right)^{n-1}.u(n-1)$

7. Use convolution to find $x(n)$ if X (z) is given by **10**

$$X(z)=\frac{1}{\left(1-\frac{1}{2}z^{-1}\right)\left(1+\frac{1}{4}z^{-1}\right)}$$

8. Find the z - transform and ROC (Region of convergence) of the following sequences :- **10**

(a) $x(n)=\left(-\frac{1}{3}\right)^{n}u(n)-\left(\frac{1}{2}\right)^{n}.u(-n-1)$

(b) $x(n)=-b^{n}u(-n-1)$

9. Determine the impulse response of the system described by difference equation $y(n)=y(n-1)-0.5y(n-2)+x(n)+x(n-1)$. Plot the pole zero pattern. **10**

10. Write short notes on ***any two*** : **5x2=10**

(a) Region of convergence (ROC).

(b) Classification of signals.

(c) Properties of Fourier Transform.