

## Tutorials No 06

### Exercise 1

A signal  $x(t)$ , whose Fourier transform  $X(f)$  is represented by figure (4), is sampled at a frequency  $F_e$ . The sampled (idealized) signal has the Fourier transform of figure (5).

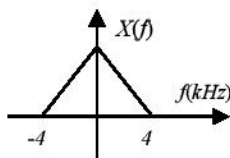


Fig. 4

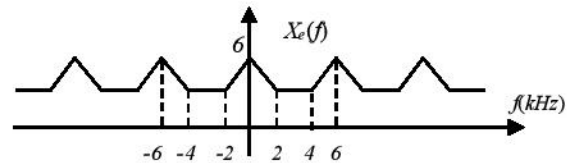


Fig. 5

1. Determine what sampling frequency is used and indicate whether this choice is judicious to allow a reconstruction of the signal by ideal filtering (justify your answer).

### Exercise 2

1. Can the signal  $x(t) = A \cdot \text{sinc}^2\left(\frac{\pi t}{T}\right)$  be reconstructed exactly if it is ideally sampled at a rate of  $F_e = \frac{1}{T}$ .

### Exercise 3

Determine the Z transforms of the following sequences:

1.  $x(k) = k^2 \cdot u(k)$
2.  $x(k) = k \cdot a^k \cdot u(k)$

### Exercise 4

Determine the inverse Z transforms of the following functions:

1.  $X(Z) = \frac{1}{(1 - Z^{-1})(1 - 0.5Z^{-1})} ; |Z| > 1$
2.  $X(Z) = \frac{Z + 1}{(Z - 2)Z^3} ; |Z| > 2$

### Exercise 5

Let the discrete system be:

$$x(k) - a \cdot x(k - 1) = u(k)$$

1. Determine its transfer function.
2. Determine the  $ZT^{-1}$ .
3. Calculate initial and final value with 2 methods.