Birzeit University

Faculty of Information Technology

Computer System Engineering

Digital Signal Processing (DSP)

Assignment No2

Instructor: Dr. Abualsoud Hanani

Exercise 1:

Determine the Fourier transform of each of the sequences below:

(a)

$x(n) = \delta(n - 3)$

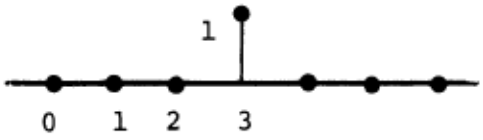

Figure P4.1-1

(b) $x(n) = \frac{1}{2}\delta(n + 1) + \delta(n) + \frac{1}{2}\delta(n - 1)$

Figure P4.1-2

(c) $x(n) = a^n u(n) \quad 0<a<1$

Figure P4.1-3

(d)

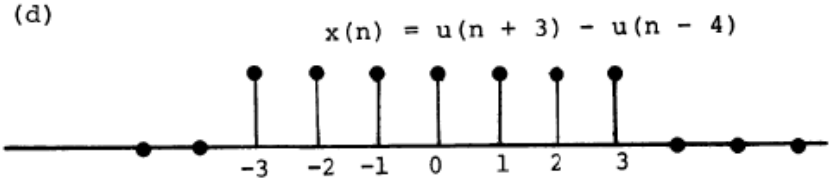

Figure P4.1-4

Exercise 2:

(a) Consider a linear shift-invariant system with unit-sample response $h(n) = \alpha^n u(n)$, where α is real and $0 < \alpha < 1$. If the input is $x(n) = \beta^n u(n)$, $0 < |\beta| < 1$, determine the output $y(n)$ in the form $y(n) = (k_1\alpha^n + k_2\beta^n) u(n)$ by explicitly evaluating the convolution sum.

(b) By explicitly evaluating the transforms $X(e^{j\omega})$, $H(e^{j\omega})$ and $Y(e^{j\omega})$ corresponding to $x(n)$, $h(n)$, and $y(n)$ specified in part (a), show that $Y(e^{j\omega}) = H(e^{j\omega})\ X(e^{j\omega})$

Exercise 3:

Let $x(n)$ and $X(e^{j\omega})$ represent a sequence and its transform. Do not assume that $x(n)$ is real or that $x(n)$ is zero for $n < 0$. Determine in terms of $X(e^{j\omega})$ the transform of each of the following:

(a) $k\ x(n)$

(b) $x(n - n_0)$ where n_0 is an integer

(c) $n\ x(n)$