

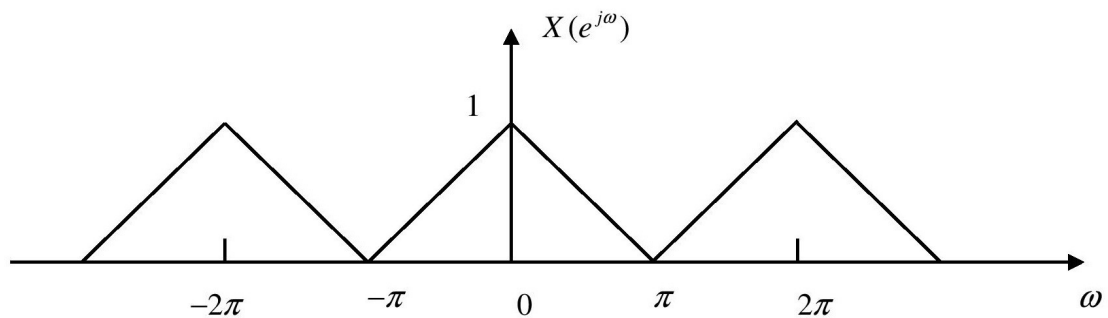


Digital Signal Processing - SS15

Theory Tutorial 5

Fourier Transform

Let $x[n]$ and $X(e^{j\omega})$ represent a sequence and its Fourier transform, respectively. Determine, in terms of $X(e^{j\omega})$, the transform of $y_s[n]$, $y_d[n]$ and $y_e[n]$. In each case, sketch $Y(e^{j\omega})$ in terms of $X(e^{j\omega})$



(a) Sampler

$$y_s[n] = \begin{cases} x[n], & n \text{ even} \\ 0, & n \text{ odd} \end{cases}$$

(Hint: $-1 = e^{j\pi}$)

(b) Compressor

$$y_d[n] = x[2n]$$

(c) Expander

$$y_e[n] = \begin{cases} x[n/2], & n \text{ even} \\ 0, & n \text{ odd} \end{cases}$$