Name Answers

EE-3221 – Dr. Durant – Quiz 2
Winter 2020-'21, Week 2

This is an open-book quiz. You should find Table 5-6 and 5-7 especially helpful.

1. (3 points) Let s(t) = δ(t) + δ(t-1) + δ(t-2). Find S(ω), the Fourier Transform of s(t), using tables.
2. (3 points) Let x(t) = cos(π/2 × t). Find X(ω), the Fourier Transform of x(t), using tables.
3. (4 points) Using tables and ***without*** evaluating the convolution integral, calculate the convolution of the 2 FTs you found above, S(ω) * X(ω). Hint: Convolution in frequency property, Table 5-7.12.

① 5-6.1: $\delta(t) \Leftrightarrow 1$

5-7.4: $x(t-t_0) \Leftrightarrow e^{-j\omega t_0} X(\omega)$

$\therefore \boxed{S(\omega) = 1 + e^{-j\omega} + e^{-2j\omega}}$

② 5-6.8: $\cos(\omega_0 t) \Leftrightarrow \pi[\delta(\omega-\omega_0) + \delta(\omega+\omega_0)]$

$\therefore \boxed{X(\omega) = \pi[\delta(\omega - \frac{\pi}{2}) + \delta(\omega + \frac{\pi}{2})]}$

③ 5-7.12: $x_1(t)x_2(t) \Leftrightarrow \frac{1}{2\pi} X_1(\omega) * X_2(\omega)$

$\therefore 2\pi\, s(t)x(t) \Leftrightarrow S(\omega) * X(\omega)$

$\therefore$ Find $2\pi\, s(t)x(t) = 2\pi(\delta(t) + \delta(t-1) + \delta(t-2))\cos(\frac{\pi}{2}t)$

scale impulse area per

$= 2\pi(\underbrace{\cos(0)}_{1}\delta(t) + \underbrace{\cos(\frac{\pi}{2})}_{0}\delta(t-1) + \underbrace{\cos(\frac{\pi}{2}\cdot 2)}_{-1}\delta(t-2))$

$= 2\pi(\delta(t) - \delta(t-2))$

So, take the FT, which is a variation on #1

$2\pi(\delta(t) - \delta(t-2)) \Leftrightarrow \boxed{2\pi(1 - e^{-2j\omega}) = S(\omega) * X(\omega)}$