EE 341 – Homework Chapter 5

5.3 Three functions x1(t), x2(t), and x3(t) have an identical magnitude spectrum |X(ω)| but different phase spectra denoted, respectively, by <X1(ω), <X2(ω), and <X3(ω); magnitude and phase plots are shown in Figs. P5.3 (a) – (d). By representing the CTFTs as Xp(ω) = |X(ω)|exp(j<Xn(ω)), for p=1,2, and 3, and calculating the inverse CTFT, determine the functions x1(t), and x2(t), and x3(t).

5.9 Using table 5.2 and the properties of the CTFT, calculate the CTFT of the following functions:

(a) $x1(t) = 5 + 3\cos(10t) - 7e^{-2t}\sin(3t)\,u(t)$

(b) $x2(t) = 1/\pi t$

(c) $x3(t) = t^2 e^{-4|t-5|}$

5.17 For each of the following functions, (i) draw a rough sketch of the function, and (ii) determine if the CTFT exists by evaluating Eq. (5.59):

(a) $x1(t) = e^{-a|t|}, with\ a\ \in R^+$

(b) $x2(t) = e^{-at}\cos(\omega o t)\,u(t), with\ a, \omega o \in R^+$

(c) $x3(t) = t^4 e^{-at} u(t), with\ a \in R^+$

5.22 Determine the T.F. of the system shown in Fig. P5.22 (a). Calculate the output of the system for the input signal shown in Fig. P5.22(b).

5.28 Using the results derived in Section 5.9.2 and the linearity property of the CTFT, calculate the output of the system shown in Fig. P5.23 for the following input signals. Assume R=1 MΩ and C=0.1 μF. Hint: can use the results of Example 5.30 in this problem.

(i) x1(t) = sin(3t)

(ii) x2(t) = cos(3t)-5sin(6t+30°)

(iii) x3(t) = cos(2t) + sin(2000t)

5.35 (MATLAB exercise) Compute the output response y(t) form Problem 5.29 by computing the CTFT for x(t) and h(t), multiplying the CTFTs and then taking the inverse CTFT of the result.