Networks and Systems EEL 3123, Section 1

HOMEWORK 5– Assigned November 21, 2011, Due in class on Nov 30, 2011

Covers Chapter 17 & 18. If there are doubts, you are welcome to see me and discuss your problems. Your notes and the textbook should be ample material to solve these problems.

1. Find the Fourier transform of a function *f(t)* that has amplitude –A between –T/2 and 0, has amplitude +A between +T/2 and 0, and is zero everywhere else.
2. A 1F capacitor and a 0.5Ω resistor are put in parallel and voltage v_o is measured across this combination. This combination is then put in series with a 1Ω resistor and an input voltage source *v(t)=exp(t)u(-t) + u(t) V*. Here, *u(.)* denotes unit step. Find v_o.
3. A series RC circuit (with *C = 10uF*) is excited by a voltage source *v(t)=15exp(-5t)V*. Find the resistance *R* when it is known that the energy available in the output signal (represented by the voltage measured across the capacitor) is two-thirds of the energy of the input signal.
4. When the input voltage to a system is 8*u(t)* V, the output voltage is v_o = [60 - 40exp(-5t) + 20exp(-20t)]*u(t)* V. What is the output voltage if v_i = 8*sgn(t)* V?
5. Given that F(ω) = exp(ω)u(-ω) + exp(–ω)u(ω). (a) What is f(t)? (b) Find 1Ω energy associated with f(t) via time-domain integration. (c) Repeat (b) using frequency-domain integration. (d) Find the value of ω_1 if f(t) has 90% of energy in the freq. band between 0 and ω_1.
6. Problem 18.2 (8^{th} edition). Or Problem 18.3 (9^{th} edition) but replace 1Ω, 4Ω, and 12Ω respectively with 5Ω, 60Ω, and 20Ω.
7. Use the results obtained in the problem above to calculate the *y* parameters for the circuit.
8. Problem 18.4 (8^{th} edition). Or Problem 18.2 (9^{th} edition) but replace 8Ω, 20Ω, 4Ω, and 10Ω respectively with 10Ω, 5Ω, 10Ω, and 16Ω.