EE 230
Assignment 2
Spring 2009

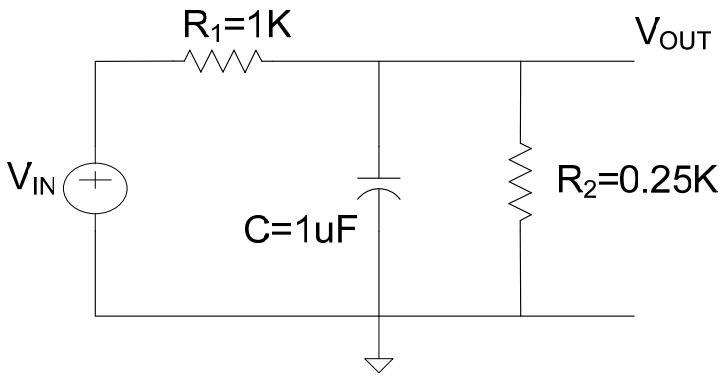
Problem 1 Plot two periods of square wave that is symmetric with respect to the horizontal axis with peak value of 1 volt and a period of 1 sec. On the same axis, plot

a) the fundamental
b) the first 7 harmonics
c) the sum of the fundamental and the first 7 harmonics

Problem 2 What is the THD of the Sherwood RX 4503 receiver? Over what frequency range is the amplifier in this receiver specified to operate? How much gain deviation could occur over this frequency range?

Problem 3 Consider the circuit shown below.

a) Determine the phasor-domain transfer function relating V_{OUT} and V_{IN}
b) Obtain the corresponding s-domain transfer function
c) Determine the steady-state output if V_{IN}=0.5sin1000t



Problem 4 A power amplifier has an output impedance of 8Ω and an open-circuit RMS voltage of 64V

a) Determine the power this amplifier will deliver to a 4Ω load, to an 8Ω load, and to a 1KΩ load
b) What would be the open-circuit voltage of the amplifier if the signal level were increased so that the power delivered to the 1KΩ load would be the same as that which was delivered to the 8Ω load in Part a) of this problem.

Problem 5 The audio industry has extensively used 4Ω and 8Ω speakers for many years. From a technical viewpoint, speakers with larger impedances could be used as well but seldom are. Identify any commercial audio power amplifier (if you have one, that would be fine) and determine the maximum power the specifications indicate that system will provide to the specified speaker. What is the peak voltage that the speaker will experience if maximum specified power is being delivered. Determine the peak voltage that would exist if the impedance of the speaker were changed to 1KΩ and the

same maximum power level were to be maintained. Comment on the practicality, safety, and other issues associated with using high-impedance speakers.

Problem 6 A linear system has a transfer function of

$$T(s) = 20\frac{s+1}{s^2+5s+6}$$

a) Plot $|T(j\omega)|$ for $0 \le \omega \le 20$

b) What is the maximum gain of this system in this frequency range

c) Determine the THD if Vi=0.3sin5t

d) What is the power at the output if Vi=0.4sin3t+0.2sin6t

Problem 7 Consider the two waveforms

$V_1(t)$=sin1000t + 0.25*sin3000t
$V_2(t)$=sin1000t + 0.25*sin(3000t+45^o)

a) Plot these two waveforms for two periods of the lower-frequency sinusoid

b) Compare the magnitude of the Fourier Series coefficients of these two waveforms