MASSACHVSETTS INSTITVTE OF TECHNOLOGY
Department of Electrical Engineering and Computer Science

6.002 – Circuits and Electronics
Spring 2004

Problem Set 7
Readings and exercises for March 29 through April 4

Issued: 29 March 2004

Reading: This week, read

- From Agarwal and Lang, Chapter 13, through section 13.6

Quiz 2 will be on Friday, April 9, in recitation.

To do and turn in on line before lecture on Monday, April 5

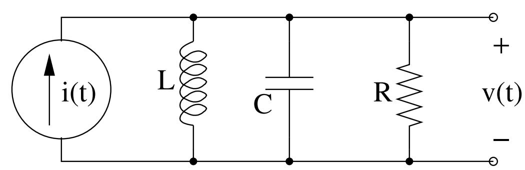

Figure 1: A parallel RLC circuit driven by a current source

1.1: Step responses for second-order systems This problem deals with two circuits. Each circuit is a parallel RLC circuit driven by a current source, as shown in figure figure 1. The circuits both have $L = 0.1$ henrys, but they different values of C and R, with the result that one of the circuits has higher Q than the other.

Assume the circuits start in an initial state where the capacitor voltages and the inductor currents are both 0, and suppose we drive both circuits with a unit step in current $i(t) = 0$ for $t < 0$, $i(t) = 1$ for $t \geq 0$. Consider the resulting response of the circuit quantities i_R, i_C, i_L, and v_C.

1. The on-line system will show you eight graphs (also shown on the following page) for these circuit quantities—-four for the lower Q circuit and four for the higher Q circuit. Your job is to say which graph corresponds to which quantity for each circuit.
2. By examining the graphs, you are to estimate the Q for each circuit, and also estimate R and C for each circuit.

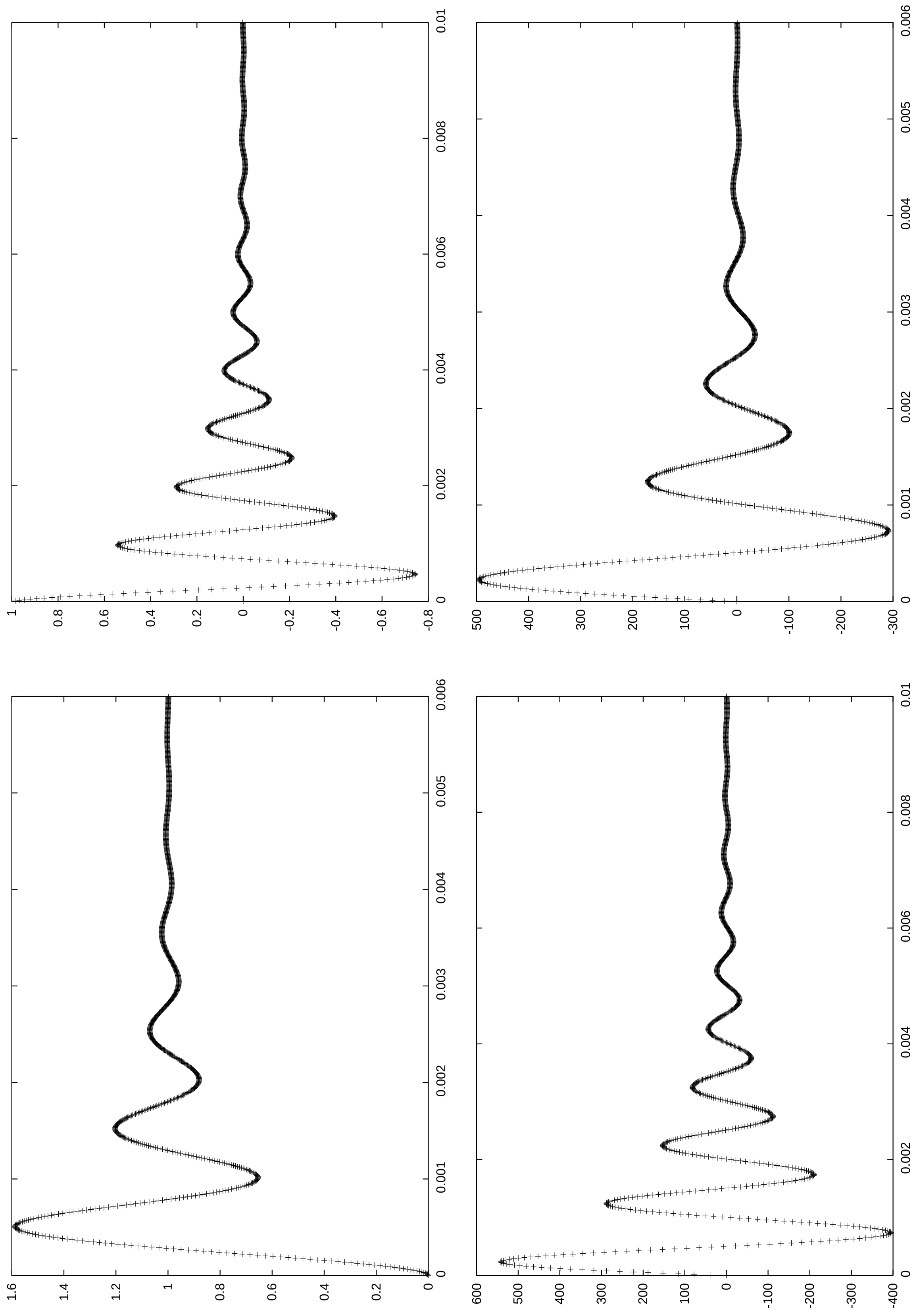

Figure 2: Graphs 1–4 for this problem

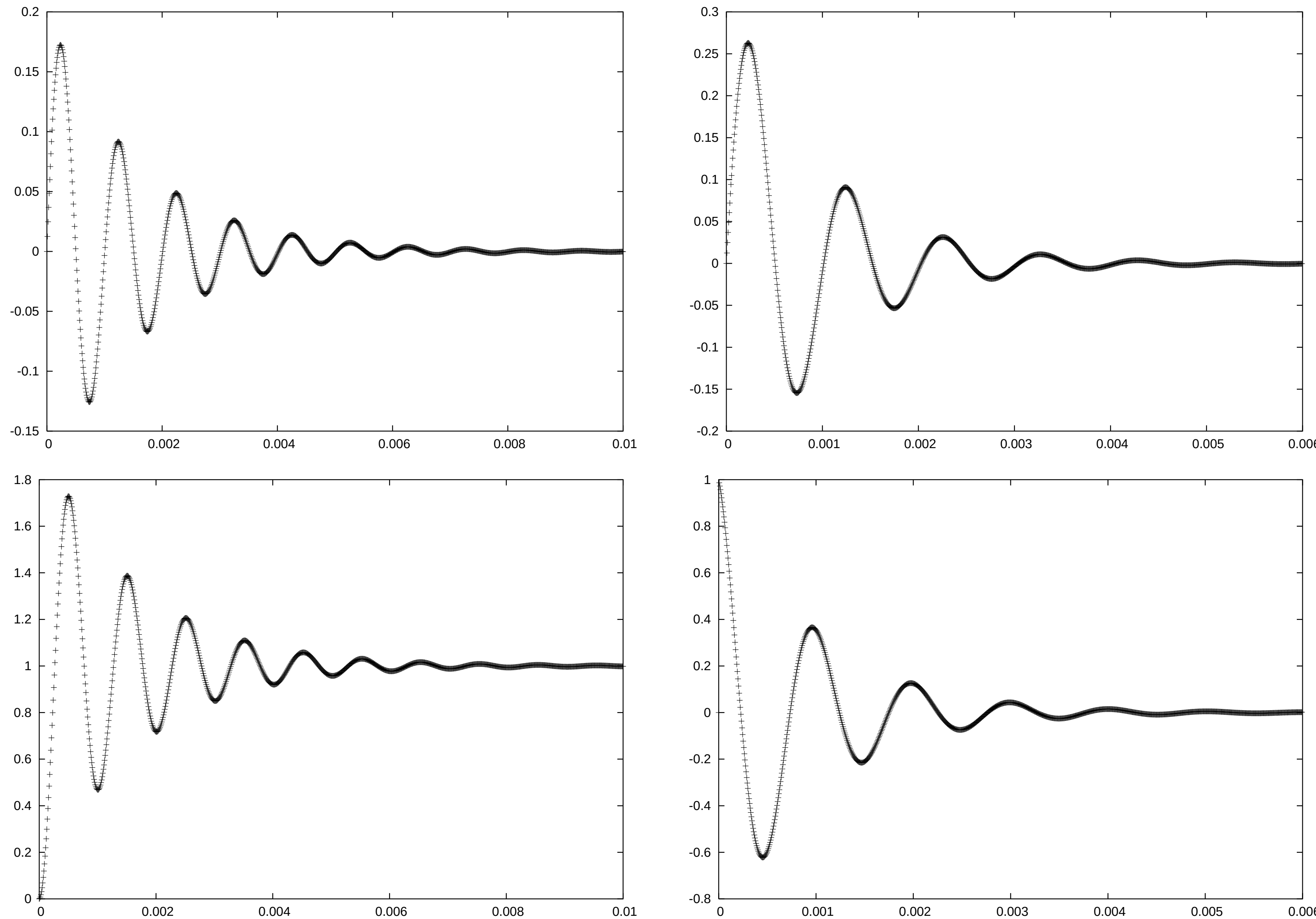

Figure 3: Graphs 5–8 for this problem