ANALOG SYSTEMS : PROBLEM SET 9

Problem 1

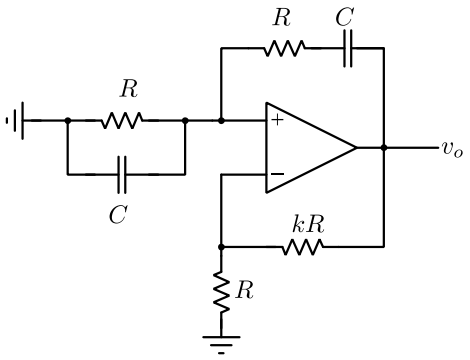

Figure 1: Circuit for Problem 1.

Fig. 1 shows a sinewave oscillator. Determine k so that it just begins to oscillate. All opamps are ideal.

Problem 2

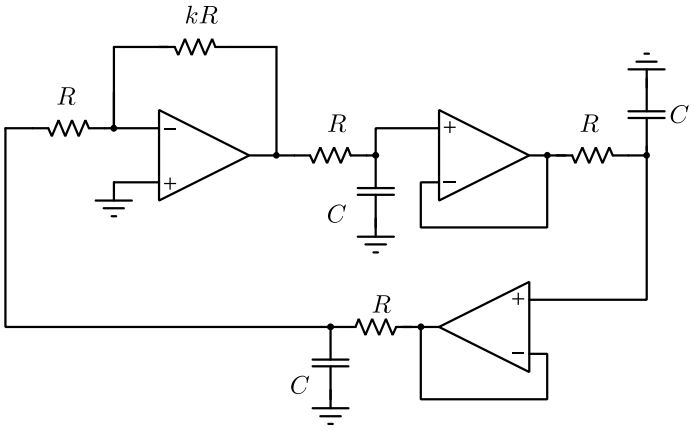

Figure 2: Circuit for Problem 2.

All opamps are ideal in Fig. 2. Determine k so that it just begins to oscillate.

Problem 3

Repeat for the circuit of Fig. 3.

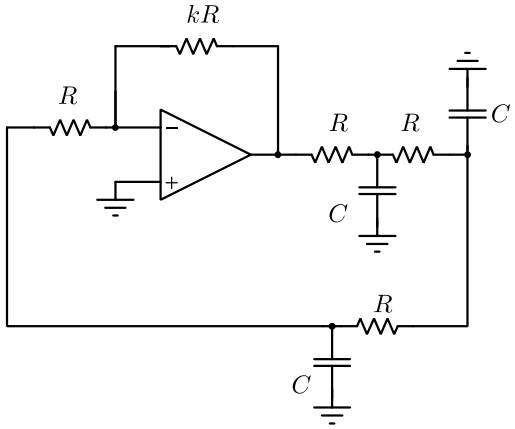

Figure 3: Circuit for Problem 3.

Problem 4

Fig. 4(a) shows an LCR network with a limiting VCCS. The Q of the RLC parallel network can be assumed to be $\gg 1$. The characteristic of the VCCS is shown in Fig. 4(b). The slope of the VCCS is denoted by G_1 and the maximum/minimum current it can source/sink is given by $\pm I_{max}$.

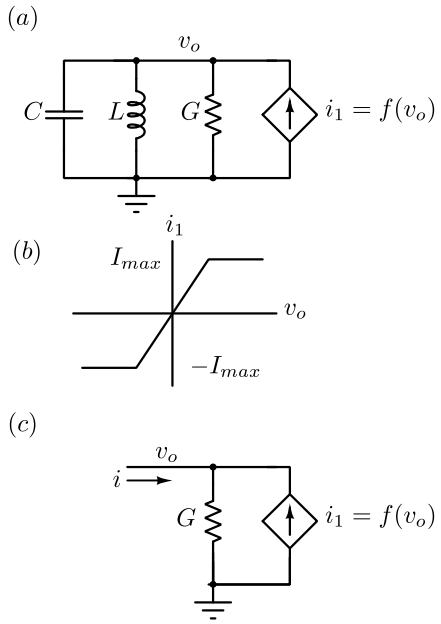

Figure 4: Circuit for Problem 4.

Determine the condition on G_1 for oscillation to start up. Assuming that this condition is satisfied, draw the $i - v_o$ characteristic of the element shown in Fig. 4(c). Assume

that $v_o = A\sin(\omega t)$. Determine and plot the amplitude of the fundamental component of the current i as A is varied from 0 to ∞. What will be amplitude of oscillation of the circuit in part (a) of the figure, in steady state? You may assume that v_o is a sinusoid at the fundamental frequency.