Department of EECS
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EE100 Summer 2008 – Nonlinear Problem Set

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1. Plot the IV graph of the following circuit at the terminals indicated:

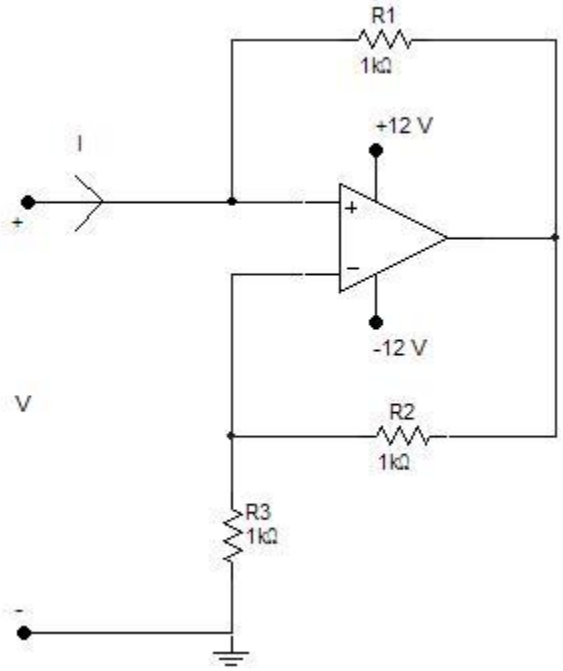
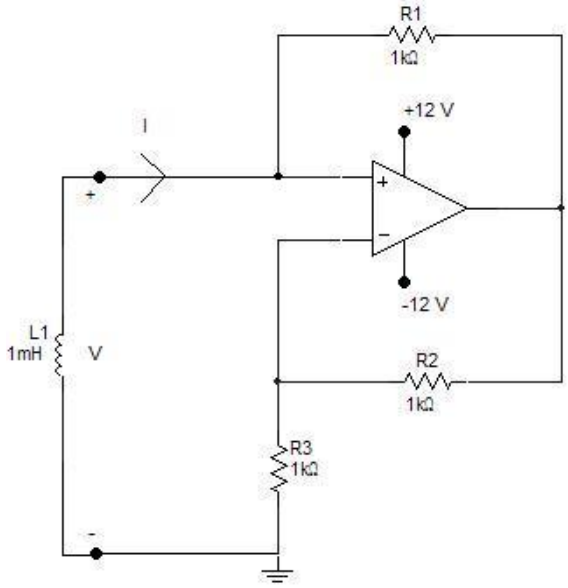
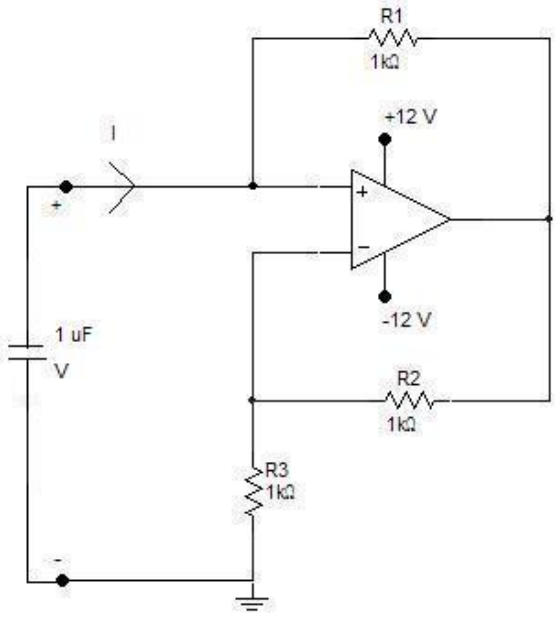


Figure 1. A negative-impedance converter (NIC)

2. One of the circuits below is an oscillator and the other is a latch[1].
   (a) Identify the oscillator, find the frequency of oscillation and sketch v(t).
   (b) Identify the latch. Describe in a FEW SHORT (≤ 3) SENTENCES as to how you switch from one stable equilibrium point to the other.



Circuit 1



Circuit 2

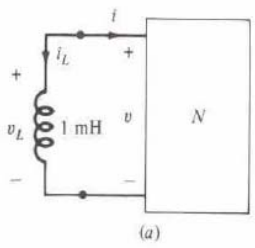
[1] Thanks to Ben Cook for teaching me the correct terminology: we are dealing with latches, not flip-flops!

(3) Ref.: Chua, Desoer and Kuh. *Linear and Nonlinear Circuits*. McGraw-Hill.

Consider the circuit shown in figure P6.21 (a) where N is described by the i-v characteristic shown in figure P6.21 (b).

i. Indicate the dynamic route. Label all equilibrium points and state whether they are stable or unstable.

ii. Suppose $i_L(0) = -20$ mA; calculate and sketch i(t) and v(t) for $\mathbf{t \geq 0}$.



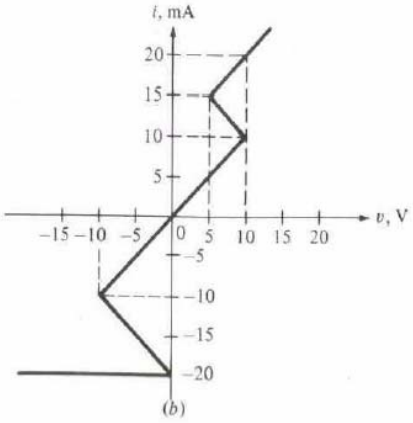


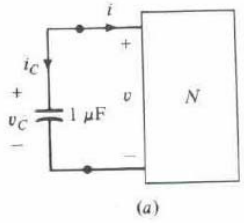
Figure P6.21

(4) Ref.: Chua, Desoer and Kuh. *Linear and Nonlinear Circuits*. McGraw-Hill.

Consider the circuit shown in figure P6.23 (a) where N is described by the i-v characteristic shown in figure P6.23 (b).

i. Sketch the dynamic route.

ii. If $v_c(0) = 2$ V and $i_c(0) = -2$ mA; calculate and sketch i(t) and v(t) for $\mathbf{t \geq 0}$.



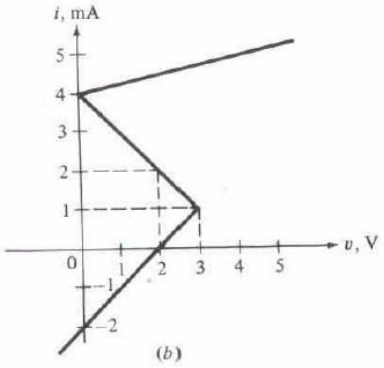


Figure P6.23