Electronics II

Relaxation Oscillator

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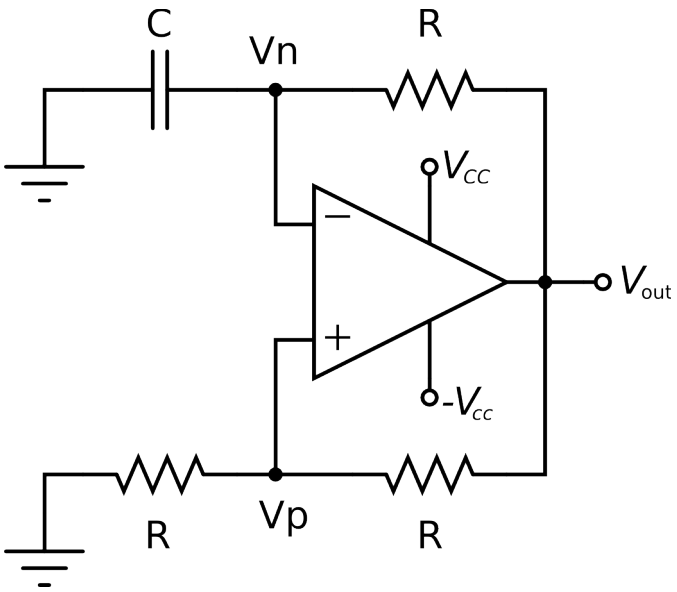

Figure 1: *Relaxation Oscillator based on an ideal op-amp and two feedback loops, one containing a capacitor.*

The Relaxation Oscillator shown in Figure 1 is based on periodic charging and discharging of the capacitor C.

1. Draw plots of the signals at V_n, V_p and V_{out} as a function of time.
2. Determine the oscillating frequency as a function of the parameters.

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Consider a feedback amplifier for which the open-loop transfer function $A(s)$ is given by

$$A(s)=\left(\frac{10}{1+s/10^4}\right)^3$$

($s = j\omega$). Let the feedback factor β be a constant independent of frequency. Find the frequency at which the phase shift is 180º. Then, show that the feedback amplifier will be stable if the feedback factor β is less than a critical value β_{cr} and unstable if $\beta \geq \beta_{cr}$, and find the value of β_{cr}. Phase margin: 0º or 45º. (Sedra & Smith, Ex. 8.10).