

Electronics II

2009-2010 mod. 1

Problem sheet 7

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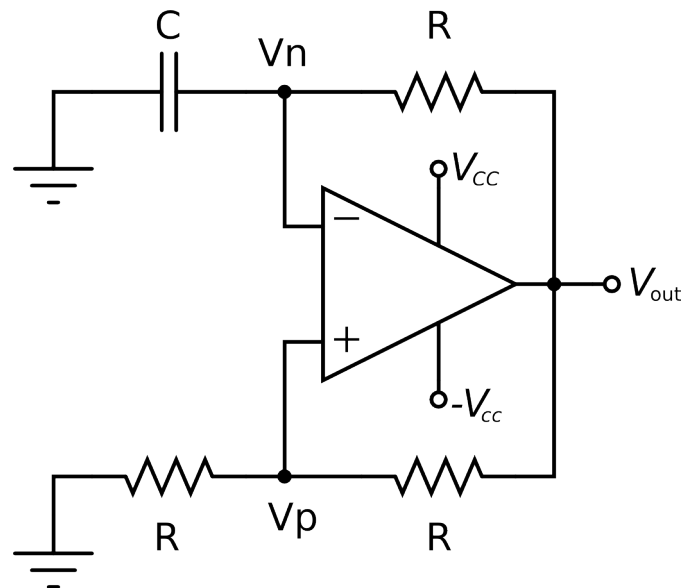


Figure 1: Relaxation Oscillator based on an ideal op-amp and two feedback loops, one containing a capacitor.

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.

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 180° . 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: 0° or 45° . (Sedra & Smith, Ex. 8.10).