6 (2. Halbtag) | Operationsverstärker

Angelo Brade*[1] and Jonas Wortmann†[1]

[1]Rheinische Friedrich–Wilhemls Universität Bonn

September 8, 2024

*s72abrad@uni-bonn.de
†s02jwort@uni-bonn.de

Contents

1 Introduction

In this experiment, 6 groups will constrcut 6 different circuits and connect them to one big circuit. The result will look like this.

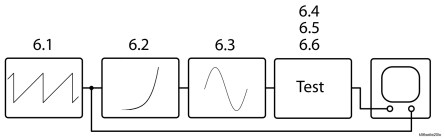

Figure 1: Circuit built from 6 individual smaller circuits; Abb. 6.14[1]

This resulting circuit will show different usecases of the opamp, for example, demonstrate different configurations of high– and lowpass filters as well as working as a resonanz amplifier.

2 Theory

The six different circtuis are

1 Ramp generator: The ramp generator will input a ramp signal to the whole circuit. The signal will be generated via the astable multivibrator. This circuit utilises a condensator which charges and discharges in a certain time interval.

2 Exponentiator: The inverting exponentiator has a very high input impedance compared to the non–inverting exponentiator, which makes it more suitable for this task.

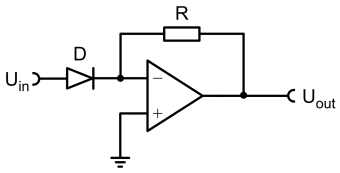

Figure 2: Inverting exponentiator; Abb. 6.4[1]

3 Voltage–frequency changer: This circuit proudces a triangle signal with constant amplitude by charging and discharging a capacitor. The current is proportional to the input voltage.

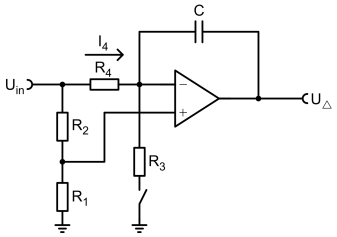

Figure 3: Reversible integrator; Abb. 6.6[1]

If the switch is open, the circuit behaves like a normal integrator and produces a constant decreasing output signal with current I_4. If the switch is closed, a current across R_3 flows into the circuit which changes the sign of I_4 because both currents add. This results in a constant increasing otuput signal. For later use, the triangle signal will be modified into a sinosoidal signal.

4 High– and low–pass: For this circuit a third order low–pass is used, by connecting three low–passes in a row all seperated by an opamp with $\nu = 1$.

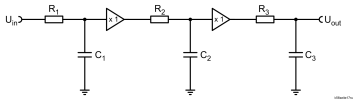

Figure 4: Third order low–pass; Abb. 6.10[1]

In this configuration, their frequency response is multiplied.

5 Band–elimination filter and resonance amplifier: In this circuit a signal is sent through two low– and high–passes connected in row. The two outupt signals are then added via an opamp. This results in a band–elimination filter.

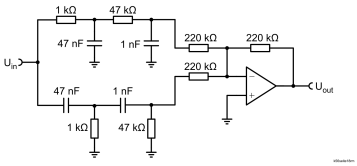

Figure 5: Band–elimination filter; Abb. 6.12[1]

6 Band–pass: The last part is a band–pass.

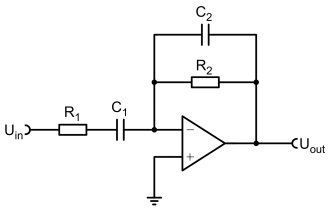

Figure 6: Band–pass; Abb. 6.13[1]

3 Analysis

List of Figures

List of Tables

Source

[1] Fabian Hügging. *Elektronik–Praktikum Versuchsanleitung*. Universität Bonn, kurs b edition, 2024.