

Circuit Theory and Electronics Fundamentals

Lab 4 - Audio Amplifier

Aerospace Engineering

Laboratory Report

May 23, 2021

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Contents

1 Introduction

This report is being made for the subject of Circuit Theory and Electronics Fundamentals and is related to the forth laboratory being its objective to develop an audio amplifier circuit by choosing the architecture of the Gain and Output amplifier stages. The circuit is shown in ???. In Section ?? a theoretical analysis will be made. Secondly, in Section ?? it will be simulated the circuit using ngspice. Following with both results from Section ?? and Section ?? being compared and commented in Section ??

The conclusions of this study are outlined in Section ??.

Finally, it is important to notice tha was developed an algorithm to find...??

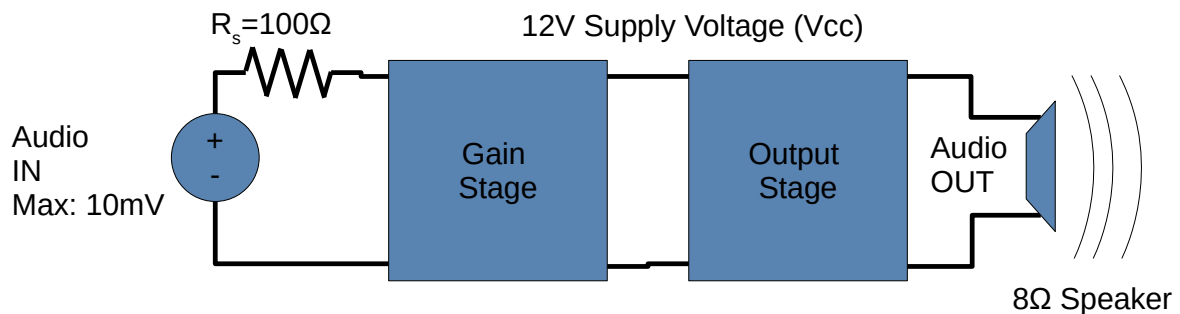


Figure 1: AC/DC converter circuit

2 Simulation Analysis

This section covers the circuit simulation using the Ngspice tool, where the AC/DC converter was simulated for 10 periods using the default diode model.

Firstly, the transformer was replaced by an ideal model using an dependent current source and an dependent voltage source. Then, by trial and error the values of the resistors, capacitor and n parameter were adjusted reaching a good accuracy. The goal was to reach the closest value to 12V in the output voltage.

As asked in the lab assignment, the input voltage of the the secondary circuit, the output voltage of the envelope detector, the output voltage of the voltage regulator and (v(5)-12) were computed and plotted.

Later in this report, we will compare this results with the theoretical ones but for now we will just show them.

The Table ?? shows the output voltages results for the circuit described in introduction.

Name	Value [A or V]
Cost	123.208
merit	54.3849

Table 1: Outpu voltages results in Volts

The Table ?? show the merit value obtained by the group.

Name	Value [A or V]
Error(parse.c-checkvalid): coll: no such vector.	
Error: RHS "v(coll)-v(emit)" invalid	
Error:	$V_{CE} : nosuchvariable.$
V(CE)	
Error(parse.c-checkvalid): base: no such vector.	
Error: RHS "v(base)-v(emit)" invalid	
Error:	$V_{BE} : nosuchvariable.$
V(BE)	
Error(parse.c-checkvalid): $v_{ce} : nosuchvector.$	
V(CE)¿V(BE)	No

Table 2: Merit values

The Table ?? show the merit value obtained by the group.

Name	Value [A or V]
Error(parse.c-checkvalid): emit2: no such vector.	
Error: RHS "v(emit2)" invalid	
Error:	$V_{EC} : nosuchvariable.$
V(EC)	
Error(parse.c-checkvalid): emit2: no such vector.	
Error: RHS "v(emit2)-v(coll)" invalid	
Error:	$V_{EB} : nosuchvariable.$
V(EB)	
Error(parse.c-checkvalid): $v_{ec} : nosuchvector.$	
V(EC)¿V(EB)	No

Table 3: Merit values

The Table ?? show the merit value obtained by the group.



Figure 2: Output Voltage of the envelope detector $v(4)$



Figure 3: Input Voltage of the secondary circuit ($v(2)-v(3)$)

Name	Value [A or V]
V_{Gain}	37.9181
Bandwidth	1.55393E+06
CO_{Freq}	8793.49

Table 4: Merit values

The Table ?? show the merit value obtained by the group.

Name	Value [A or V]
Z_{in}	-548.062 + 82.7641 j

Table 5: Merit values

3 Conclusion

The objective of this laboratory assignment was to develop an AC/DC converter circuit and the main goal was achieved. However it was achieved not having the best merit. The merit of the circuit was obtained by trial and error, a method that is not perfect and does not result in the best possible results. In this way, we concluded that in order to obtain good results, we were obliged to "yield" part of the merit.

We also note that this time, the results were not equal and exactly the same comparing both NGSpice and Octave.

However, we believe that the differences are not that significant and they can be explained by how NGSpice solves the circuit compared to how it was done in the theoretical analysis, processes that were also explained on our lectures. To solve the circuit, NGSpice used far more advanced simulation methods for the diodes, with many more parameters, while we used an approximated model with V_{on} and an incremental resistor.

The error obtained between the average theoretical value and average simulated value is 4.86% which wouldn't be significant in a real life scenario but for a online simulation is a bit significant.

This way, the objective should have never been to have equal results, but rather, have results that seemed reasonables, which we believe it was achieved. The merit obtained was 1.538149e-01.