TÉCNICO LISBOA

Circuit Theory and Electronics Fundamentals

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Laboratory Report 1

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Contents

1 Introduction

The objective of this laboratory assignment is to do analysis on a circuit using the mesh and the nodal method as well as running a simulation using NgSpice with the objective of detecting small diferences between the different approcahes and understand why said differences happen. The circuit can be seen in Figure 1.

In Section 2, a theoretical analysis of the circuit is presented. In Section 3, the circuit is analysed by simulation, and the results are compared to the theoretical results obtained in Section 2. The conclusions of this study are outlined in Section 4.

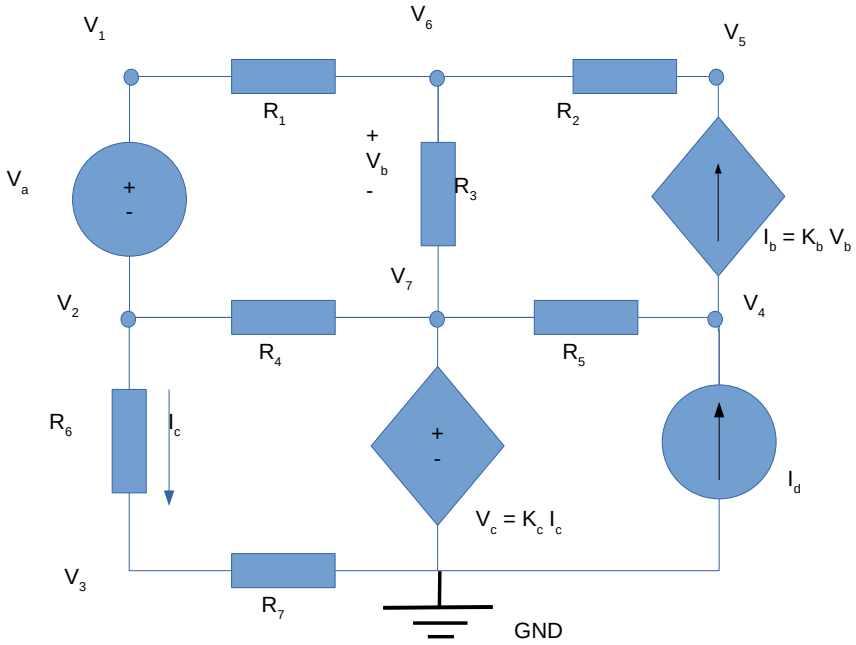

Figure 1: Circuit with an independent current and voltage source (V_a and I_d respectively) and linear dependent sources (V_c-linear current controlled voltage source and I_b-linear voltage controlled current source

The values given for this report can be found in table 1.

Name	Values
R1	1.01949191994 Kohms
R2	2.05054429461 Kohms
R3	3.09286027724 Kohms
R4	4.12838973576 Kohms
R5	3.06635427647 Kohms
R6	2.01254230153 Kohms
R7	1.00502981701 Kohms
Va	5.24204797361 V
Id	1.01905568201 mA
Kb	7.23185131759 mS
Kc	8.12820254987 Kohms

Table 1: Values received by the Python program.

2 Theoretical Analysis

2.1 Mesh Analysis

TO BE DONE

2.2 Nodal Analysis

3 Simulation Analysis

Table 2 shows the simulated operating point results for the circuit under analysis given the values found in Table 1.

Name	Value [A or V]
@gib[i]	-2.45467e-04
@id[current]	1.019056e-03
@r1[i]	2.344922e-04
@r2[i]	-2.45467e-04
@r3[i]	1.097445e-05
@r4[i]	1.220071e-03
@r5[i]	-1.26452e-03
@r6[i]	-9.85579e-04
@r7[i]	-9.85579e-04
v1	8.216102e+00
v2	2.974054e+00
v3	9.905358e-01
v4	1.188846e+01
v5	7.473699e+00
v6	7.977039e+00
v7	8.010982e+00
v8	2.974054e+00

Table 2: Operating point. A variable preceded by @ is of type *current* and expressed in Ampere; other variables are of type *voltage* and expressed in Volt. (the g in ”gib” refers to the NgSpice notation of a voltage controlled current source)

We can get all the missing values given the equations showed in section 2.

$$V_c = V_7 \tag{1}$$

$$V_b = \frac{I_b}{K_b} \tag{2}$$

4 Conclusion

TO BE DONE