



Poznan University of Technology
Faculty of Computing and Telecommunications
Institute of Multimedia Telecommunications

COMPUTER AIDED DESIGN
LABORATORY

Instruction for the laboratory exercise

Analyzer IV applications in Multisim

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1. The aim of the exercise

- learning the *IV Analyzer* application,
- plotting of the dynamic characteristics for selected semiconductor devices,
- transistor amplifiers designing.

2. Examination the characteristics of transistors

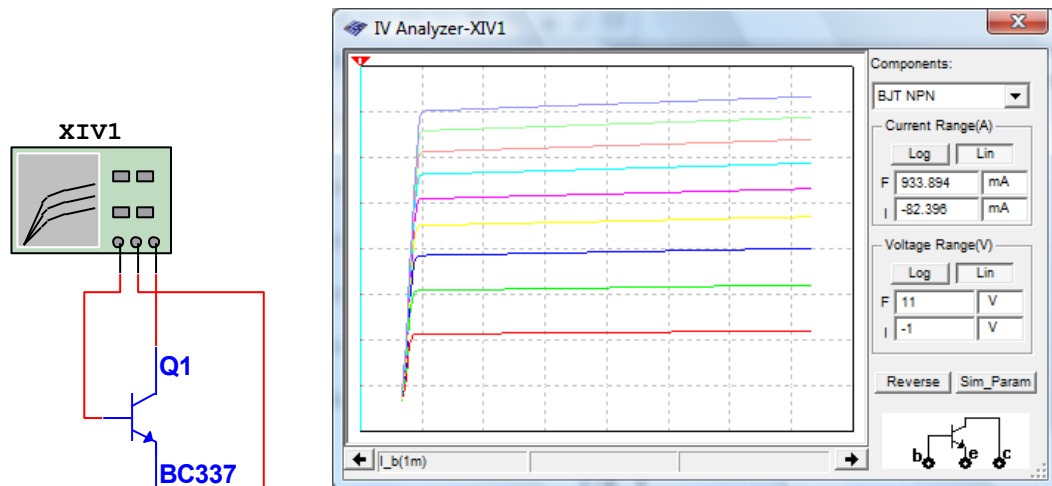


Fig.1. Setting the parameters of the analyzer.

a) Testing characteristics of the bipolar transistor

- insert object *IV Analyzer*,
- connect the tested transistor (BC337) to the analyzer (the teacher can specify a different type of transistor for testing) - Fig.1,
- enter the measuring range *Sim_Param* (Fig.2):
 - $U_{ce} = 0 - 10V$,
 - $I_b = 1 - 10mA$,
- read the value of current I_c for $U_{ce} = 5V$ for each base current (selection trace: right click -> *Select Trace ID*),
- calculate the transistor current gain (take the mean value).

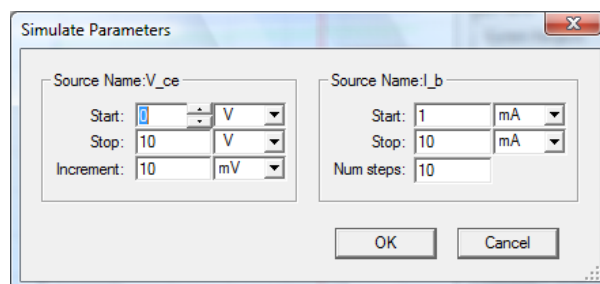


Fig.2. Simulation parameters

b) Testing characteristics of the FET transistor

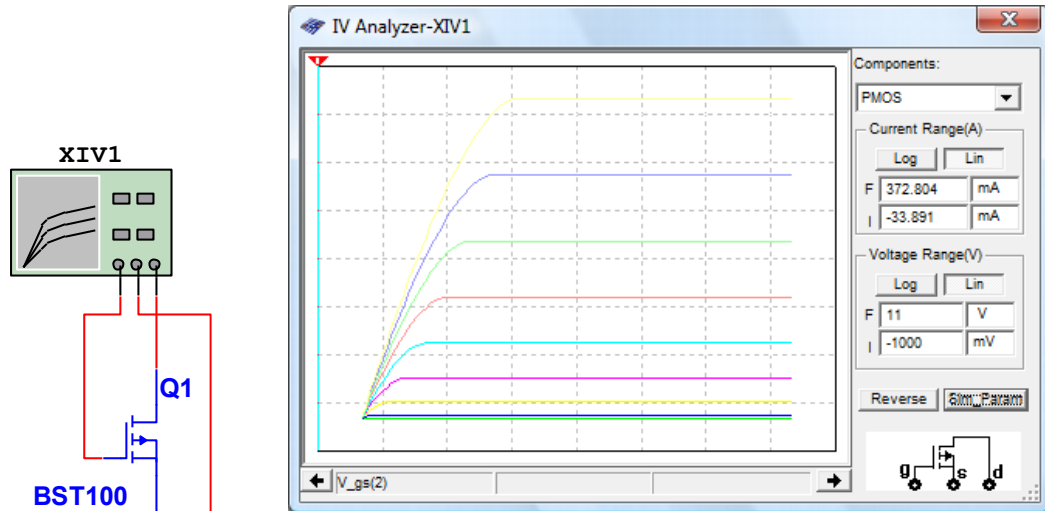


Fig.3. Setting the parameters of the analyzer

- insert object *IV Analyzer*,
- connect the tested transistor (BST100) to the analyzer (the teacher can specify a different type of transistor for testing) - Fig.3,
- enter the measuring range *Sim_Param* (Fig.4):
 - $U_{ds} = 0 - 10V$,
 - $U_{gs} = 2 - 5V$,
- read the value of current I_d for $U_{ds} = 5V$ for each U_{gs} voltage (selection trace: right click -> *Select Trace ID*),
- calculate the transistor gain (take the mean value).

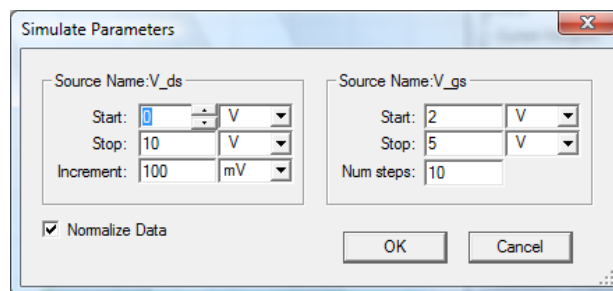


Fig.4. Simulation parameters

3. Tasks for students to do homework (obligatory)

a) Design amplifier with bipolar transistor (class A)

- based on https://www.electronics-tutorials.ws/amplifier/amp_2.html design simple bipolar transistor amplifier (draw the transistor characteristic),
- connect input testing signal (sine, 1kHz) and observe output (use oscilloscope),
- calculate gain of amplifier,
- make AC analysis.

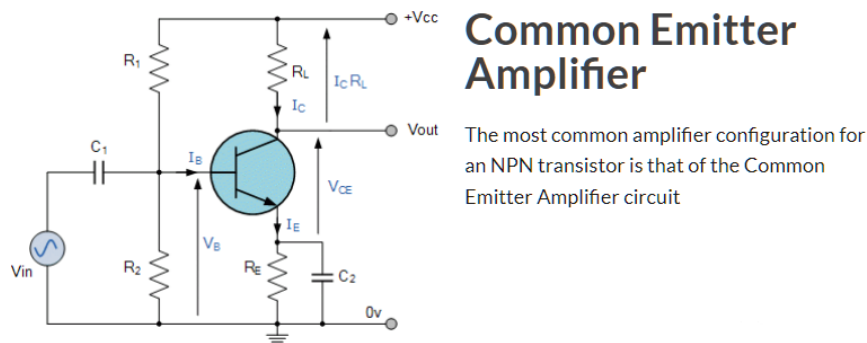


Fig. 5. The bipolar transistor amplifier.

b) Design amplifier with FET transistor

- Based on https://www.electronics-tutorials.ws/amplifier/amp_3.html design JFET amplifier and test it.

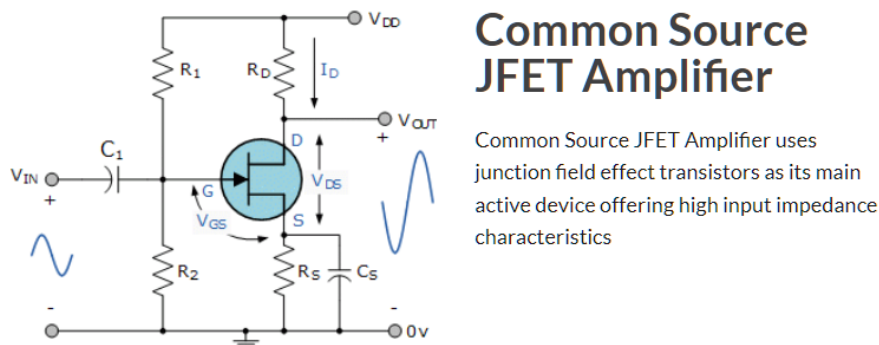


Fig. 6. The JFET amplifier.

4. Additional tasks

- based on <https://www.electronics-tutorials.ws/amplifier/mosfet-amplifier.html> design simple MOSFET amplifier and test it.

5. Report

It should contain:

- all schemes of simulated circuits,
- simulation results,
- answers to the questions contained in the manual,
- conclusions.