Circuit Theory II Laboratory

NODAL ANALYSIS

Aim of the exercise

The aim of the exercise is to experimentally verify the nodal analysis in RLC circuits. The aim of the exercise is achieved by measuring the voltages on different nodes of the chosen circuits using dedicated evaluation board having programmable function generator and vector voltmeter. The obtained measurement results should be compared with analytical calculations.

Schematics

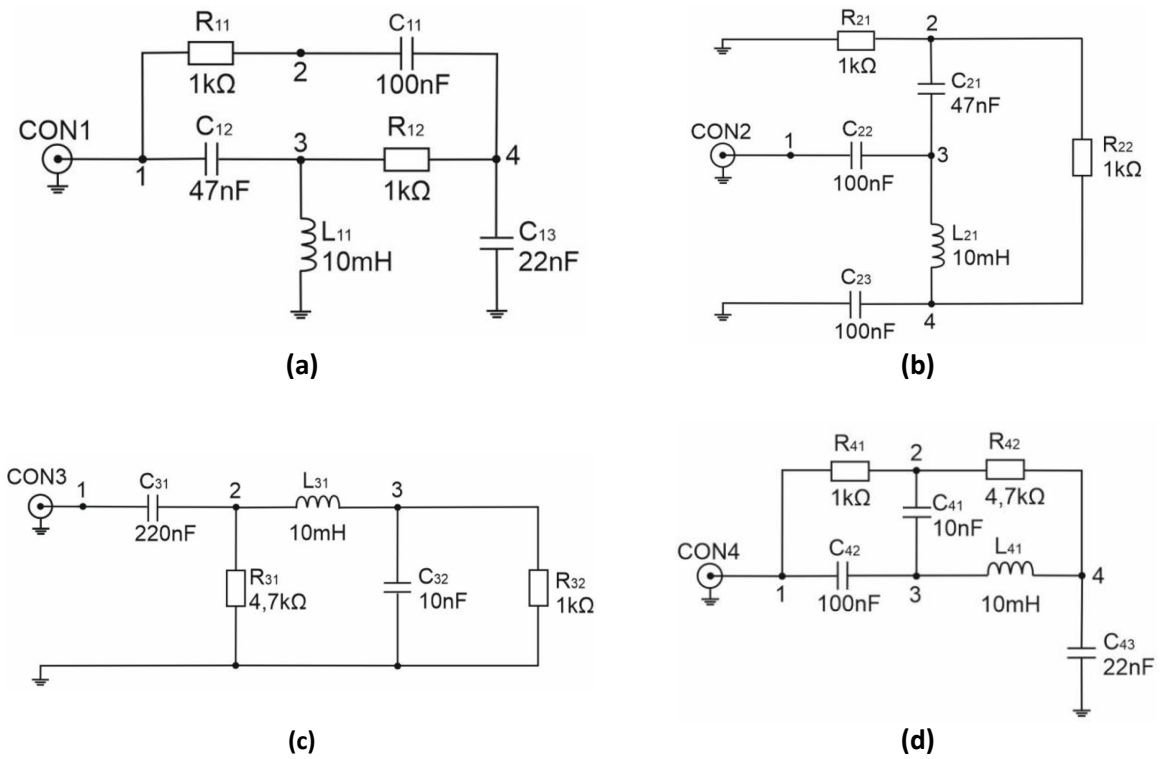

Fig. 1 Schematics of circuits measured during laboratories.

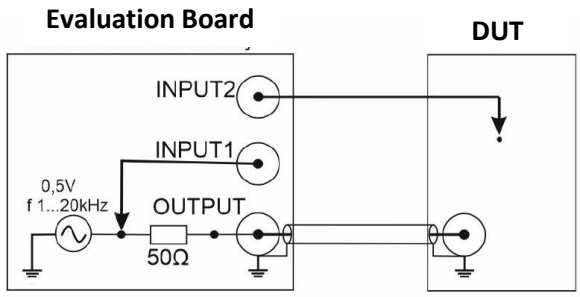

Fig. 2. The concept schematic showing way of connection between dedicated evaluation board and chosen circuit - DUT (Device Under Test)

Measurements methodology

The output of the vector voltmeter (the evaluation boarrd) should be connected with a coaxial cable to the input of the tested, chosen circuit (Fig. 1 a-d). In this way, we get a complete electrical circuit containing the signal source. The first measurement channel of the voltmeter should be connected directly to the voltage source (before the 50Ω series resistor). Such a feedback set a reference waveform (with zero phase) for the voltmeter. The second channel should be used to measure the remaining voltages in the tested circuit using an oscilloscope test probe. The task of each section is to measure all voltages in two selected circuits for the given frequency values of the sinusoidal signal (the list of values for individual sections is at the end of the manual).

Report requirements

The report should include a comparison of the results obtained during measurements with theoretical calculations. Apart from the values of potentials in individual nodes of the circuits being measured, it is necessary to calculate the currents flowing through the elements indicated in the manual (see: the next "chapter": list of circuits to be measured). Any tools can be used for calculations, but remember to present in the report the course of solutions leading to the result (formulas, transformations, source codes, etc.). Comment on the obtained results of measurements and calculations.

List of configurations to measure

Section I (3, 7, 11 kHz):
- *circuit (a), current of the inductor L_{11}*
- *circuit (d), current of the capacitor C_{42}*

Section II (1, 9, 17 kHz):
- *circuit (b), current of the capacitor C_{23}*
- *circuit (c), current of the capacitor C_{32}*

Sekcja III (1, 5, 9 kHz):
- *obwód (a), current of the capacitor C_{12}*
- *obwód (b), current of the resistor R_{22}*

Sekcja IV (4, 6, 8 kHz):
- *circuit (b), current of the inductor L_{21}*
- *circuit (d), current of the capacitor C_{41}*

Sekcja V (3, 9, 11 kHz):
- *circuit (a), current of the inductor L_{11}*
- *circuit (d), current of the capacitor C_{42}*