Electronics II
(02 SE048)

Lab Experiment 4:
Oscillators and Signal Generators

Objectives

The objectives of this experiment are:

a) to design either a sinusoidal oscillator or a waveform generator using of-the-shelf components

b) to compare the accuracy of the analysis "by hand" of positive feedback circuits with respect to their full circuit simulation

c) to practice oscillators analysis using simulation software.

Components and Instrumentation

Transistors (BJT or FET-type), or operational amplifiers

Several resistors, capacitors and perhaps inductors

A potentiometer

A variable DC power supply (0 to 20 V)

A DMM with 2½ or more digits

A resistance, capacitance, inductance measurement instrument (RLC bridge)

An oscilloscope with x10 or x1 probes

A frequency meter (not compulsory)

A circuit simulation software: WinSpice, Electronic Work Bench, OrCad, or something similar.

Theoretical Procedure

Choose any of the two following design problems:

1. Design a sinusoidal oscillator with the following specifications:
    a. Operating frequency of 5 MHz
    b. Minimum output voltage amplitud of 3 V
    c. For a load resistance of 1 KΩ minimum

   d. Biased with a single DC power supply of 15 V maximum

2. Design a waveform generator with the following specifications
   a. Sinusoidal, triangular and square output voltages
   b. Variable operating frequency, from 100Hz to 10KHz, for the three output waveforms
   c. Minimum amplitudes for the output voltages of 5 V
   d. For a load resistance of 1 KΩ minimum for each output waveform
   e. Biased with a single DC power supply of 18 V maximum

Lab and Simulation Procedure

Using the selected software, enter to the simulator the circuit designed. Re-adjust your theoretical design until the simulator yields the desired performance.

Implement in the laboratory your circuit already designed and simulated. Re-adjust your design and simulation if necessary. Measure the performance of the final circuit.

Report

Write a report including all the theoretical, simulation and lab procedures as well as your conclusions. Since it is a design problem, it is very important to justify all the critical decisions during the design process (related to calculations as well as to selection of components). The report must include the schematic of the complete final circuit, indicating the tolerances for the passive components (or their exact values if they were measured).

Deadline and Assessment

The deadline for submitting the report is on Wednesday December 3, 2003. The report can be written either in English or in Spanish.

This lab experiment can be realized in teams of up to 3 students. The evaluation of the report will be as follows:

Quality of the report	30%
Accuracy of the theoretical analysis	30%
Lab measurements and procedures	40%

If the report is written in acceptable English, an extra 10% can be granted.