ENGR 252 LAB #6 -- Filter Design and Analysis

"This lab & associated report should be completed individually"

Objective

Utilizing Computer Aided Design and Analysis tools to design and analyze active and passive filters.

Related Principles

- *Electrical Circuits* textbook by Nilsson
- *OrCAD Capture and PSpice Integrated Tutorial*

Equipments

- Windows-based PC
- Cadence orCAD 16.6 lite
  http://www.engrcs.com/tools_programs/16.6_OrCAD_Lite_Capture&PSpice_Products.zip
- USB hard disk or other removable drives

Supplies

- None

Preparation

- OpAmp Model
  This lab uses LM 324 (a single supply OpAmp) with model available in the EVAL library of PSpice.

- Op Amp (LM 324) Data Sheet available at:
  http://www.engrcs.com/components/LM324_OpAmp.pdf.

Experiment #1

Implement a passive unity gain bandpass filter for receiving Oregon Public Radio AM Broadcast in the Portland/Vancouver metropolitan area (550 Khz). Assume that your radio signals receiver has build-in input amplifier that delivers signals with maximum of 60 dBm to your filter's input. The Q of your filter is required to be larger than 10.

- Design the circuit using Selective Circuit Theories (RLC).
- Implement circuit using PSpice
- Validate your design with unloaded output using the PSpice simulation.

Do you feel the filter described by the specifications in this experiment is an acceptable radio receiver for OPB and why?

Experiment #2

Implement an active unity gain bandpass filter for receiving Oregon Public Radio AM Broadcast in the Portland/Vancouver metropolitan area (550 Khz). Assume that your radio signals receiver has build-in output amplifier that delivers signals from 60 dBm. The Q of your filter is required to be 10 or higher.

- Design the circuit using Active Filter Circuit Theories, LM 324 for OpAmp and other parts as needed.
- Implement circuit using PSpice
- Validate your design with unloaded output using the PSpice simulation.

Experiment #3

Add one 8-ohm speaker (model as an 8-ohm resistor) to each of the experiment #1 and #2's output (load). How did each circuit's behavior change with respect to experiments #1 and #2 requirements? Which would your recommend for a radio receiver design and why?

Report Requirements

This lab and report must be completed individually. All reports must be computer printed (Formulas and Diagrams may be hand drawn) and at minimum include:

For each Experiment

a) Clear problem statement; specify items given and to be found.
b) Identify the theory or process used.
c) Documents resulting circuit, calculation, tables, timing diagram, schematic and other relevant results.

For the report as a whole

a) Cover sheet with your name, class, lab, completion date and team members' names.
b) Lessons Learned from the experiments.
c) A new experiment and expected results which provide additional opportunity to practice the concepts in this lab.