ENGR 252 LAB #1 - Capacitance Meter Design

Objective
Utilize the steady state response of RC circuit and Phasor analysis to develop a procedure for measuring unknown Capacitance. Use the procedures to measure the value of the unknown capacitors provided.

Related Principles
- Electrical Circuits Text: Chapters 7,8 & 9.

Equipment
- Digital Multi-Meter
- Oscilloscope
- Signal Generator
- Power Supply

Supplies
- 3 unknown capacitors
- 1K, 10K and 1M ohms resistors
- Prototype board

Experiment 1
Using the phasor concepts, identify a process to measure capacitance. Based on the selected process, develop the associated equations for finding C. Additionally, perform the required experiments and calculations to measure the actual value of C for 3 of the available unknown capacitors.

Experiment 2
Repeat experiment 1 for R values 1K, 10 K and 1M, while adjusting the signal frequency between 1 kHz, 10 kHz and 100 kHz. For your design, which combination of R value and frequency provides the most accurate capacitance measurement? Explain the reasons for your findings.
Note: Use multi-meter to measure the unknown capacitors in order to evaluate accuracy of your measurement.

Experiment 3
Identify an alternative method for measuring Capacitance. Describe the process and explain advantages / disadvantages of this new method compared with method used in experiment 1.

Report Requirements
Reports must be prepared individually even if the experiments are performed as a team. 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 circuits, 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.