Lab 11 Grading Standard:

1) *In grading, do not explicitly assign points to the various sections. Rather, take points off for incorrect, incomplete or missing items.*
2) *When you take point off, be sure to write a short comment as to why the points were lost.*
3) *Example: (-1) What is the measured value of the component?*
   (-3) What is the mathematical formula that you are plotting on top of your data?

General Notes:

- The axis of all plots must be labeled. This should include the quantity, the units and numerical values.
- The boxed questions should be answered in the lab book.
- Procedures must have a circuit diagram.
- Measured values of components used should be recorded in the lab book.
- Relevant formulas should be included in the lab book.
- Formulas for computed quantities in tables should be near the table in the book.

Failure to measure a component value when possible (max -1 per occurrence)
Missing units on components, plot axes, tables … (-1 per occurrence).
Missing plot (-4 per occurrence).
Missing axes labels on plots (-1 per label).
Missing column labels on tables (-1 per label).
Missing formula for computed quantity in table (-1 per table)--can be in column title
Missing important formulas (-2 per occurrence)
No fit to linear curves (-2 per occurrence).
No fit values with units (-2 per occurrence).
No comparison of fit values with expectations when possible (-2 per occurrence).
Missing theoretical calculations, including formulas (-3 per occurrence).
Failure to answer questions (-2 per question, maximum of -10)

Pre-lab Signature: 10

Purpose/Introduction 5

There should be a two to five line description of what they are going to do in this lab. This is all or nothing for five points.

The Summing Amplifier:

Procedure: 5

A description of what resistor values were chosen, and why they were chosen is needed.

Measurement: 10
There should be either scope traces or accurate sketches of the input and output signals. Verify that the output actually goes from 0 to 5V. Note, if they chose small input resistances (100s of Ohms), this might load down the input and in turn, load down the output. If they saw this, they should describe how the compensated for it.

The 4-bit DAC:

Procedure: 5

Data: 10
Their data should follow a divide-by-two sequence. E.g. 5V, 2.5V 1.25V, 0.625V, … This should be quite accurate with the use of precision resistors. If it is off by 10% or more, there is a problem and they should comment on it.

The Transistor Switch:

Procedure: 5

Data: 10
The main data here are a careful map of Vout vs Vin for various DC levels. There will be a narrow range in Vin over which the output rapidly changes from 0V to 5V. This should be well mapped out and commented on. The second detail is a measurement of how fast the transistor can switch. The data are an accurate sketch or a screen capture of the input square wave and Vout of the transistor. The important number is how fast it can change states.

The Op-amp Comparator:

Procedure: 5

Data: 5
The main data here are a screen capture of photo of the scope showing the input triangle wave and the output changing states. The key feature of the simple comparator is that the output changes states in both directions at the same input voltage. Data should include a couple of reference voltages

The Schmitt Trigger:

Procedure: 5

Data: 10
The same sore of data as for the simple comparator is needed. However, in the Schmitt trigger, the rising and falling transitions occur at different thresholds. They should comment on this and also explore the extreme limits of the potentiometer where they

should see the two transitions happening at nearly the same voltage. This effect should be explained in terms of the known formulas for the Schmitt Trigger.

Questions	10
Conclusion/Summary	5