DATA SHEET FOR EXP. 1A

Your Name: __________________________ Date: ___________ Station #: ________

Names of other Team members:

______________________________________________
______________________________________________

IIIB: Measurement of common ground voltages (not all blanks have to be filled):

<table>
<thead>
<tr>
<th>Location of positive probe</th>
<th>Location of negative probe</th>
<th>Observed Voltage</th>
<th>Location of positive probe</th>
<th>Location of negative probe</th>
<th>Observed Voltage</th>
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IVB: 1. Offset voltage using the following switch settings:

NORM ____________V       INV ____________V

IVB: 2. Voltage source loading (show calculations)

Output voltage \((E_o)\) without 100 \(\Omega\) load = ______________V

Source Voltage \((E_S)\) = ______________V

Output voltage \((E_o)\) with 100 \(\Omega\) load = ______________V

\(R_A/R_B = \) __________

\(R_A = \) __________ \(\Omega\)

\(R_B = \) __________ \(\Omega\)

Show calculation of \(R_A/R_B\)

Show calculation of \(R_A\)

Show calculation of \(R_B\)
IVC: DMM Multimeter use (include units)

E (measured) = ________

i (measured) = ________

DMM current range used: ________

R (measured) = ________

% error in R (expected value is nominal value) ________

Show calculation of the % error in R

i (calculated from E and R measured) = ________

Show calculation of the current i:

% difference between i calculated from E and R measured and i measured ________

Show calculation of the % difference in i:

VB: Attach a copy of the output from the DVM program and the Excel file proving that the STDDev and the Averages reported by the program are correct.

VC: Attach Excel chart, labeled with date, your name, a title, label voltage axis (+0.5 to -0.5 V) and the time axis with labels and units. Use proper significant figures.

VIA: Voltage Balance
Teammate’s name: Did Teammate performed voltage balance operation?

_________________________________________  ___________

_________________________________________  ___________
VIB: Voltage follower

measured $E_{in} =$ _________ measured $E_o =$ _________ expected $E_o =$ _________

% error = _________

VIC: Voltage amplifier (include units)

measured $E_{in} =$ _________ measured $E_o =$ _________ expected $E_o =$ _________

% error = _________

Show formula and calculation of expected $E_o$:

VID: Response time (for nominal 10-s time constant)

Mark on your Excel chart $E_0$, $E_f$ and the halfway point $(E_0 + E_f)/2$, label axes, and attach a copy of the chart.

How many seconds does it take to reach 50% of the final voltage? _________ s

What is the expected $RC$ (calculated from $R$ & $C$)? _________ s

What is the experimental value of $RC$ (calculated from time to reach 50%)? _________ s

% error in $RC =$ _________

What is the response time (not time constant) based on experimental value for $RC$? _________ s

Response time (for nominal 1-s time constant) _________ s

Mark on your Excel chart $E_0$, $E_f$ and the halfway point $(E_0 + E_f)/2$, label axes, and attach a copy of the chart.
The response time estimated from the chart is __________s.

From your experimental results, by what factor does the response time decrease when RC is decreased by a factor of 10? (just give one significant figure) __________

VIE: Integrator

Measured $E_{in}$ = __________ mV

Open the file in Excel and produce a labeled chart; attach a hardcopy of the chart

Determine the slopes from the data using trendline = 1._______ 2._______ mV/s

Average of absolute value of slopes for 2 runs = ________ mV/s

Theoretical slope of OA output (calculated from equation 6) = __________ mV/s

Show calculation

Experimental % error in slope (based on values above) = __________

Estimated % error in slope = __________

Below show the calculation of the estimated % error in the slope (uncertainty). It is based on propagation of error or uncertainty mathematics and estimates of the uncertainty due to the R and C component tolerances (Table I) and the uncertainty due to the voltmeter to measure $E_{in}$ (Table II). (See lecture notes or Harris 7e p. 49 for propagation of systematic error.)

Is your experimental error within your estimated error? __________

What is the main source of the experimental error? __________________________________________