

Lab 7 Worksheet

Return to CM: _____

To: _____

From: _____

Date: _____

Re: ES 205 Thermocouple Parameter Identification (Lab 7)

Record the following as you work your way through the lab exercise.

Method 1 (Single Points Off of Graph)

- 1. Initial Condition T_0 _____
- 2. Steady-State Temperature T_{ss} _____
- 3. Time Constant from the Graph
 - τ_1 (using $1 \cdot \tau$) _____
 - τ_2 (using $1 \cdot \tau$) _____
 - τ_3 (using $1 \cdot \tau$) _____
 - τ_{avg} _____

Which one of these do you think is most accurate? Why?

Method 2 (Log-Incomplete Response)

- 1. Slope of Linear Curve-Fit _____
- 2. Best Estimate of the Time Constant τ_4 _____
- 3. Your Final Values For:
 - T_0 _____
 - T_{ss} _____

How did varying parameters affect the correlation coefficient?

Method 3 (Performance Index)

- | | | |
|---|----------|-------|
| 4. Time Constant (adjusting τ only) | τ_5 | _____ |
| 5. Time Constant (adjusting τ , T_0 , and T_{ss}) | τ_6 | _____ |
| | T_0 | _____ |
| | T_{ss} | _____ |

Which of these gives a better fit?

Summary of All Methods

Comment on the differences or similarities among the values you obtained for the time constant using each of the three methods. Refer to the figure showing the four time responses (1 – experimental & 3 – theoretical, one for each method) on same graph to support your observations.

Convection Coefficient

Show the calculations for your range of convective heat transfer coefficient, h , values.

Compare your result to the range of published values.

Turn in this worksheet with your plots. You should have a minimum of four figures including:

- A plot of the experimental step response, $T_m(t)$, showing 1- τ , 2- τ , and 3- τ estimates of the time constant.
- A plot of the log-incomplete response, $Z(t)$, with the linear least-squares curve-fit showing the slope.
- A plot of the experimental data and the two performance index fits on the same graph.
- A plot comparing the experimental step response, $T_m(t)$, to the three theoretical responses: 1) using τ_1 from the 1- τ estimate, 2) using τ_4 from the log-incomplete response, and 3) using τ_5 from the performance index.

Everyone on the team is to initial next to their names in the header.