Data Analysis Lab

Objectives
- to plot measured data in order to observe experimental trends, using a computer-aided graphing (spreadsheet) tool
- to determine device parameters from plotted data

Lab Experiment

The circuit in Figure 1 was constructed by an engineering team and a series of measurements were taken and recorded in Table 1.

![Figure 1: MOSFET Circuit](image)

<table>
<thead>
<tr>
<th>$V_{GS}$ (V)</th>
<th>$V_{DS}$ (V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.5</td>
</tr>
<tr>
<td>2.3</td>
<td>0</td>
</tr>
<tr>
<td>2.5</td>
<td>0</td>
</tr>
<tr>
<td>2.7</td>
<td>0</td>
</tr>
<tr>
<td>2.9</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 1: Table of Drain Currents, $I_D$ (mA)
Data Analysis

- In Excel, plot the data in Table 1 with $V_{DS}$ on the horizontal axis and $I_D$ on the vertical axis. Make a family of curves.
  (i.e. Plot the curves for $I_D$, for each value of $V_{GS}$, on one set of axes.)
- Connect points smoothly (with best-fit curves).
- Label your axes appropriately. (You may need to add text boxes to your chart.)
- Provide a clear legend (to distinguish each curve in the family of curves).
- Add a descriptive title (appropriate for the data that is plotted).

BONUS: From the data in the saturation (linear) region compute the values of the conduction parameter $K_n$ in equation (1). Assume a value of $V_{TH} = 2.1$ V.

$$I_D = K_n (V_{GS} - V_{TH})^2$$ \hspace{1cm} (1)

Hint: See “Example Problem 2” from our Chapter 5 class notes.

To receive credit for this lab, either
(a) make a print copy of your graph and hand it to your professor, or
(b) make a 1-page PDF of your graph and e-mail it to your professor.

If you do not receive a confirmation e-mail within 24 hours, assume that he did not receive your submission, and re-send.