Homework #1: Introduction to Mechatronics

Attach the cover sheet (filled out) to your homework responses. Where written responses are requested, please type them. Make sure that you show how you arrive at any answers involving numerical calculations. Answers that do not show intermediate steps will likely not get any points. Photocopy, photograph, or scan your work, so that you have a back up copy.

1. (5 pts) Join the AVRfreaks Community (http://www.avrfreaks.net/). Include proof that you joined in your homework submission (screenshot or other means).

2. Visit the Mechanical Engineering Magazine June, 2008 feature article: “Who Owns Mechatronics?” (http://www.memagazine.org/contents/current/features/whoowns/whoowns.html), and answer the following questions:
   a. (5 pts.) According to Kevin Craig how does mechatronics figure in to modern design?
   b. (5 pts.) Describe Peter Schmidt’s take on how mechatronics figures in to designing factory automation at Rockwell.
   c. (5 pts.) Describe how mechanical engineers with training in mechatronics figure in to design projects at Technology Driven Products Inc. in Loveland, Colorado.
   d. (5 pts.) Describe Dave Alciatore’s and Kevin Craig’s viewpoint about how mechatronics fits into mechanical engineering.
   e. (5 pts.) What is the conclusion of the article with regard to mechatronics?

   Note: your responses need to be at least a few paragraphs each, in your own words, and typed. If you want to read the article shown in lecture from the ME Magazine (Defining Mechatronics), visit: http://www.engr.sjsu.edu/bjfurman/courses/ME106/ME106pdf/ME_may97_article.pdf

3. (5 pts.) In Lab Experiment 1 (Introduction to the Mechatronic Engineering Laboratory), which you will do next week, what does ‘High Z’ refer to for the function generator, and why is it important?

4. Consider the circuit to the right. The resistors are carbon film resistors having four color bands, $V_S = 5 \text{ V p-p} + 2 \text{ V DC offset}$

<table>
<thead>
<tr>
<th>First band</th>
<th>Second band</th>
<th>Third band</th>
<th>Fourth band</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>Brown</td>
<td>Black</td>
<td>Orange</td>
</tr>
<tr>
<td>R2</td>
<td>Red</td>
<td>Black</td>
<td>Red</td>
</tr>
<tr>
<td>R3</td>
<td>Brown</td>
<td>Black</td>
<td>Red</td>
</tr>
<tr>
<td>R4</td>
<td>Green</td>
<td>Brown</td>
<td>Red</td>
</tr>
</tbody>
</table>

   a. (5 pts.) What is the nominal RMS voltage value for $V_A$?
   b. (5 pts.) What is the largest RMS voltage value for $V_A$?
   c. (5 pts.) What is the nominal RMS voltage value for $V_B$?
   d. (5 pts.) What is the smallest RMS voltage value for $V_B$?
   e. (5 pts.) This configuration of resistors is named after a Victorian-era English scientist. What is his name, and what other important contributions did he make?

Question to ponder: What is the use of a Thevenin equivalent circuit?