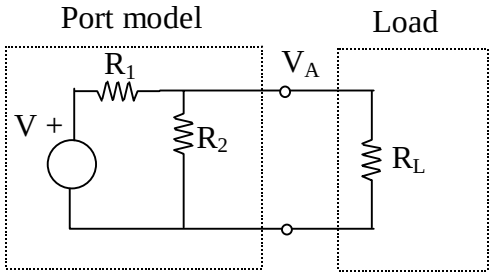
SAN JOSÉ STATE UNIVERSITY
Department of Mechanical and Aerospace Engineering

ME 285 Fundamentals of Mechatronics

Hw #1: Introduction to Mechatronics and Basic Electronics (Due 1/31/01)

1. From the May 1997 feature article in Mechanical Engineering magazine (http://www.memagazine.org/backissues/may97/features/mechtron/mechtron.html) on mechatronics:
   a. Why is Mechatronics important? Support your answer from information presented in the article.
   b. What are the career opportunities like for mechanical engineers with training in mechatronics?
2. From the paper, "What is Mechatronics?", by David Auslander,
   a. How would you describe his view of what mechatronics is all about?
   b. What are some of the major technological developments that have enabled mechatronics?
   c. What are some of the key issues in computational software used for mechatronics systems?
3. The circuit schematic below shows a model of a data port (like the serial port on your computer) to which a load (modeled as a resistor, R_L) is connected
   a. What is the output impedance of the port in terms of R_1 and R_2? (Hint: find the Thevinin equivalent circuit for the port)
   b. What is the input impedance of the load in terms of R_L?
   c. Let V_1=10 V, R_1=R_2=1 kΩ. Plot V_A and the power dissipated by the load resistor R_L vs. the value of R_L using the range of R_L values listed. Use an engineering computation tool such as Excel, Matlab, etc. to generate your plot. Plot both curves on the same graph, and use a log scale for R_L (It is really easy to do in Excel. Just use the 'Chart Wizard', and Add data series. See me if you have questions on this). Please ***explain*** your observations about what happens to V_A and the power dissipated as a function of R_L.
   d. If you wanted to make sure that V_A does not drop lower than 10% of its open-circuit value (i.e. the voltage when R_L is infinite), approximately what is the minimum value of R_L that you could use?
   e. In summary then, what should you be careful about when you hook up a load (represented here by R_L) to a port or signal source?



R_L, kΩ
1000
500
100
10
5
2
1
0.5
0.2
0.1
0.05
.01
0.001