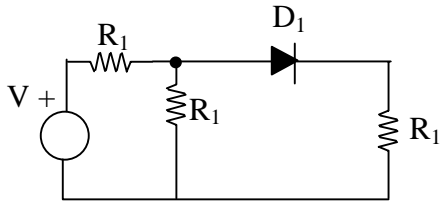


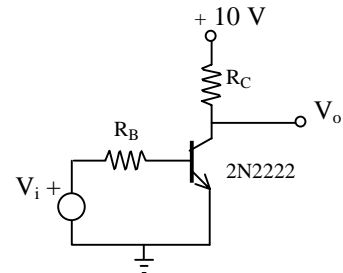
## ME 285 Fundamentals of Mechatronics

### HW #2: Diodes and Transistors (Due 2/7/01)

1. Find the current through the diode, supposing  $V=10\text{ V}$ ,  $R_1=1\text{ k}\Omega$ , and:
  - a. The diode is a 1N4148
  - b. The diode is an LED



2. Given the schematic shown to the right:
  - a. If  $V_i = 5\text{ V}$  (and cannot supply more than 4 mA) and  $R_C = 200\ \Omega$ , what is the largest value of  $R_B$  you would choose to make sure that the transistor is saturated? Assume that  $V_{ce_{sat}} = 0.4\text{ V}$  and  $h_{fe_{min}} = 100$ . What base current will result from your choice of  $R_B$ ? Show how you arrive at your answers.



Check out a data sheet for the transistor. One source is STMicroelectronics (<http://us.st.com/stonline/>) Is  $h_{fe}$  a constant? Is the assumption of  $h_{fe}=100$  a good one? Please comment on your answer.

- b. When the transistor is saturated, what is:
    - 1). The collector current?
    - 2). The power dissipated by  $R_C$ ?
    - 3). The power dissipated by the transistor?
3. Look at the data sheet for the ULN2803A Darlington array. Show how you might use it to drive a small motor (Radio Shack catalog no. 273-223) from a logic level source (0 or 5 V with about 1 mA drive capability). Will it work?