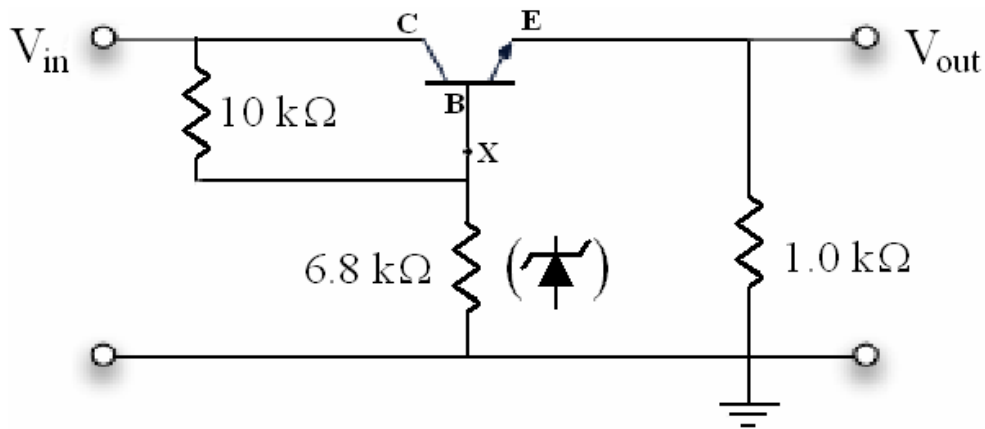


### Problem T5

This problem involves the Pass-Transistor circuit you will test in the Bipolar Transistors II Lab. This circuit is essentially an emitter follower and it is useful for the construction of stable constant voltage sources. For the following questions, use the resistor values shown in the figure below and assume the transistor has a very high input impedance (i.e., assume  $\beta$  is very large).



(a) For  $V_{in} = 15$  V DC, calculate  $V_X$  (the voltage at point X) and  $V_{out}$ .

(b) For  $V_{in} = 10$  V DC, calculate  $V_X$  and  $V_{out}$ .

Now to make the output more stable to input fluctuations, suppose you replace the 6.8k resistor with a reversed-biased 5.6 V Zener diode.

(c) For  $V_{in} = 15$  V DC, calculate  $V_X$  and  $V_{out}$ .

(d) For  $V_{in} = 10$  V DC, calculate  $V_X$  and  $V_{out}$ .