Special Problem 3.4-1

A diode manufacturer provides us with the information that, when in breakdown, a certain Zener diode will exhibit a voltage of 10 V across it when 10 mA is flowing through it. Likewise, the incremental resistance of the diode at this operating point is \( r_z = 10 \) ohms. This Zener diode is used in the regulator circuit shown below.

a) Find the value of resistor \( R \), if the current through the Zener diode is 10 mA.

b) Approximately how much will \( v_o \) change if \( v_i \) changes by 1 mV?

c) Approximately how much will \( v_o \) change if current \( i_L \) changes by 1 mA?