

# Lecture 7

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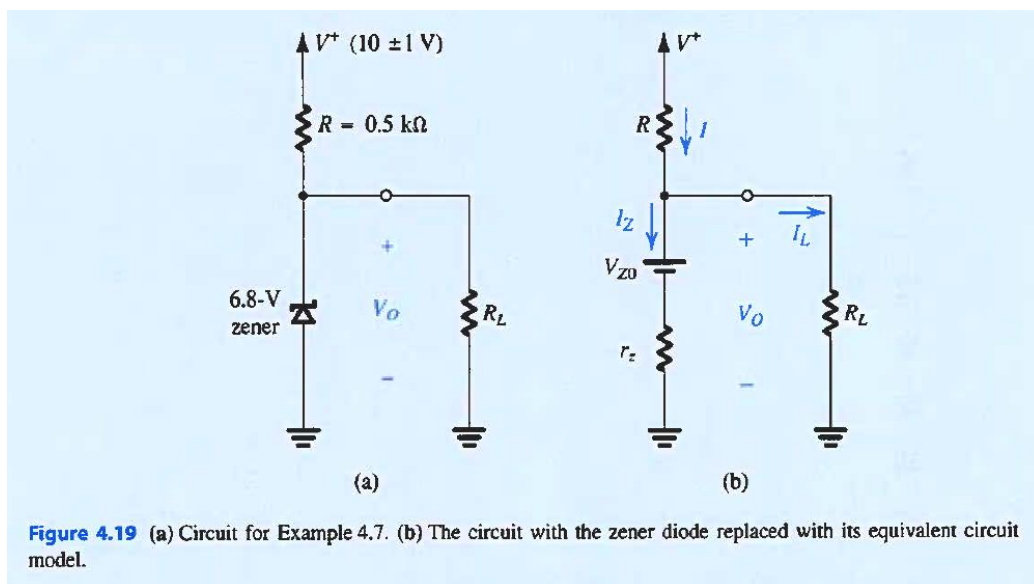
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## 1 Negative Bias

Recall that if a negative voltage is applied to a diode, there is a  $V_{ZK}$  before which leakage current is negligible and is approximately constant. There is an avalanche past that point with slope  $\frac{1}{r_z}$ , where  $r_z$  is a small value. We can consider this as a linearised circuit, where there is a voltage source in the opposite direction to current (internal voltage), and a resistor with resistance  $r_z$ .

## 2 Zener Diode as Shunt Regulator

A shunt regulator keeps voltage constant. We can use a diode as a shunt regulator by attaching it parallel to a desired voltage. This is because if the desired voltage overcomes  $V_{ZK}$ , it will essentially be a conductor with an internal voltage. Once that voltage is overcome, all the "excess" current is drawn into the diode, so voltage output is regulated.



**Figure 4.19** (a) Circuit for Example 4.7. (b) The circuit with the Zener diode replaced with its equivalent circuit model.