ENGR 305 – Homework 3 solutions

4.46

Eq. (4.8), $V_Z = V_{Z0} + r_z I_Z$, also applies to the test voltage and current. Thus,

$V_{ZT} = V_{Z0} + r_z I_{ZT}$

We can use this equation to complete the table as follows.

V_{ZT}	I_{ZT}	r_z	V_{Z0}	V_Z @ $I_Z = 10\ mA$
3 V	2 mA	50 Ω	2.9 V	3.4 V
5 V	5 mA	100Ω	4.5 V	5.5 V
6 V	2 mA	150Ω	5.7 V	7.2 V
9.1 V	1 mA	100Ω	9 V	10 V

4.9

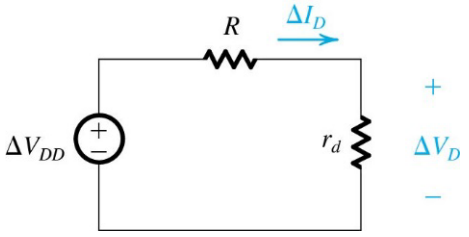
Suitable value for R so that the peak diode current does not exceed 40 mA:

$$R \geq \frac{120\sqrt{2}}{40\ mA} = 4.2\ k\Omega$$

The largest reverse voltage appearing across the diode is equal to the peak input voltage:

$$120\sqrt{2} = 169.7\ V$$

4.62



Here R = 200 Ω and r_d = 10 Ω

From the small-signal model: $\frac{\Delta v_o}{\Delta v_s} = \frac{10}{200+10} = \frac{10}{210}$

Now $\Delta v_s = 1.0\ V \Rightarrow \Delta\ v_o = \frac{10}{210}\Delta v_s$

$$\Delta v_o = \frac{10}{210} \times 1.0 = 47.6\ mV$$