

EE 310

Practice Problem 1

The Ideal Diode

- 1.1 (a) In the circuit of Fig. P1.1 let $v_s = 25$ V, $R_1 = 2$ k Ω , $R_2 = 3$ k Ω , $R_3 = 1$ k Ω , and $i_s = 4$ mA. Find the voltage across and the current through the diode.
- (b) Repeat, but with $v_s = 10$ V and $i_s = 10$ mA.
- (c) Repeat, but with $v_s = 5$ V and $i_s = 3$ mA.
- (d) Repeat parts (a) through (c), but with a fourth resistance $R_4 = 1.8$ k Ω connected in parallel with the diode. List the cases in which this additional resistance make a difference, and those in which it doesn't.

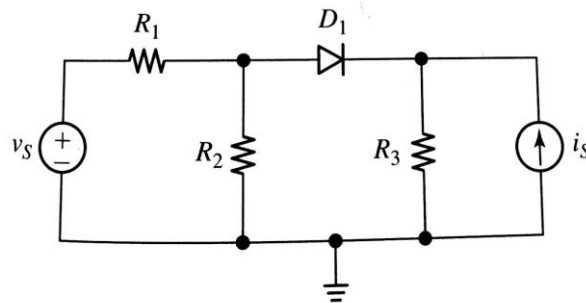


FIGURE P1.1

- a) V_{DI} (open circuit) $> 0 \Rightarrow$ must be on, $V_{DI} = 0$ (ideal), $I_{DI} = 5$ mA
- b) V_{DI} (open circuit) $< 0 \Rightarrow$ must be off, $I_{DI} = 0$, $V_{DI} = -4$ V
- c) V_{DI} (open circuit) $= 0 \Rightarrow$ must be off, $I_{DI} = 0$, $V_{DI} = 0$ V
- d) The additional resistance will make no difference in (a) and (c); in (b), the diode will be off with $V_{DI} = -1.8$ V.