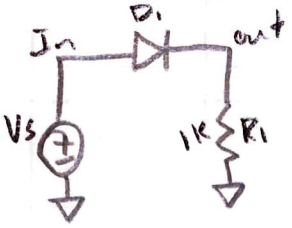
Gabriel Emerson gte0002 | HW3 | Due 2/5

1.) Voltage across load resistor for different source voltages



a.) $V_s = 0V$; $V_{out} = 0V$

b.) $V_s = 1.0V$; $V_{out} = V_s - V_{diode}$
$= 0.3V$

c.) $V_s = 2.0V$; $V_{out} = V_s - V_{diode} \Rightarrow 1.3V$

d.) $V_s = 4.0V$; $V_{out} = V_s - V_{diode} \Rightarrow 3.3V$

2.) $V_{in} = 0V$ $V_{out} = 0V$

$V_{in} = 1.0V$ $V_{out} = 0.3V$

$V_{in} = 2.0V$ $V_{out} = 1.3V$

$V_{in} = 4.0V$ $V_{out} = 3.3V$

3.) See attached file

4.) a.) $V_s = 0V \rightarrow$ Diode off $\rightarrow V_{out} = 0V$

b.) $V_s = 1V \rightarrow$ Diode off $\rightarrow V_{out} = 0V$

c.) $V_s = 5V \rightarrow$ Diode on $\rightarrow V_{out} = 5 - 0.7 - 0.7$
$\Rightarrow 3.6V$

d.) $V_s = -5V \rightarrow$ Diode on $\rightarrow V_{out} \Rightarrow 3.6V$

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5.) PN Diode with $I_s = 10^{-15}\,A / \phi_t = 0.0258V$

$$I = I_s\left[e^{\left(\frac{V_f}{n\phi_t}\right)} - 1\right] \qquad \frac{I}{I_s} + 1 \rightarrow \ln\left(\frac{I}{I_s}+1\right) n\phi_t = V_f$$

$$\ln\left(\frac{0.01mA}{10^{-15}A} + 1\right) 0.0258 \Rightarrow \boxed{0.594V}$$

$$\ln\left(\frac{0.1mA}{10^{-15}A} + 1\right) 0.0258 \Rightarrow \boxed{0.653V}$$

$$\ln\left(\frac{1mA}{10^{-15}A} + 1\right) 0.0258 \Rightarrow \boxed{0.7128V}$$

$0.7128 - 0.653 = 0.0598$
$0.653V - 0.594 = 0.059$
} Approx. 60mV

6.) a.) See attached files

b.) Using the delay takes away the initial large ripple in the waveform, and makes the value of V_{ripple} go down significantly.