Scores:
1) 
2) 
3) 
4) 

Total____________

I pledge on my honor that I did not copy any of this exam, and that this work is entirely my own. Furthermore, I did not use PSpice during this exam.
Problem 1 (25 Points):
Plot $V_o(t)$ and $V_{in}(t)$ for the circuit below. Indicate numerical values for all breakpoints. Let $V_{in}$ be a ±15 volt triangle wave. **Do not** ignore the diode 0.7 V drop.

a) Sketch the waveforms using the graph below (17 Points):

![Waveform Graph](image)

b) Sketch the transfer curve, $V_o$ versus $V_{in}$ (8 Points).
Problem 2 (25 Points):
Plot $V_o(t)$ and $V_{in}(t)$ for the circuit below. Indicate numerical values for all breakpoints. Let $V_{in}$ be a ±15 volt triangle wave. The Zener breakdown voltage is 3 V.

a) Sketch the waveforms using the graph below: (17 Points)

b) Sketch the transfer curve, $V_o$ versus $V_{in}$ (8 Points).
Problem 3 (25 Points):

The circuit below is a voltage regulator:

For what range of values of the load will $V_{out}$ be constant at 5 V?
Problem 4 (25 Points):
An n-type piece of silicon has a conductivity of $21.6 \Omega^{-1} \text{cm}^{-1}$ at 350 °K. Find the concentration of holes in the piece of silicon.