UNIVERSITY OF CALIFORNIA, SAN DIEGO

Electrical and Computer Engineering Department

ECE 65 – Fall 2021

Components and Circuits lab

Midterm Exam 1

Closed books, two double-sided cheat sheets, and calculators are allowed

Electronic devices are not allowed.

Please put all answers in the provided sheets.

Be sure to write your name and PID on **all pages**.

Please do not begin until told. **Show your work**. Good luck.

All electronic devices including cell phones must be turned off and stored away in a backpack or a purse. Anyone caught with such a device on their person during the exam will be charged with academic dishonesty.

There is only one problem on this exam.

Problem (15 points)

a) Design a diode waveform shaping circuit that would have the below transfer characteristics.

- You can use PN junction diodes and Zener diodes with $V_{D0} = 0.7\ V$, $V_Z = 4\ V$, DC voltage sources, and resistors in your design.
- **You must use a Zener diode in your design.**
- In your circuit schematic, show v_i with the symbol of a voltage source. Clearly label the terminals that are used to measure the output.

b) Write the possible cases of the operation of the diode(s) in your designed circuit, and for each case, include the calculation of finding v_o and the range of v_i.

   Show your work.

c) Sketch the output, $v_o(t)$, for $0 \le t \le 2ms$, if the input is a 5V DC signal, $v_i(t) = 5\ V$.

v_O

Slope = $\dfrac{1}{3}$

9 V

9 V

v_i

Slope =1