EEE210 : Electronic Circuits and Devices

Lab #1 : Transfer Characteristic of Circuits with Diodes (Part 1)

Experimental work : Use diodes 1N4148 or an equivalent (1N914). All oscilloscope readings are done with DC coupling of the input channels. Measurements can also be done (more conveniently) with the *Analog Discovery* gizmo by *Digilent* but an external function generator must be used for V_i as the *Analog Discovery* gizmo cannot generate a waveform of amplitude as large as 10 V.

1. For each of the circuits in figures 1(a), 1(b), 1(c) :
   (a) Apply on V_i a symmetrical triangular wave of frequency 20 Hz (approximately), amplitude 10 V and 0 DC–offset. V_i is generated by a function generator, even if you are using the *Analog Discovery* gizmo.
   (b) Connect channels 1 and 2 of the oscilloscope on signals V_i and V_o respectively and observe the waveforms.
   (c) Observe the transfer characteristic of the circuit by placing the oscilloscope in the *X-Y deflection mode*.
   (d) Adjust the center of the oscilloscope screen to the point ($V_i = 0, V_o = 0$) and accurately measure the coordinates of the break points or, if you are using the *Analog Discovery* gizmo, export the data from the X-T window to a `csv` file ; this can be opened in a spreadsheet.
   (e) Repeat for the values of $V_R = 0$ V, $V_R = 2$ V and $V_R = 5$ V.
2. Build the circuit of figure 1(d).
   (a) Measure its input–output transfer characteristic as in steps 1b, 1c, 1d above by applying on V_i a symmetrical triangular wave of frequency 20 Hz (approximately), amplitude 2 V and 0 DC–offset.
   (b) Observe (no measurements required) the shape of the output signal V_o when the input is a sinewave, triangular wave or square wave of amplitude 0.1 V, 0.2 V, 1 V and 5 V.

Report : Compare the experimental input–output transfer characteristics with those predicted by the theory. Use the piece-wise linear model of the diode that includes a 0.7 V voltage source.

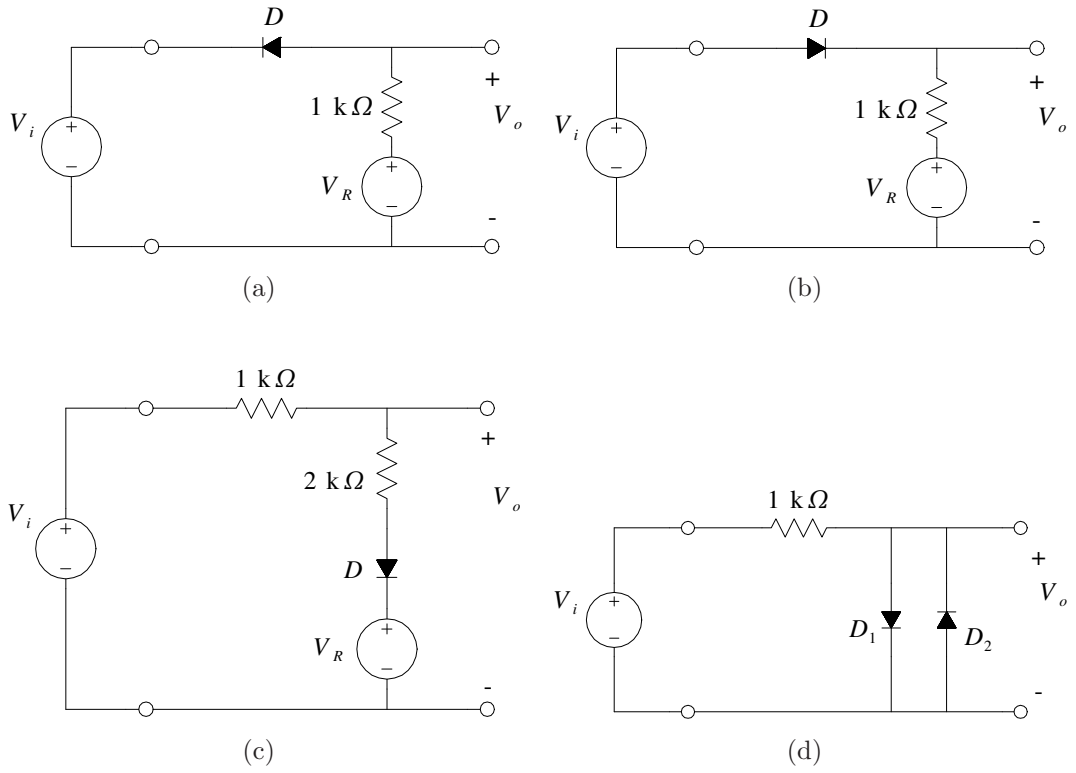

FIGURE 1 – Wave shapers and clippers