Wave Shaping Circuits with Diodes

Aim: To study clipping and clamping circuits.

Part I: Clipping Circuit 1

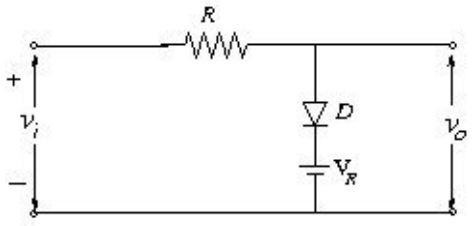

Figure 1(a)

(a) Analyse the circuit of Fig. 1(a), and plot V_o versus V_i for -5V < Vi < 5V. Assume the diode voltage drop to be 0.7 V when conducting.

(b) Using the result of (a), plot the waveform $V_o(t)$ versus time for a triangular input voltage $V_i(t)$, varying from -5V to +5V, with a frequency of 1 kHz.

(c) Simulate the circuit and verify your answers of (a) and (b).

Part II: Clipping Circuit 2

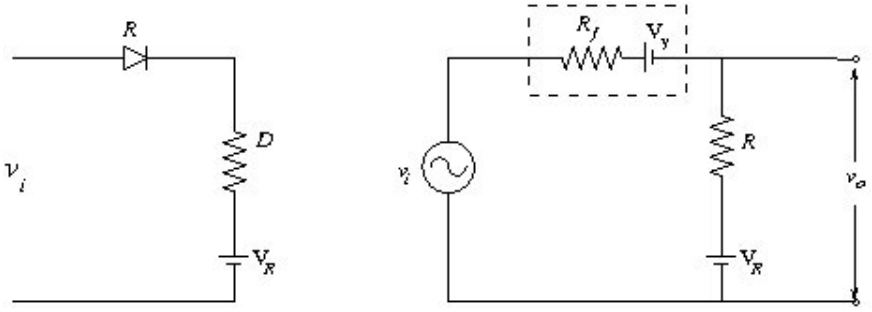

Figure 2(a)

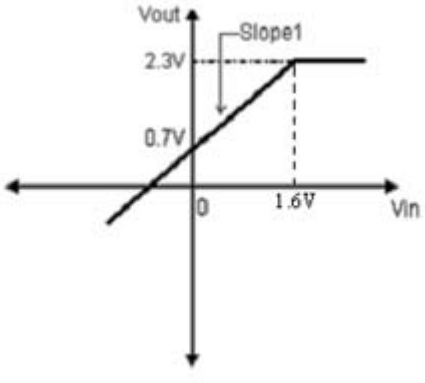

Figure 3 (a)

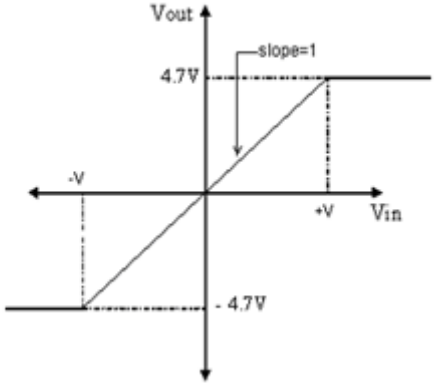

Figure 3 (b)

(a) Analyse the circuit of Fig. 2 (a), and plot V_o versus V_i for -5V < Vi < 5V. Assume the diode voltage drop to be 0.7 V when conducting.

(b) Using the result of (a), plot the waveform V_o (t) versus time for a triangular input voltage V_i (t), varying from -5V to +5V, with a frequency of 1 kHz.

(c) Simulate the circuit and verify your answers of (a) and (b).

(d) Design and simulate the circuit shown in Fig. 3 (a) and 3 (b).

Part III: Clamping Circuit

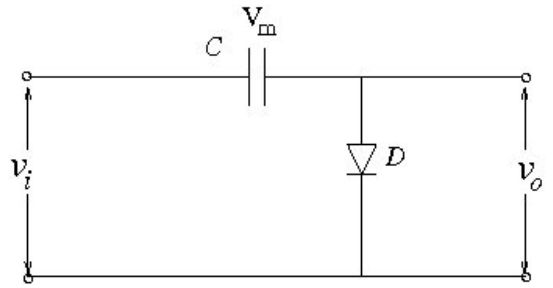

Figure 4 (a)

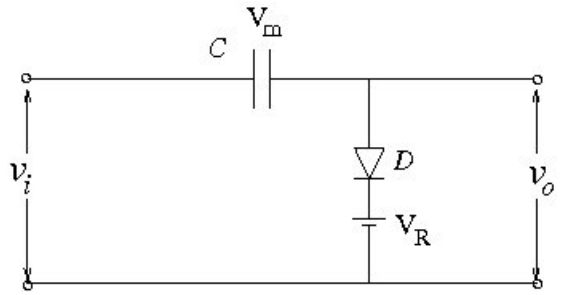

Figure 4 (b)

(a) Analyse the circuit of Fig. 4 (a), and plot V_o versus V_i for -5V < Vi < 5V. Assume the diode voltage drop to be 0.7 V when conducting.

(b) Using the result of (a), plot the waveform V_o (t) versus time V_i (t)

(c) Plot the waveform V_o (t) versus time for a sinusoidal input voltage V_i (t), varying from -5V to +5V, with a frequency of 1 kHz.

(d) Simulate the circuit and verify your answers of (a) and (b).

(e) Repeat (a) – (d) for Fig. 4 (b) with V_R=+1V and -1V.