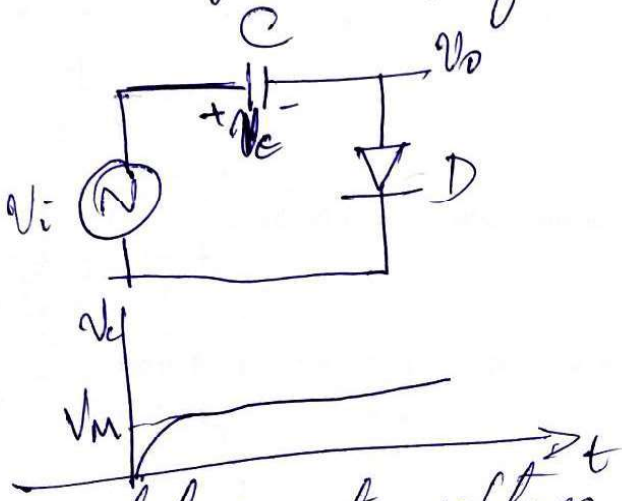
Clampers

Clamping shifts the entire signal voltage by a dc level. In steady state, the output waveform is an exact replica of the input waveform, but the output signal is shifted by a dc value that depends on the circuit. The distinguishing feature of a clamper is that it adjusts the dc level without needing to know the exact waveform.

An example clamping circuit is shown in Fig. The



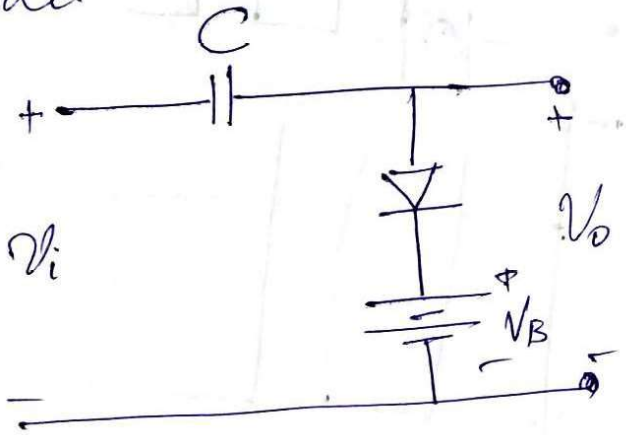
sinusoidal input voltage signal is also shown. Assume that the capacitor is initially uncharged. During the first 90° of the input waveform, the voltage across the capacitor follows the input and $v_c = v_i$ (assuming ideal diode). After v_i and v_c reach their peak values, v_i begins to decrease and the diode becomes reverse biased. Ideally, the capacitor cannot discharge

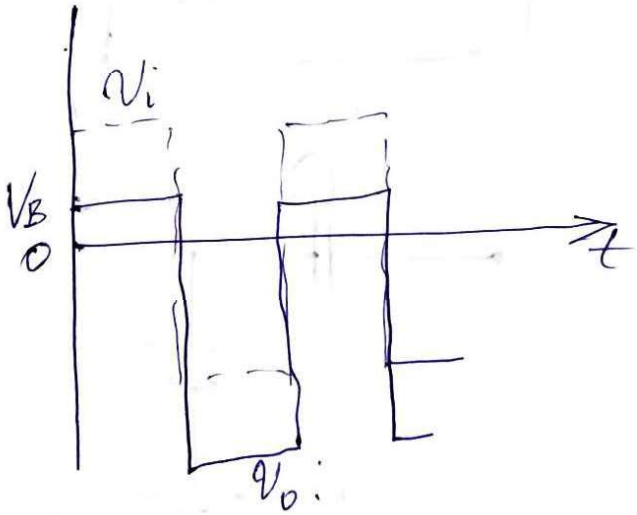
so the voltage across the capacitor remains constant at $v_c = V_M$. Now Kirchhoff's voltage law

$$v_o = -v_c + v_i = -V_M + V_M \sin(\omega t)$$

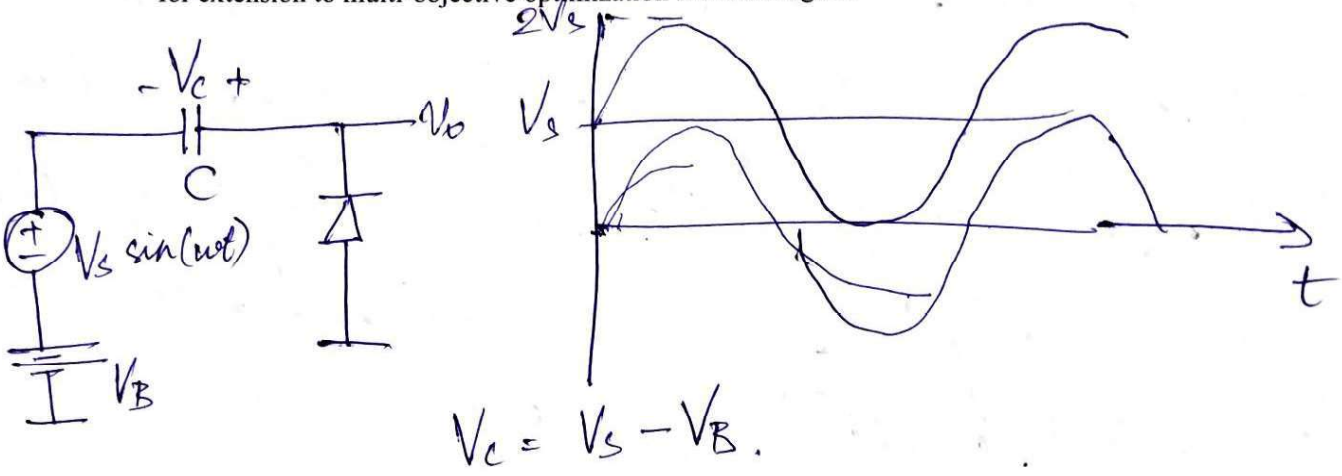
The capacitor and output voltages are shown. The output voltage is "clamped" at zero volts, that is $v_o \leq 0$. In steady state the waveshapes of the input and output signals are the same, and the output signal is shifted by a certain dc level compared to the input signal.

A clamping circuit that includes an independent voltage source V_B. In this circuit, the RC time constant is assumed to be large. Assuming ideal diode.





In summary, the novel GSO algorithm presented in this thesis should find numerous practical applications where multimodal and multidimensional cost functions are involved. The presented algorithm is population based and hence will lend naturally for extension to multi-objective optimization methodologies.



$$V_C = V_S - V_B.$$

