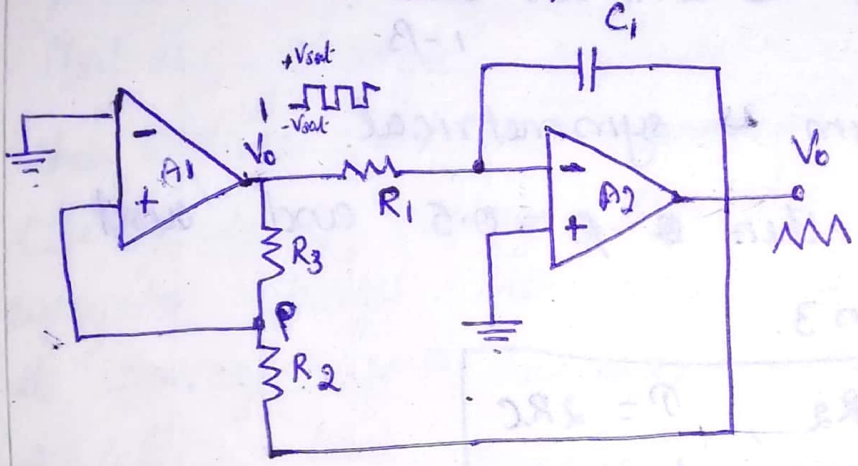
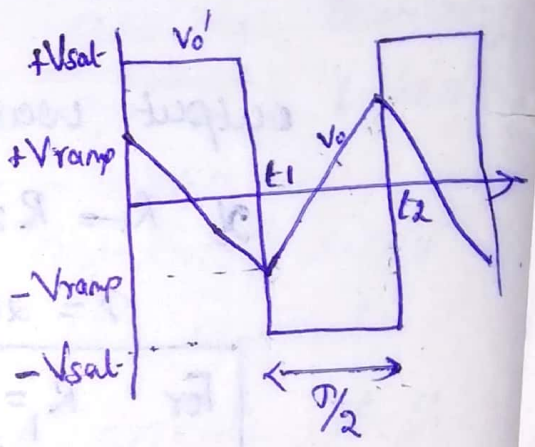
Triangular wave Generator.

Another triangular wave generator using lesser number of components is shown below.





It basically consists of a two level comparator followed by an integrator. The output of the comparator A_1 is a square wave of amplitude $\pm V_{sat}$ and is applied to the $(-)^{ve}$ input terminal of the integrator A_2 producing a triangular wave. This triangular wave is fed back as i/p to the comparator A_1 through a voltage divider $R_2 R_3$.

working

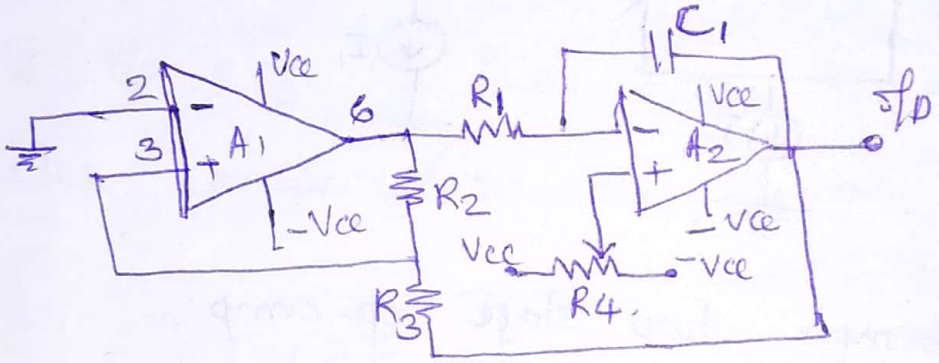
The comparator A_1 compares the voltage at point P continuously with the inverting input that is at 0V. When the voltage at P goes slightly below or above 0V, the output of A_1 is at the $-ve$ or $+^{ve}$ saturation level, respectively.

Consider that the output of comparator A_1 is at $+V_{sat}$. The o/p of the integrator A_2 will be a negative going ramp. Thus one end of the voltage divider $R_2 R_3$ is at a voltage $+V_{sat}$ and the other at the negative going ramp of A_2. At a time $t = t_1$, when the negative going ramp attains a value of $-V_{ramp}$, the effective voltage at point P becomes slightly less than 0V. This switches the output of A_1 from positive saturation to negative saturation level $-V_{sat}$. During the time when the output of A_1 is at $-V_{sat}$, the o/p of A_2 increases in the positive direction. At the instant $t = t_2$, the voltage at point P becomes just above 0V, thereby switching

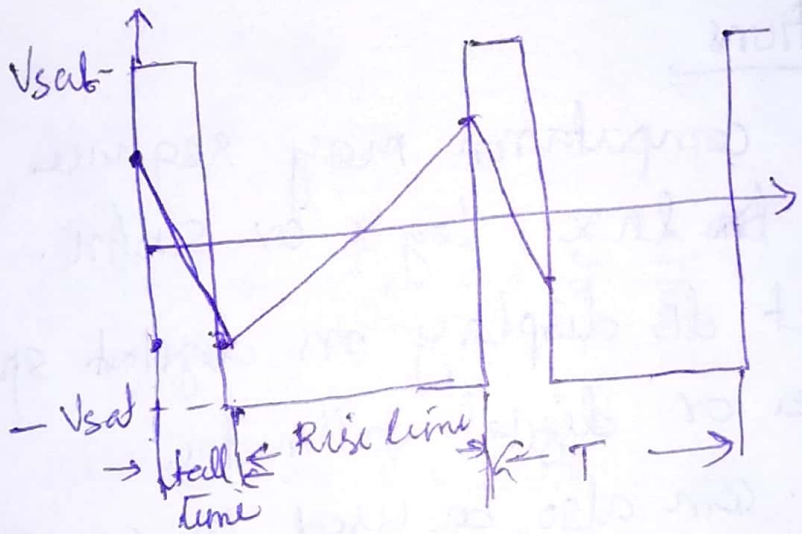
the output of A_1 from $-V_{sat}$ to $+V_{sat}$. The cycle repeats and generates a triangular waveform. The amplitude of the triangular wave depends upon the RC value of the integrator A_2 and the output voltage level of A_1.

Saw tooth waveform generators

The difference between the triangular and saw tooth waveforms is that the rise time of the triangular wave is always equal to its fall time i.e, the same amount of time is required for the triangular wave to swing from $-V_{ramp}$ to $+V_{ramp}$ as from $+V_{ramp}$ to $-V_{ramp}$. The saw tooth waveform has unequal rise and fall times



The triangular wave generator can be converted in to a saw tooth wave generator by injecting a variable dc voltage in to the non inverting terminal of integrator. Depending upon the R_4 setting, a certain dc level is inserted in the o/p of A_2. The o/p of A_1 is a square wave and the pot R_4 is adjusted to a certain dc level. i.e, the o/p of A_2 will be a triangular wave riding on some dc levels. The duty cycle of the square wave is determined by the polarity and amplitude of these dc level. A duty cycle less than 50% will cause the o/p of A_2 to be a saw tooth.



The pot's variable terminal is moved towards -Vcc, the rise time of the saw tooth wave will become longer than the fall time. On the other hand the variable point is moved towards +Vcc fall time becomes longer than the rise time. Also the freq. of the sawtooth wave decreases as R4 is adjusted towards +Vcc or -VEE. However the amplitude of sawtooth wave is independent of the pot position.