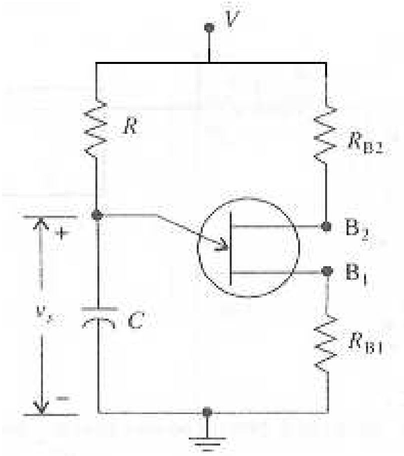
UJT sweep circuit (or) UJT relaxation oscillator :

UJT sweep circuit is shown in figure below.



Here initially voltage at emitter terminal of UJT is zero.

So UJT is in OFF state (replaced with an open circuit).

Now capacitor charges with a time constant RC .

At a particular instant voltage across the capacitor

(voltage at emitter terminal of UJT) is equal to the peak

Point voltage (V_P) of UJT. then UJT is said to be in ON state.

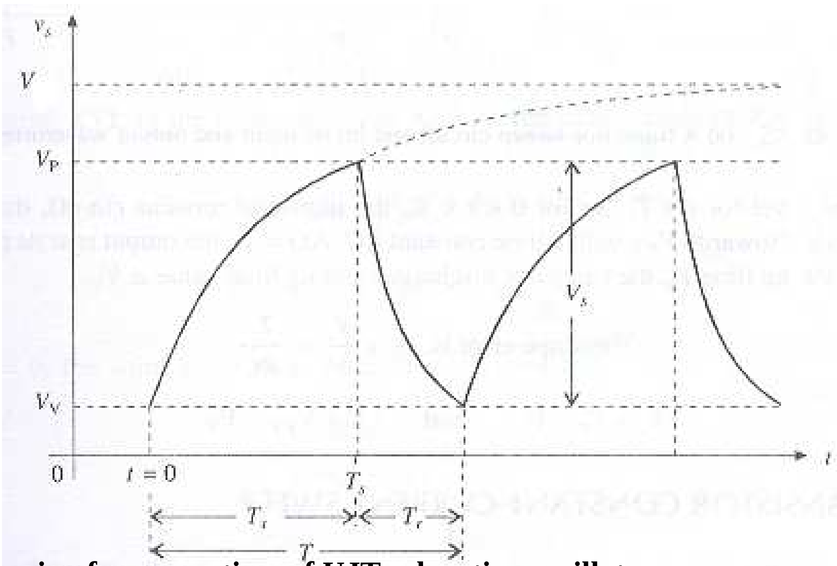
If UJT is in ON state ,capacitor discharges until voltage across

The capacitor is equal to the valley point voltage (V_V).

When ever voltage at emitter terminal is equal to valley point voltage

then UJT is in OFF state. This process is repeated.

The resultant waveform of the circuit is shown below.



Expression for sweep time of UJT relaxation oscillator:

If we neglect return time then sweep time is nothing but the time period of UJT relaxation oscillator.

We know here capacitor charges exponentially with a time constant RC ,

So $V_O = V + (V_V - V)e^{\frac{-t}{RC}}$ (by using general equation for exponential signals)

At $t = T_S$, $V_O = V_P$

Then $V_P = V + (V_V - V)e^{\frac{-T_S}{RC}}$

$$e^{\frac{-T_S}{RC}} = \frac{V_P - V}{V_V - V}$$

By taking natural logarithm,

$$T_S = RC \ln\left(\frac{V - V_V}{V - V_P}\right)$$

But generally $V >> V_V$,

$$T_S = RC \ln\left(\frac{V}{V - V_P}\right)$$

$$T_S = RC \ln\left(\frac{1}{1 - \frac{V_P}{V}}\right)$$

$$T_S = RC \ln\left(\frac{1}{1 - \eta}\right)$$

Where $\eta = \frac{V_P}{V}$, it is named as intrinsic stand of ratio of UJT.

Finally sweep waveforms generated from exponential charging circuits are not perfectly

Linear. So to improve the linearity of sweep waveforms there is a need of miller and

Boot strap time base generators.