Waveforms of the Astable Multivibrator:

We shall now explain the waveforms at both collector and bases.

Consider at t=0 , Q1 OFF &Q2ON ,

Assume that astable remains in this state for a time T_1.

At t = T_1 , the state of the device is Q1ON & Q2 OFF

Also consider astable remains in this state for a time T_2.

So the time period of astable is T= T_1+T_2

Case(i):

At t =0+ , Q1 OFF & Q2 ON ,

Here $v_{C2} = V_{CE(sat)}$

And $v_{B1} = V_{BE(sat)} - \left(V_{CC} - V_{CE(sat)}\right)$

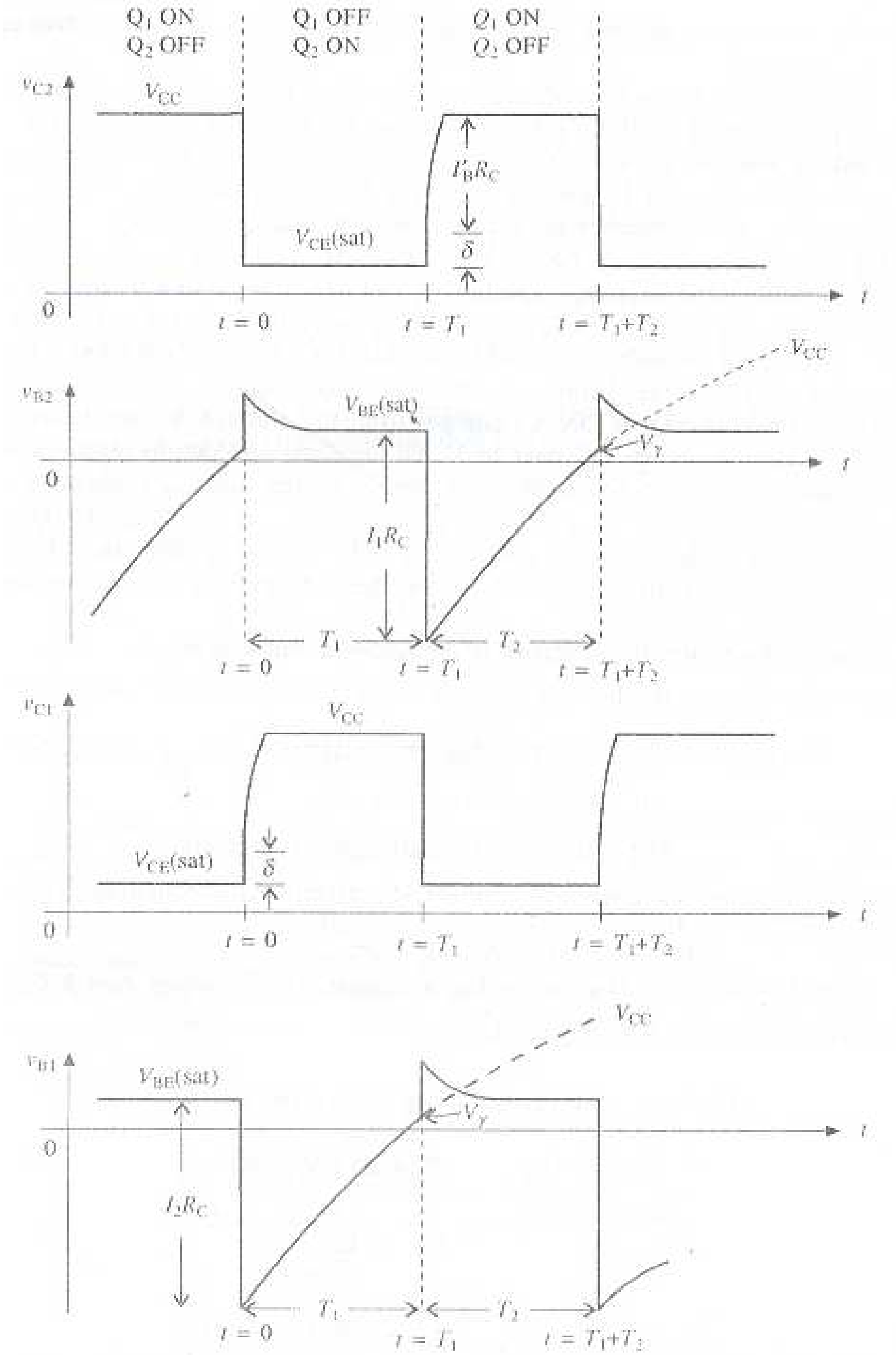
Due to the base spreading resistance of a transistor , a spike of amplitude δ appears at

Base terminal of Q2 and at collector terminal of Q1. (refer monostable multi)

After certain time (small) , $v_{C1} = V_{CC}, v_{B2} = V_{BE(sat)}$

During the interval 0 to T_1 , voltage at base terminal of Q1 increases exponentially with a

time constant R_1C_1 (by neglecting R_O). remaining voltage levels are constant



Case(ii):

At t =T_1+ , Q1 ON & Q2 OFF ,

Here $v_{C1} = V_{CE(sat)}$

And $v_{B2} = V_{BE(sat)} - \left(V_{CC} - V_{CE(sat)}\right)$

Due to the base spreading resistance of a transistor , a spike of amplitude δ appears at

Base terminal of Q1 and at collector terminal of Q2. (refer monostable multi)

After certain time (small) , $v_{C2} = V_{CC}, v_{B1} = V_{BE(sat)}$

During the interval T_1 to T_2 , voltage at base terminal of Q2 increases exponentially with

a time constant R_2C_2 (by neglecting R_O). remaining voltage levels are constant.

Time period of an astable multivibrator:

From the above waveforms we know $T = T_1 + T_2$

We know time taken by the multivibrator to remain in one quasi stable state is $T = 0.693RC$ (from monostable multi)

So here $T_2 = 0.693R_2C_2$

And $T_1 = 0.693R_1C_1$

Hence $T = 0.693(R_2C_2 + R_1C_1)$

If $R_1 = R_2 = R and C_1 = C_2 = C$ then $T = 1.386RC$