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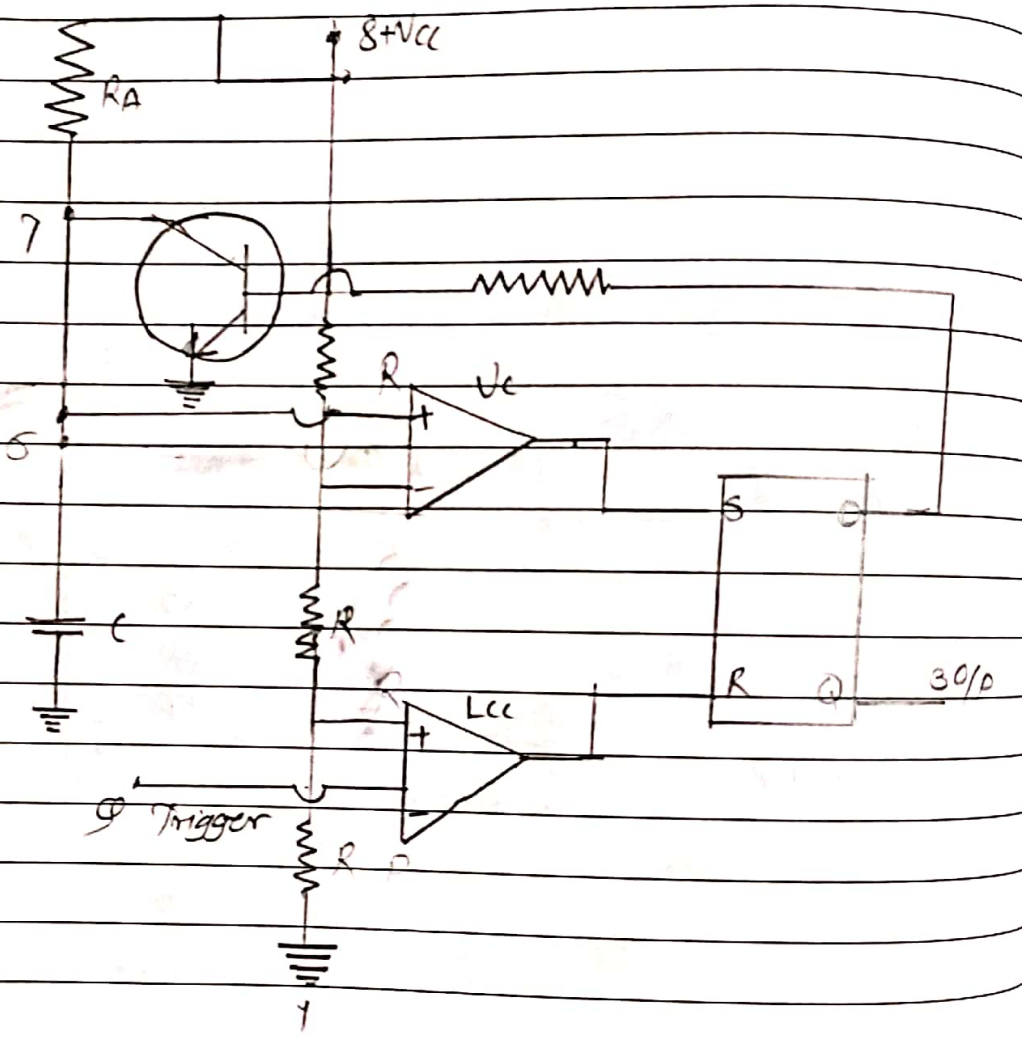
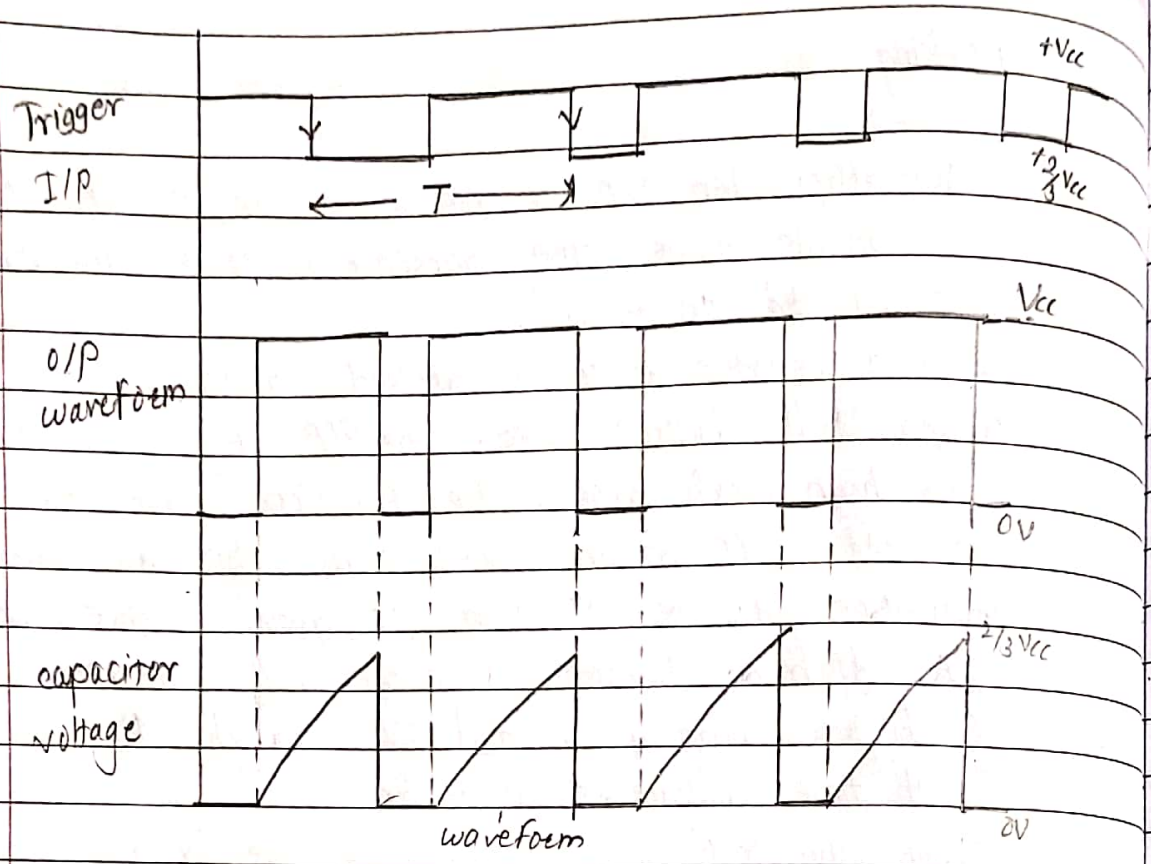
(Q3) Explain working of IC555 as a monostable multivibrator with the help of neat circuit diagram. Draw waveform & state the formula for pulse width.



Working

1) Initially, when O/P at pin 3 is low the circuit is in stable state. the transistor is ON & capacitor C is shorted to ground.
2) When a negative pulse is applied to pin 2, the trigger falls below $\frac{1}{3}V_{cc}$. The O/P of comparator goes high which resets the flip-flop & transistor turn off & O/P at pin 3 goes high. This is the transition of the O/P from to quasi stable state
3) As discharge transistor is cutoff, The capacitor 'C' begins charging toward $+V_{cc}$ through R_A with time constant equal to R_AC.
4) When the increasing capacitor voltage becomes slightly greater than $+\frac{2}{3}V_{cc}$, the O/P of comparator 1 goes high which sets the flip-flop. The capacitor 'C' which sets the Flip flop. The starts discharging & O/P of timer goes low. Thus O/P returns back to stable state from quasi-stable state.
5) The O/P of the monostable multivibrator remains low until a trigger pulse is again applied. Then the cycle repeats



Pulse width = W = 1.1 RC.

The voltage across capacitor C at any instant 't' is given by $V = V_{cc}(1 - e^{-t/RC})$

T (time constant) is time required for the capacitor to change from 0 to $\frac{2}{3} V_{cc}$.

$\therefore V = \frac{2}{3} V_{cc}$

$t = T$

$$\frac{2}{3} V_{cc} = V_{cc}\left(1 - e^{-t/RC}\right)$$

$$T = RC \log_e \left(\frac{V_{cc}}{V_{cc} - \frac{2}{3}V_{cc}}\right) = 1.1\,RC$$

$\therefore T = 1.1RC = W =$ pulse width.