GATE 2022 IN 36

EE23BTECH11065 - prem sagar

Question:
A signal $V_{in}(t)$ shown is applied from t=0ms to t=6ms to the circuit shown Given the intial voltage across capacitor is 0.3V, and that the diode is ideal,the open circuit voltage $V_{out}(t)$ at t=5ms is
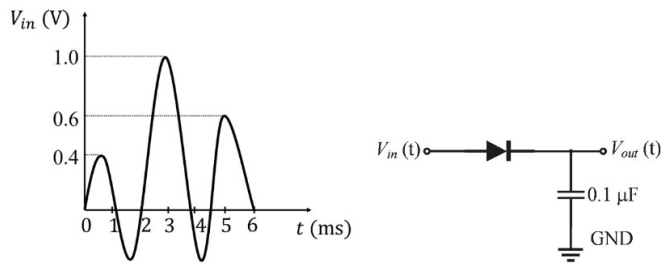

Fig. 1.

Solution:

Symbol	Value	Description
$V_{in}(t)$		input signal
$V_c(t)$		voltage across capacitor
$V_c(0)$	0.3V	intial voltage across capacitor
$v_{out}(t)$		open circuit voltage

TABLE 1

INPUT PARAMETERS

From Table 1
the circuit is a positive peak detector circuit

$$V_c(t) = V_{in}(t) - V_{out}(t) \tag{1}$$

as diode is ideal
during positive half cycle of input signal it conducts allowing capacitor to charge to the peak voltage of input

$$V_{out}(t) = V_c(t) \tag{2}$$
$$= 1V \tag{3}$$

once the capacitor is charged to 1V it retains this voltage due to ideal diode's behaviour and open circuit condition. ∴ at t=5ms

$$V_{out} = 1V \tag{4}$$