Timing Circuits Exercises

Question 1

Calculate the time constant of an RC circuit where C = 100 µF and R = 47 kΩ

Question 2

An RC circuit has a time constant of 100 ms and a capacitor value of C = 56 nF. Calculate the value of the resistor in the circuit

Question 3

Calculate the time period of a 555 monostable where the timing component are C = 220 µF and R = 120 kΩ

Question 4

A NAND gate monostable requires a time period of 20 ms and uses a resistor value of 1 MΩ. Calculate a suitable value for the timing capacitor

Question 5

Give one advantage of using a NAND gate monostable instead of a 555 monostable

Question 6

A 555 monostable requires a time period of 1.0 s with a capacitor value of 47 µF. Calculate a suitable resistor value

Question 7

A 555 astable uses a 10 kΩ resistor for Ra, a 22 kΩ for Rb and C = 33 µF. Calculate the time period of the astable circuit

Question 8

For the astable in question 7, calculate the frequency of the astable circuit

Question 9

For the astable in question 7, calculate the mark-space ratio

Timing Circuits Answers

Question 1

Using $\tau = RC$ gives the time constant as $\tau = 47 \times 10^{3} \times 100 \times 10^{-6} = 4.7\,s$

Question 2

Rearranging $\tau = RC$ gives $R = \tau / C$ therefore $R = 100 \times 10^{-3} / 56 \times 10^{-9} = 1.8\,M\Omega$

Question 3

Using $T = 1.1RC$ gives a time period of $T = 1.1 \times 120 \times 10^{3} \times 220 \times 10^{-6} = 29\,s$

Question 4

$T = 0.7RC$ gives $C = T / (0.7R)$ therefore $C = 20 \times 10^{-3} / (0.7 \times 1 \times 10^{6}) = 29\,nF$

Question 5

A NAND gate monostable will give the required time period even when the trigger is held permanently LOW.

Question 6

Rearranging $T = 1.1RC$ gives $R = T / (1.1C)$. $R = 1 / (1.1 \times 47 \times 10^{-6}) = 19\,k\Omega$

Question 7

Using $T = 0.7(Ra + 2Rb)C$ gives $T = 0.7 \times (10 \times 10^{3} + 2 \times 22 \times 10^{3}) \times 33 \times 10^{-6} = 1.2\,s$

Question 8

Using $f = 1 / T$ gives $f = 1 / 1.2 = 0.8\,Hz$

Question 9

Using the equation for mark-space ratio, $T_{ON} / T_{OFF} = (Ra + Rb) / Rb$, the mark- space ratio is given by $(10 + 22) / 22 = 1.45$. The mark-space ratio is 1.45:1.0