# LAB-1 REPORT

**TABLE NO:-42**
**ROOM NO:-117**
**NAME:-SANTHOSH**
**ROLL NO:-2024102054**
**NAME:-AKSHAY**
**ROLL NO:-2024102014**

## OBJECTIVE:-

to compare the theoretical value and practical values of time constant,cutoff frequency,using the digital Storage oscilloscope

## EQUIPMENT REQUIRED:

Breadboard,Resistors (various values) ,Capacitors (various values), Digital Storage Oscilloscope (DSO),Connecting wires

## PROCEDURE:

Take a resistor and capacitor in which the capacitance is known and the resistance should be calculated by multimeter

Now take the DSO (digital storage oscillator ) take the input as square wave for the first signal

Connect the potential difference between capacitor to the second signal which will be a exponential increase and decrease

The increasing curve represents charging of the capacitor and the decreasing curve represents the discharging of the capacitor

Now calculate the theoretical value of the time constant

Time constant=RC

Calculate the time at which the potential difference becomes 63rd percentage of its highest value by referring the initial time as zero

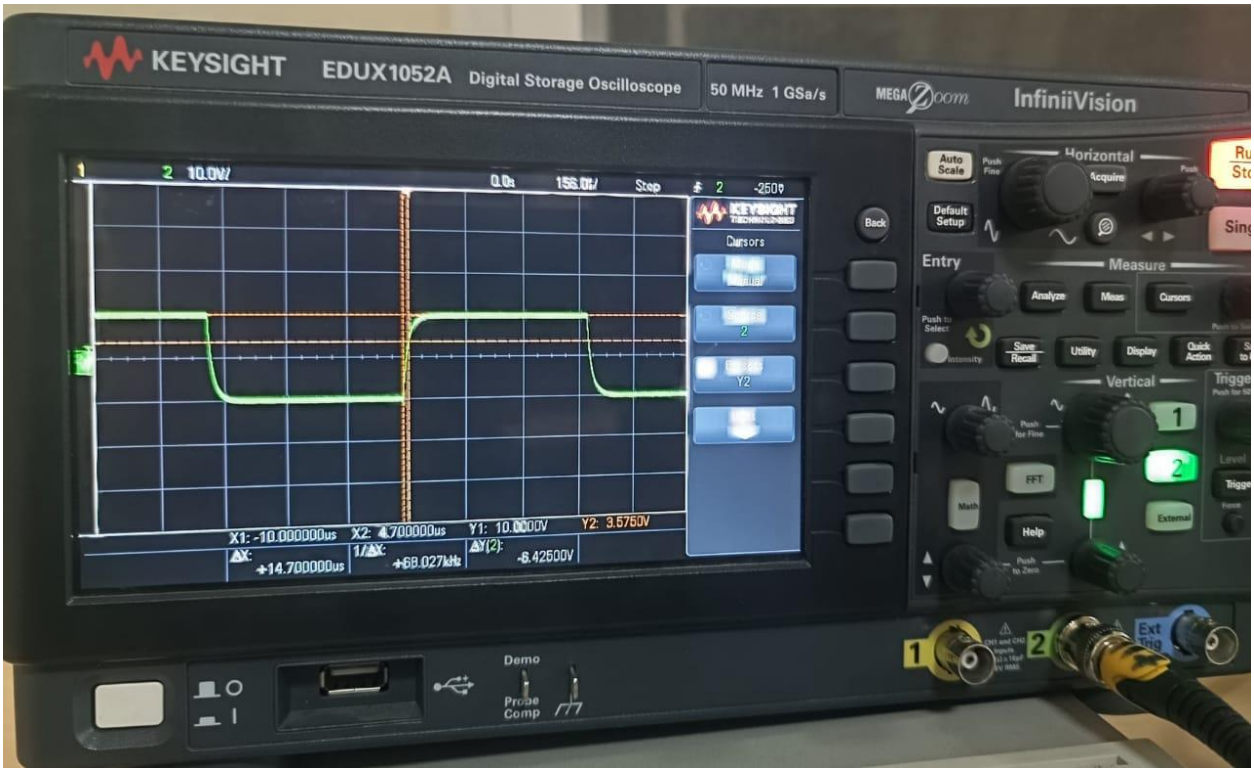
Compare the theoretical and practical value of the time constant

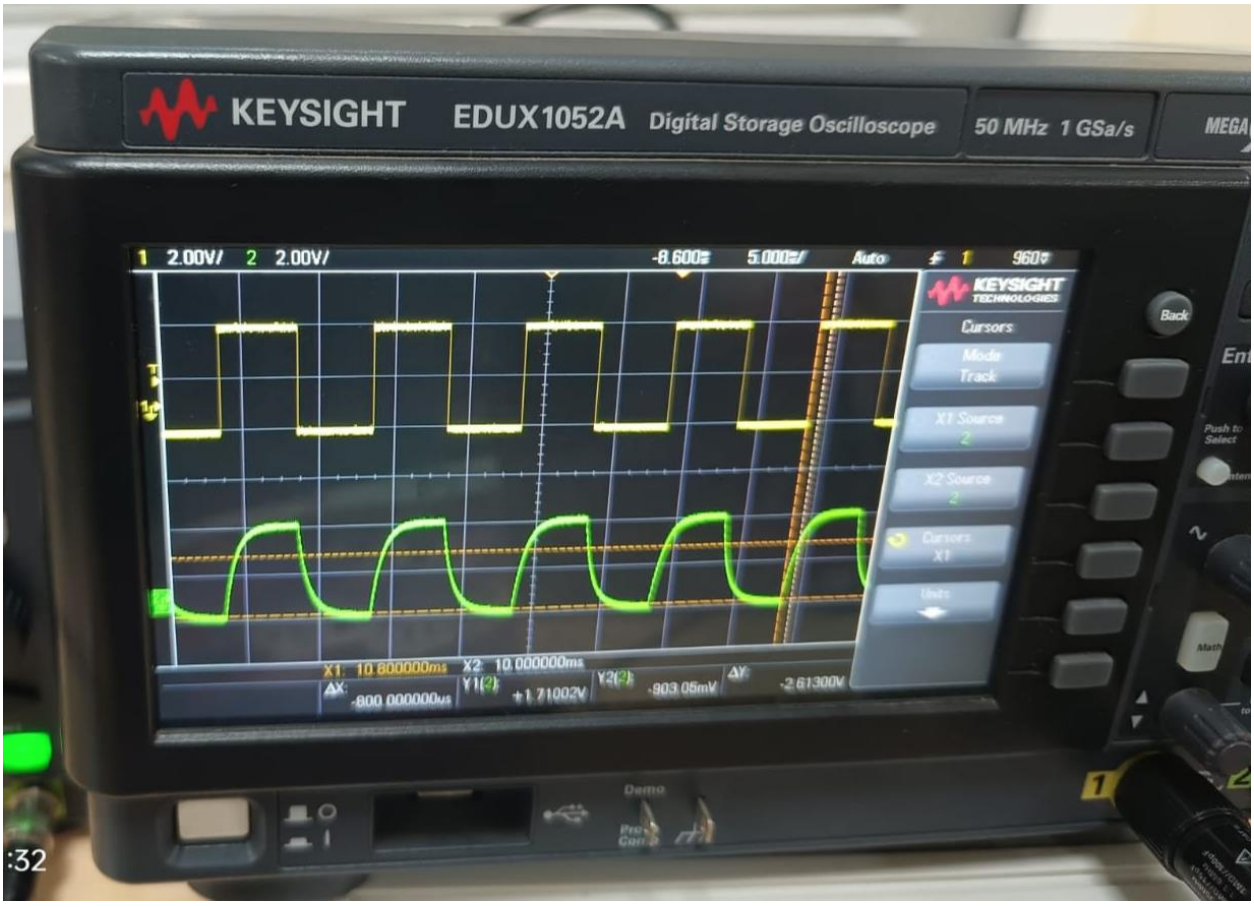
Perform it for 2 resistances and compare them

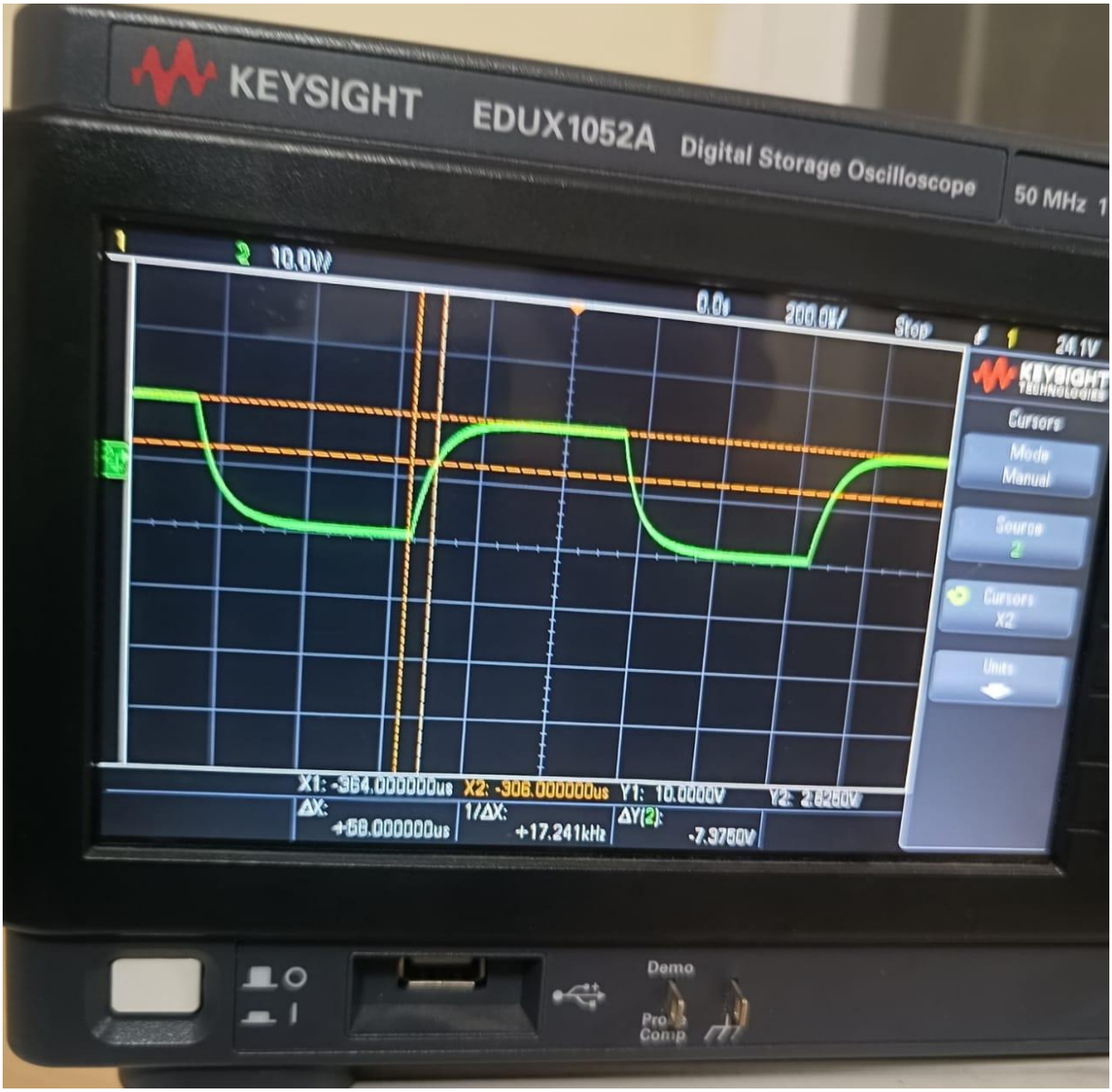
## OBSERVATIONS AND RESULTS:

| s.no | R(in Ω) | C(in μf) | Time const (theoretical) (in μs) | Time Const (practical) (in μs) | Cutoff Freq (theoretical) (In k hz) | Cutoff Freq (practical) (in k hz) |
|---|---|---|---|---|---|---|
| 1) | 10000 | 0.1 | 1000 | 800 | 0.16 | 0.15 |
| 2) | 11600 | 0.001 | 11.6 | 14.7 | 13.7 | 10.8 |
| 3) | 46600 | 0.001 | 46.6 | 58 | 3.41 | 2.7 |

## DSO IMAGES AND CALCULATIONS


KEYSIGHT
EDUX1052A
Digital Storage Oscilloscope
50 MHz 1 GSa/s
InfiniiVision
Horizontal
Vertical
Entry
Measure
Cursors
Back
Demo
Probe Comp


KEYSIGHT
EDUX1052A
Digital Storage Oscilloscope
50 MHz 1 GSa/s
1 2.00V/ 2 2.00V/
Cursors
Mode
Track
Back
Demo


KEYSIGHT
EDUX1052A
Digital Storage Oscilloscope
50 MHz
10.0V/
0.0s
200.0V/
Stop
24.1V
Cursors
Mode
Manual
Source
2
Cursors
X2
Units
X1: -364.000000us
X2: -306.000000us
Y1: 10.0000V
ΔX:
+58.000000us
1/ΔX:
+17.241kHz
ΔY(2):
-7.3750V
Demo
Comp

$R = 10 \times 10^3\ \Omega$

$C = 10^{-7}\ F = 0.1\ \mu F$

$T = RC = (10 \times 10^3\ \Omega)(10^{-7}\ F)$

$= 10^{-3}$ sec

Experimental
Time constant : $0.8 \times 10^{-3}$ sec

Calculated
Time constant : $10^{-3}$ sec

$$f = \frac{1}{2\pi RC}$$

$$= \frac{1}{(2)(3.14)(10^{-3})}$$

$$= 0.16 \times 10^3$$

$$= 1.6 \times 10^2$$

cut off frequency $= 1.6 \times 10^2$

Experimental $= 150\ Hz$

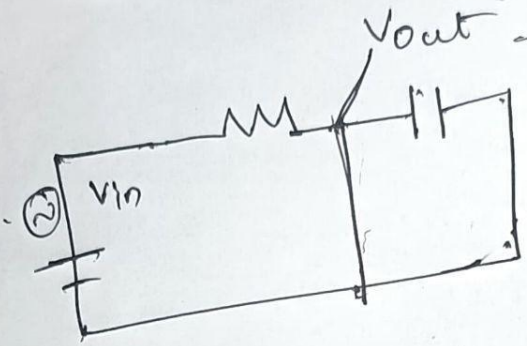
S V. santosh  CH. Akshay

$11.6 \times 10^3 \Omega$

$46.6 \times 10^3 \Omega$

10.4
9.7
21.1 × 0.63
= 13.293
9.700
3.593

27.62
7.56
20.12




$\lambda = \frac{1}{RC}$

$\tau = RC$

4.25
4.43
9.68

19.25
6.09

$C = 0.001 \mu f$
$= 10^{-3} \mu f$
$= 10^{-3} \times 10^{-6} f$
$= 10^{-9} f$
$C = 1nf$

$\tau = 46.6 \times 10^3 \times 10^{-9}$

$\tau = 46.6 \mu s$

20 × 0.63
= 6.3 × 2
12.6 − 10
= 2.6

(1) $\tau = 11.6 \mu s$
14 × 4 μs

$t = \tau$

$q = CE\left[1 - e^{-\frac{RC}{RC}}\right]$

$= CE\left[1 - \frac{1}{e^1}\right]$

$q = 0.63\, CE$

$V = \frac{q}{C} = 0.63E$

$q = CE\left[1 - e^{-t/RC}\right]$

$t \to \infty$

$q = CE[1 - 0]$

$q_{max} = CE$

$V_{max} = \frac{q_m}{C} = E$

→ Experimental : 58 lls
→ calculated : 46.6 lls

(2) 9.625
10
19.625

Tanuja

## CONCLUSION:

There is a cutoff frequency which is calculated as 1/(2.(pi).RC) after which the capacitor charges and discharges very quickly in which the maximum value cannot be reached the time constant also cannot achieve its exact value due to some errors in the instrument