Ganpat University

Faculty of Engineering & Technology

Computer Science & Engineering

***Name:-*** ***Dwij Vatsal Desai***

***Sem:-*** ***2***

***Sub: -*** ***BCS***

***Enrollment No.:-*** ***23162121027***

***Prac:-*** ***9***

# Practical – 9

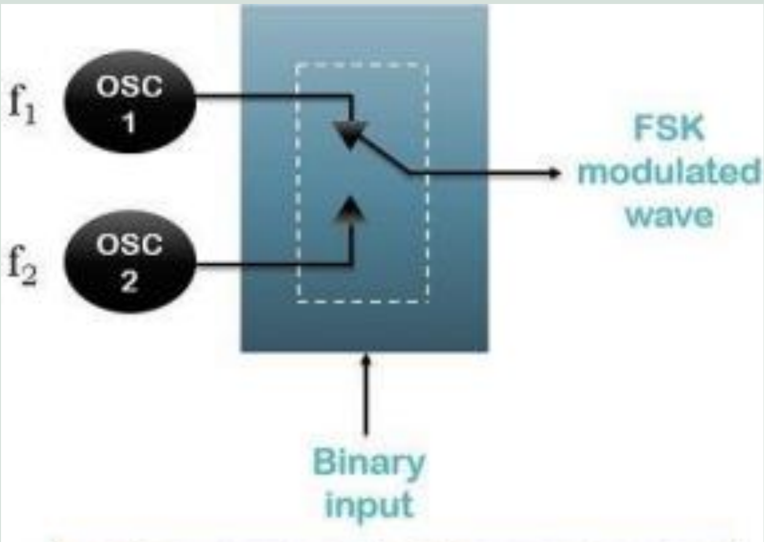
**Aim:** To perform Frequency Shift Keying (FSK) Modulation and Demodulation

## Student Group Detail

| No | Enrollment No. | Student Name |
|---|---|---|
| 1 | 23162121027 | Dwij Desai |
| 2 | 23162121020 | Aagam shah |
| 3 | 23162121024 | Priyal soni |

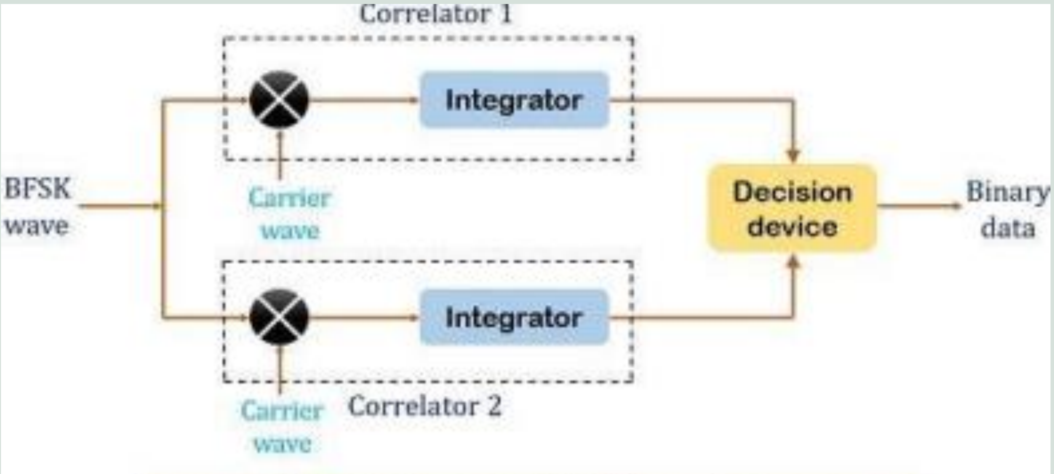
## Block Diagram

1. **Frequency Shift Keying (FSK) Modulation**



Generation of FSK waveform

2. Frequency Shift Keying (FSK) Demodulation



Block diagram of BFSK receiver

**Description:**

**Modulation**

In wireless transmission, wider communication bandwidth is almost always the key to better reception and signal recovery. Frequency modulation types can therefore show better performance on received signal quality. In digital data transmission, this corresponds to Frequency Shift Keying (FSK). FSK is a type of FM where the modulating signal assumes discrete values and shifts the output frequency to a set of predetermined discrete frequency values. If the information consists of only two values (binary), they are sometimes referred as the mark and space frequencies. An example binary information signal and FSK modulated signal are shown in the following figure.

In frequency shift keying, the signals transmitted for spaces (binary zeros) and marks (binary ones) are

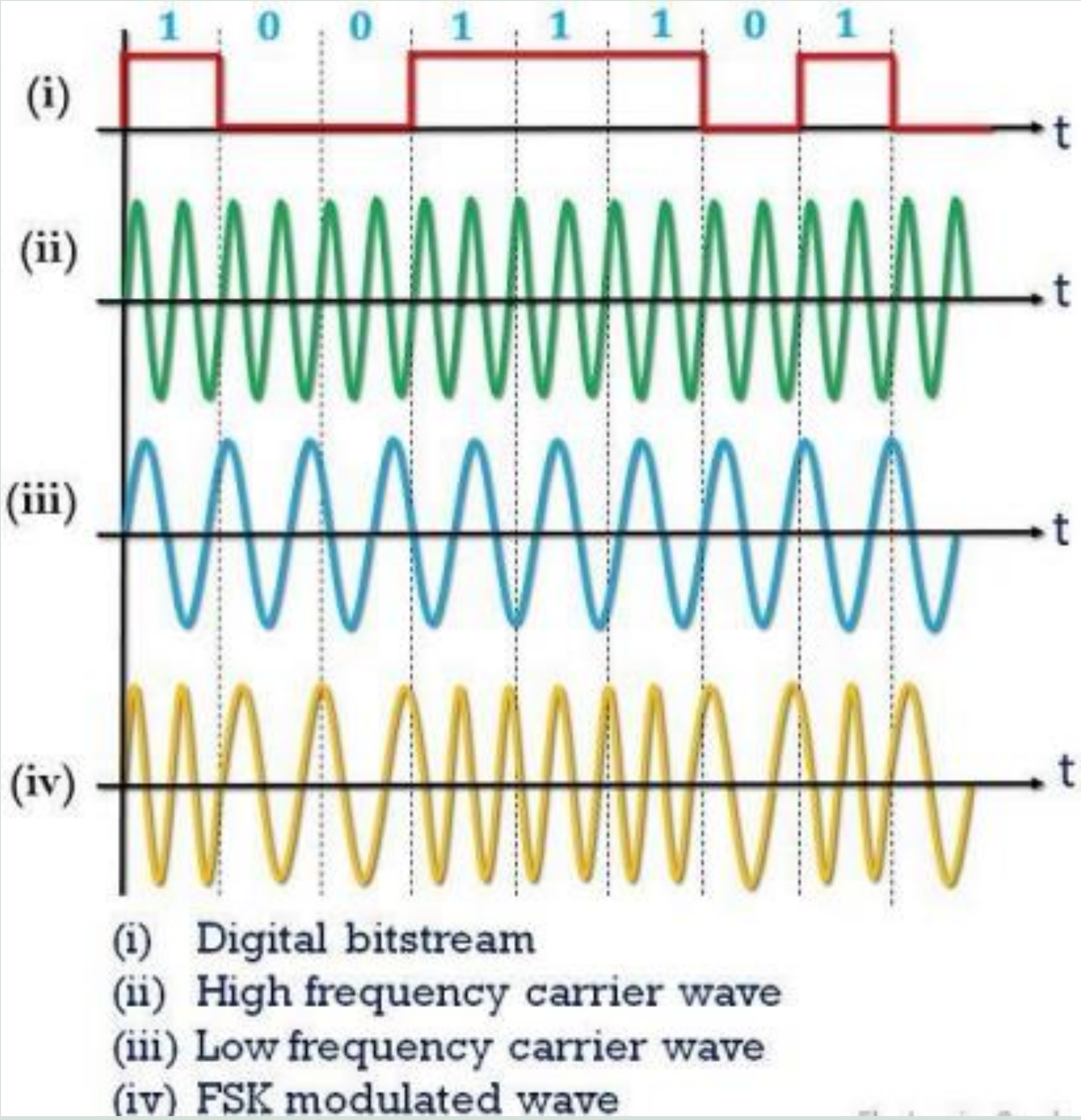
$$s_0(t) = A\cos(2\pi f_0 t + t_0), \quad 0 < t \leq T_b$$
$$s_1(t) = A\cos(2\pi f_1 t + t_0), \quad 0 < t \leq T_b$$

respectively, where ��$_0$ is an arbitrary initial phase. This is called a discontinuous phase FSK system, since the sinusoidal are generated independently and therefore the modulated signal is discontinuous at the switching times.

## Demodulation

Demodulation of FSK signal can be done by converting FSK to ASK by a filter whose ascending/descending slope is centered between two FSK frequencies, followed by an ASK demodulator. Similar to synchronous demodulators, these two discrete frequencies can also be replicated at the receiver (via PLLs) and a synchronous demodulation can be performed.

**Expected Waveforms:**



1 0 0 1 1 1 0 1
(i)
(ii)
(iii)
(iv)
t
(i) Digital bitstream
(ii) High frequency carrier wave
(iii) Low frequency carrier wave
(iv) FSK modulated wave

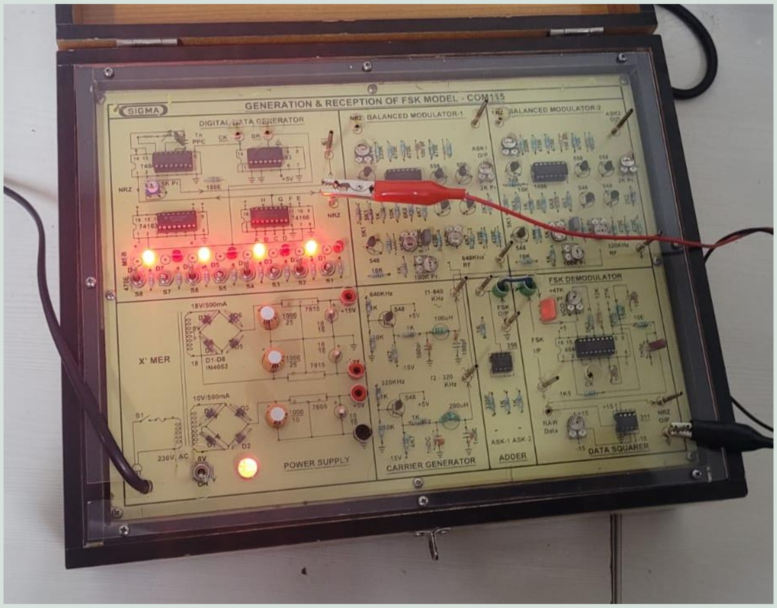
**Observations:**

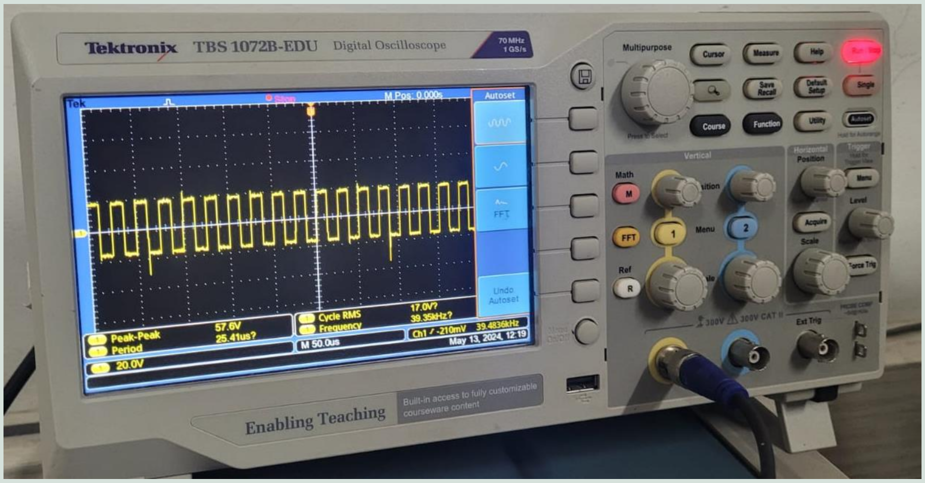
**Circuit Diagram**

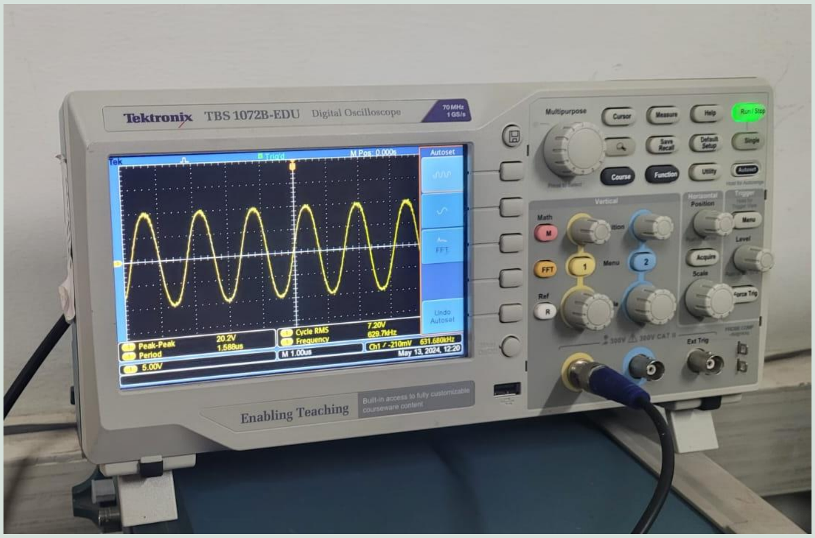
**Case 1**

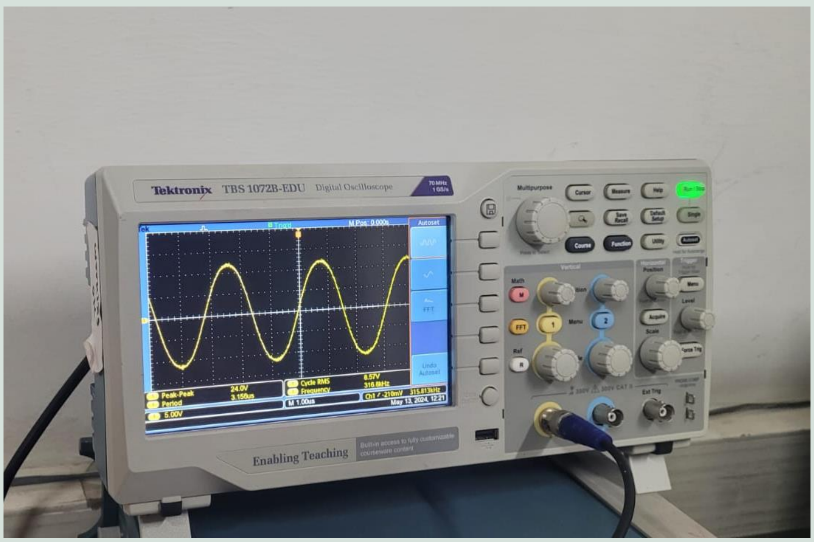
· Data: 11001100(Aagam shah)

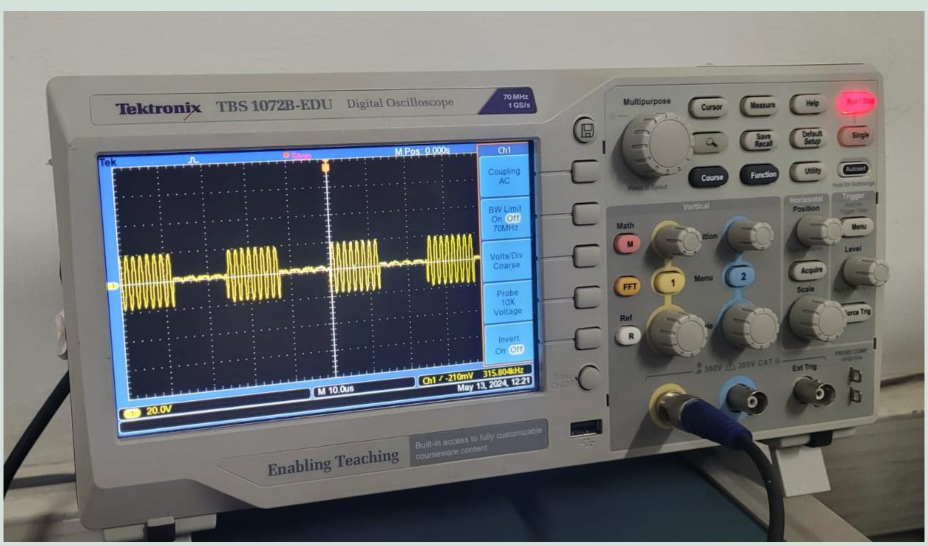
· Waveforms

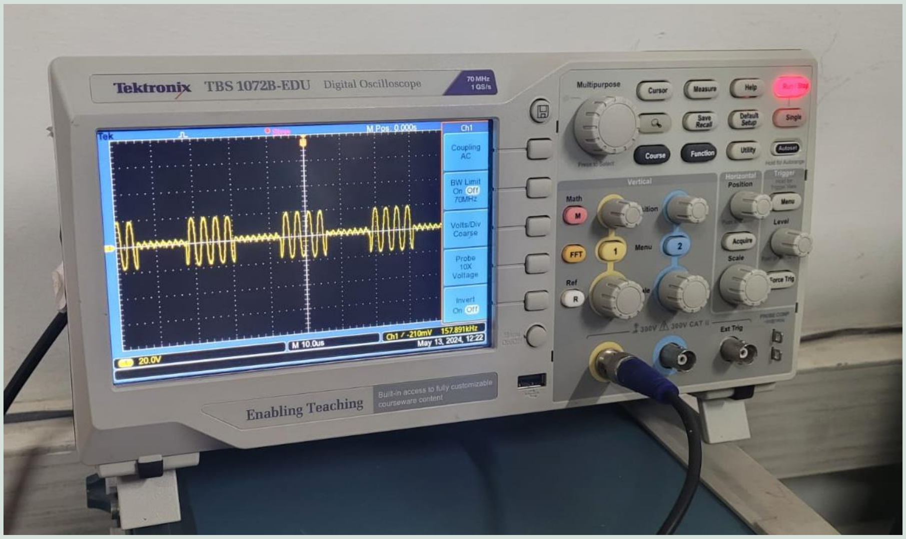


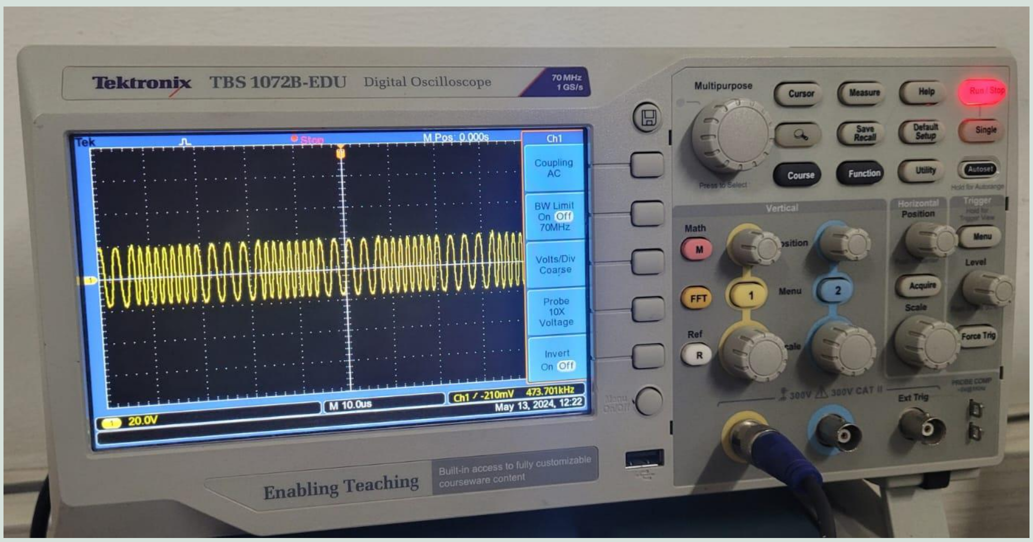



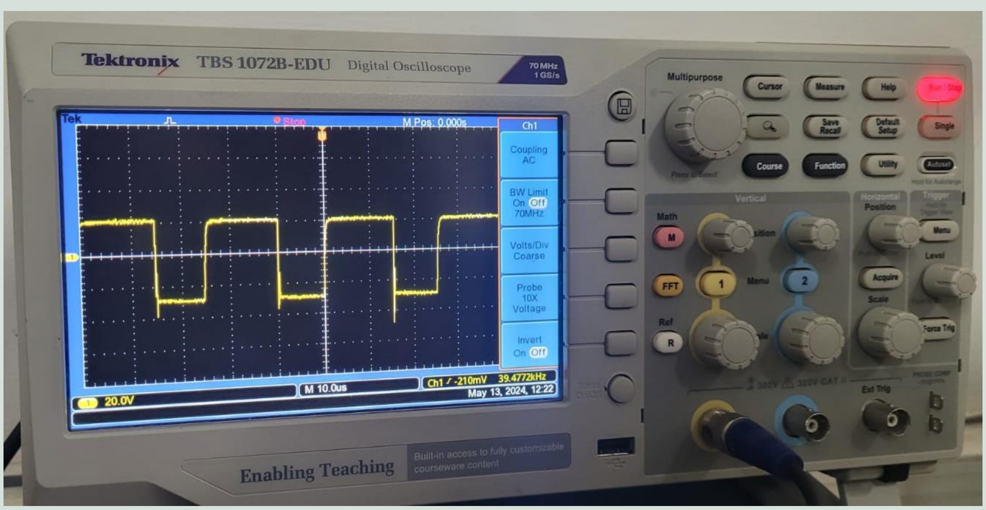

Tektronix
TBS 1072B-EDU
Digital Oscilloscope
Enabling Teaching


Tektronix
TBS 1072B-EDU
Digital Oscilloscope
Enabling Teaching


Tektronix
TBS 1072B-EDU
Digital Oscilloscope
Enabling Teaching


Tektronix
TBS 1072B-EDU
Digital Oscilloscope
70 MHz
1 GS/s
Tek
Stop
M Pos: 0.000s
Ch1
Coupling
AC
BW Limit
On Off
70MHz
Volts/Div
Coarse
Probe
10X
Voltage
Invert
On Off
M 10.0us
Ch1 ∕ -210mV
157.891kHz
May 13, 2024, 12:22
20.0V
Enabling Teaching
Built-in access to fully customizable courseware content

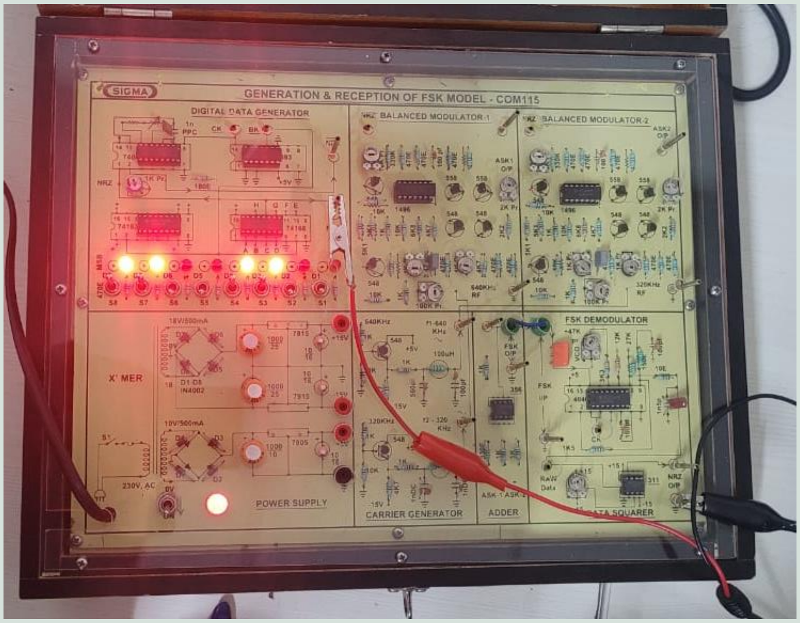

Tektronix
TBS 1072B-EDU
Digital Oscilloscope
70 MHz
1 GS/s
Multipurpose
Cursor
Measure
Help
Run / Stop
Save Recall
Default Setup
Single
Course
Function
Utility
Autoset
Vertical
Math
M
FFT
Ref
R
Menu
Horizontal
Position
Acquire
Scale
Trigger
Level
Force Trig
Ext Trig
Tek
Stop
M Pos: 0.000s
Ch1
Coupling
AC
BW Limit
On Off
70MHz
Volts/Div
Coarse
Probe
10X
Voltage
Invert
On Off
M 10.0us
Ch1 ∕ -210mV
473.701kHz
May 13, 2024, 12:22
20.0V
Enabling Teaching
Built-in access to fully customizable courseware content

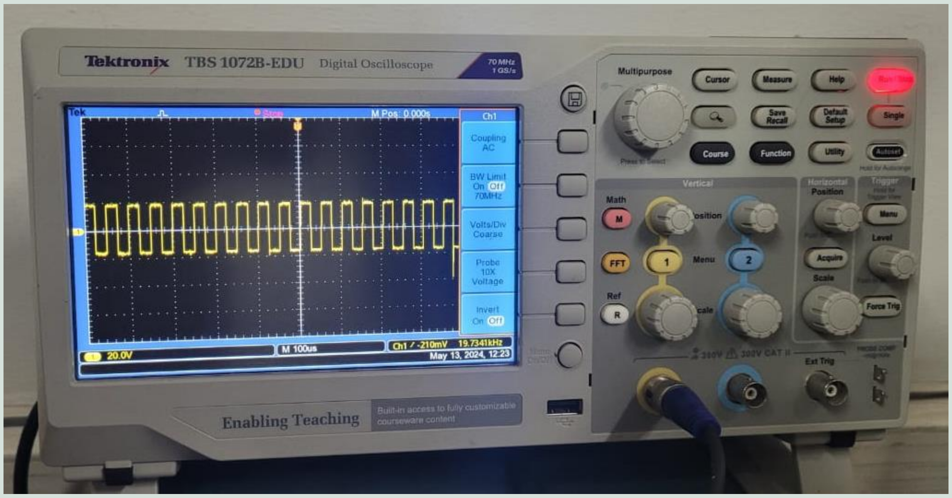

Tektronix
TBS 1072B-EDU
Digital Oscilloscope
70 MHz
1 GS/s
Multipurpose
Cursor
Measure
Help
Save Recall
Default Setup
Single
Course
Function
Utility
Autoset
Tek
Stop
M Pos: 0.000s
Ch1
Coupling
AC
BW Limit
On Off
70MHz
Volts/Div
Coarse
Probe
10X
Voltage
Invert
On Off
M 10.0us
Ch1 ∕ -210mV
39.4772kHz
May 13, 2024, 12:22
20.0V
Enabling Teaching
Built-in access to fully customizable courseware content

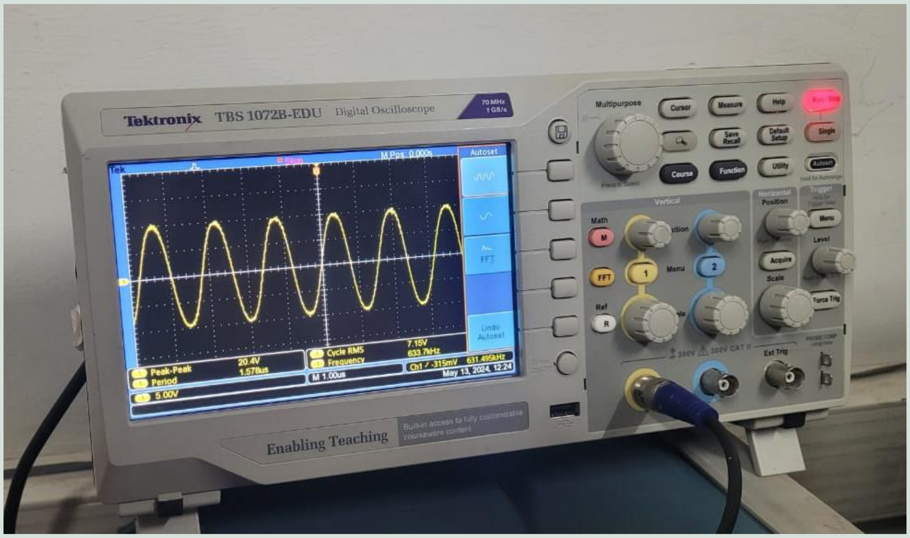
## Case 2

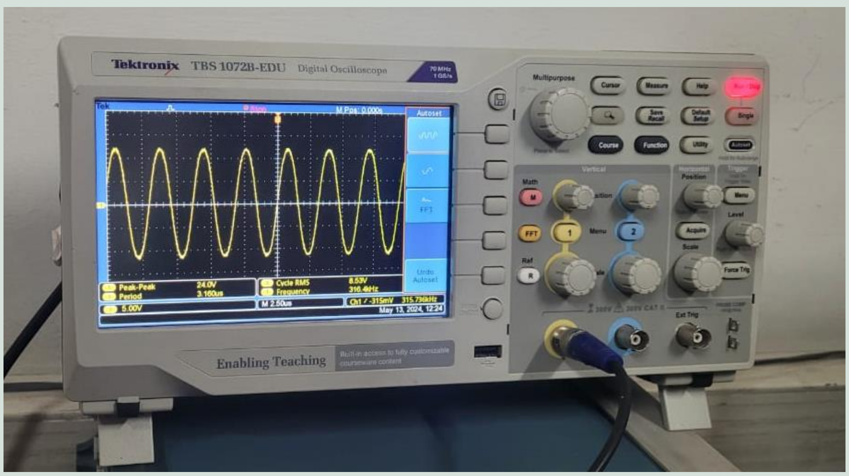
· Data: 10101010(Dwij Desai)

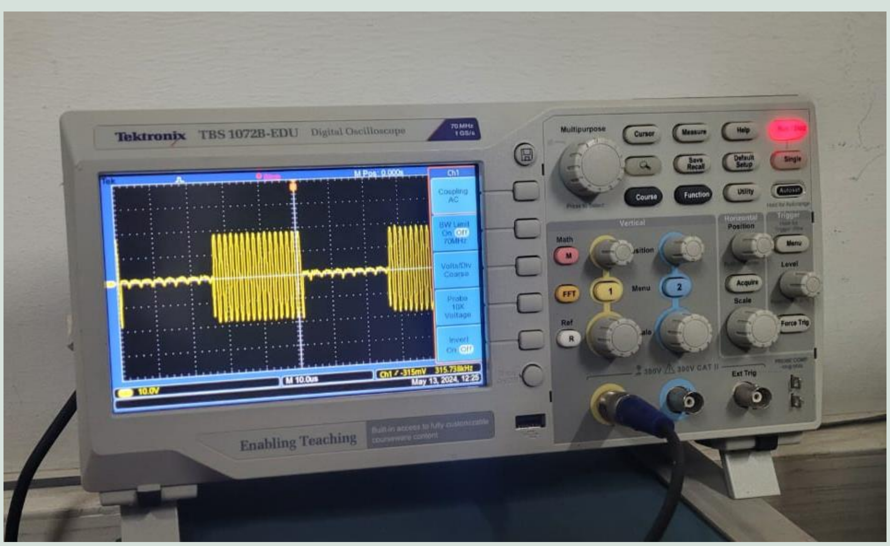
· Waveforms

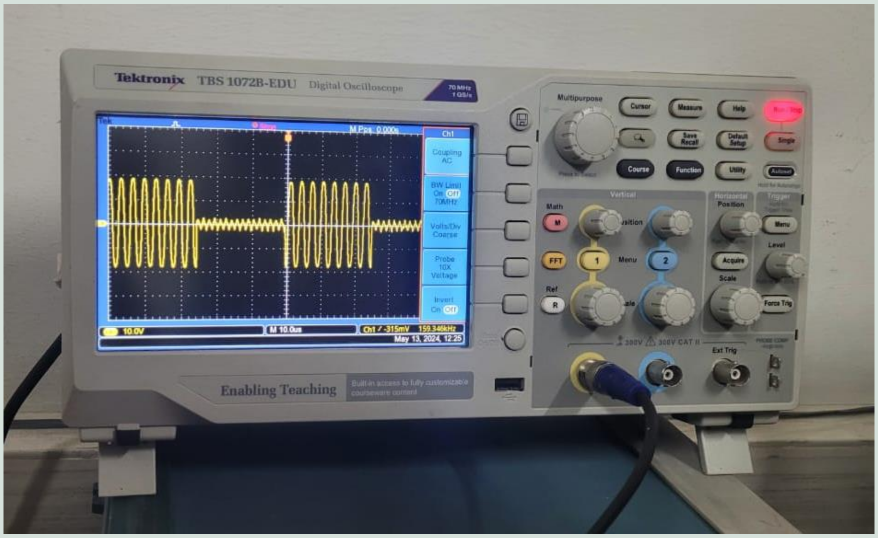


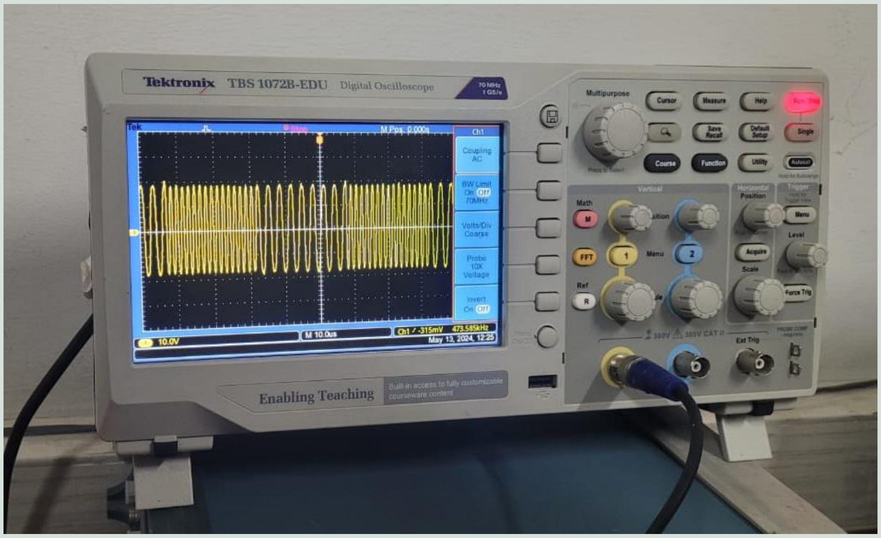



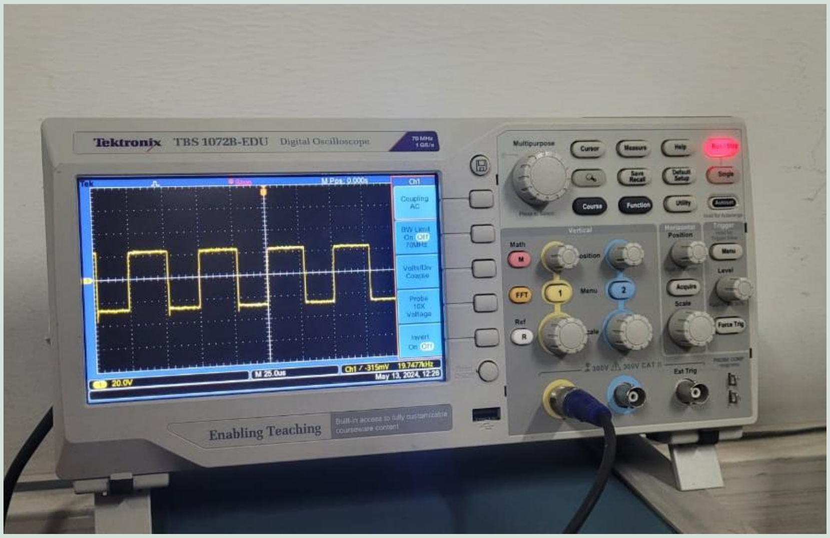

Tektronix
TBS 1072B-EDU
Digital Oscilloscope
Peak-Peak 20.4V
Period 1.578us
Cycle RMS 7.15V
Frequency 633.7kHz
M 1.00us
5.00V
May 13, 2024, 12:24
Enabling Teaching


Tektronix
TBS 1072B-EDU
Digital Oscilloscope
Peak-Peak 24.0V
Period 3.160us
Cycle RMS 8.53V
Frequency 316.4kHz
M 2.50us
5.00V
May 13, 2024, 12:24
Enabling Teaching


Tektronix
TBS 1072B-EDU
Digital Oscilloscope
10.0V
M 10.0us
May 13, 2024, 12:28
Enabling Teaching


Tektronix
TBS 1072B-EDU
Digital Oscilloscope
10.0V
M 10.0us
Ch1 / -315mV 159.346kHz
May 13, 2024, 12:25
Enabling Teaching

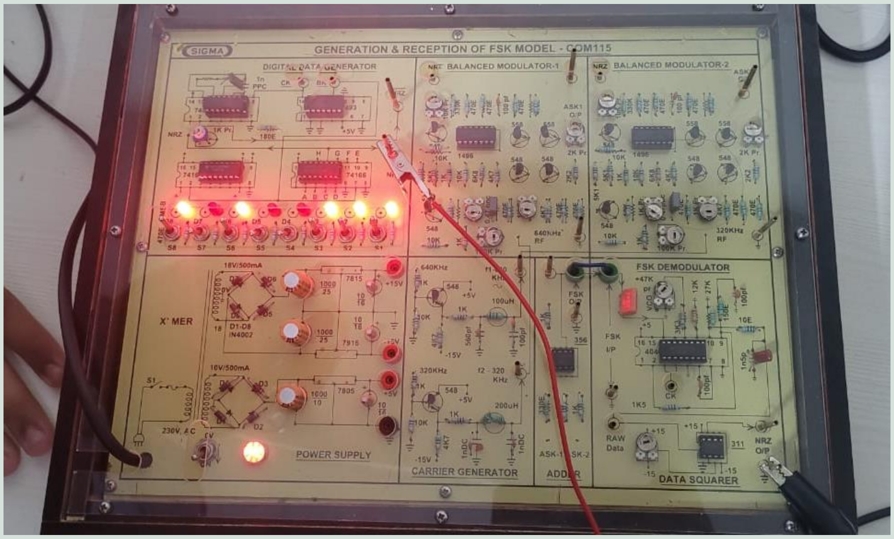

Tektronix
TBS 1072B-EDU
Digital Oscilloscope
10.0V
M 10.0us
Ch1 / -315mV 473.585kHz
May 13, 2024, 12:25
Enabling Teaching

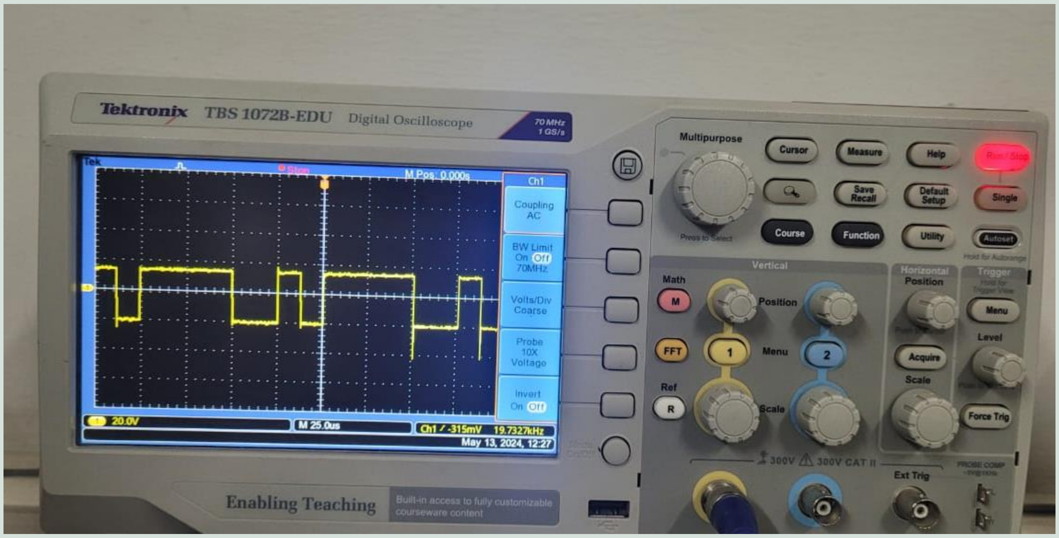

Tektronix
TBS 1072B-EDU
Digital Oscilloscope
20.0V
M 25.0us
Ch1 / -315mV 19.7477kHz
May 13, 2024, 12:25
Enabling Teaching

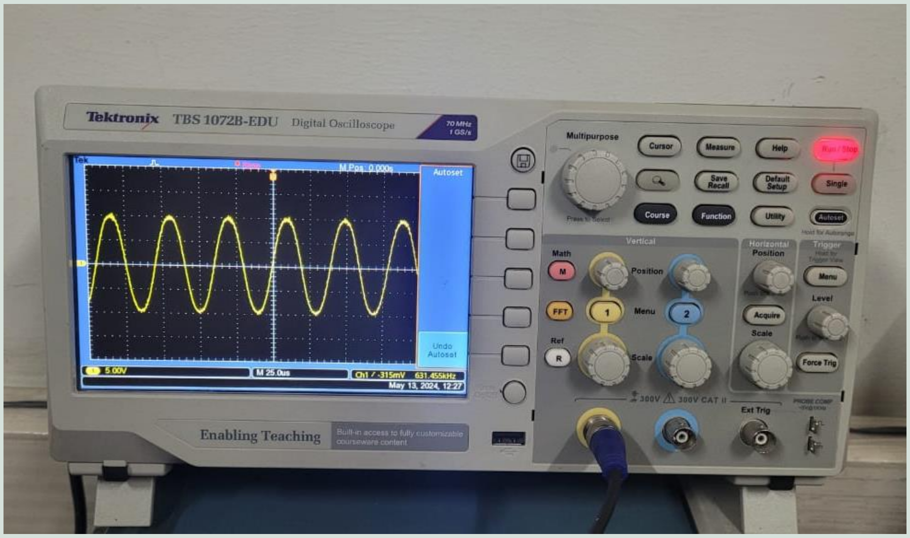
**Case 3**

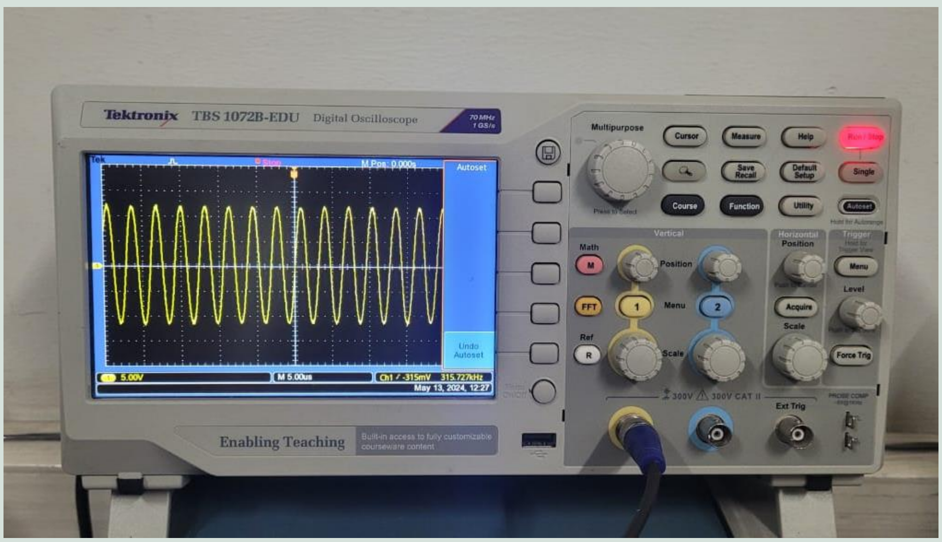
· Data: 10110111(Priyal soni)

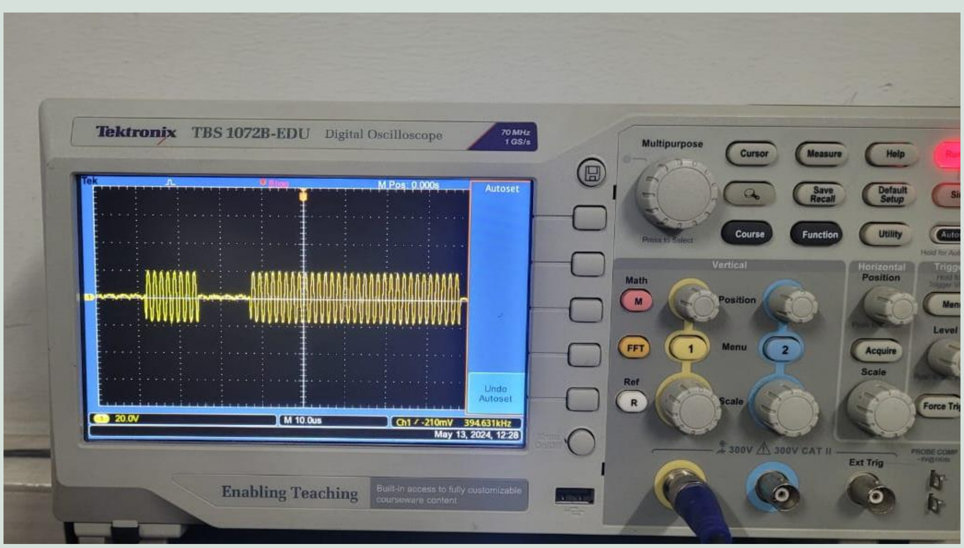
· Waveforms

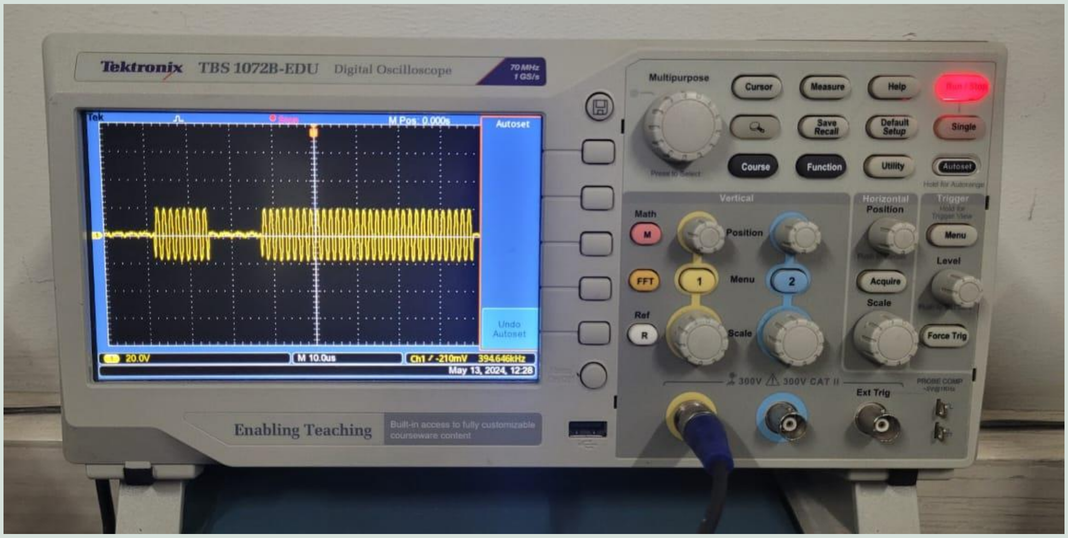


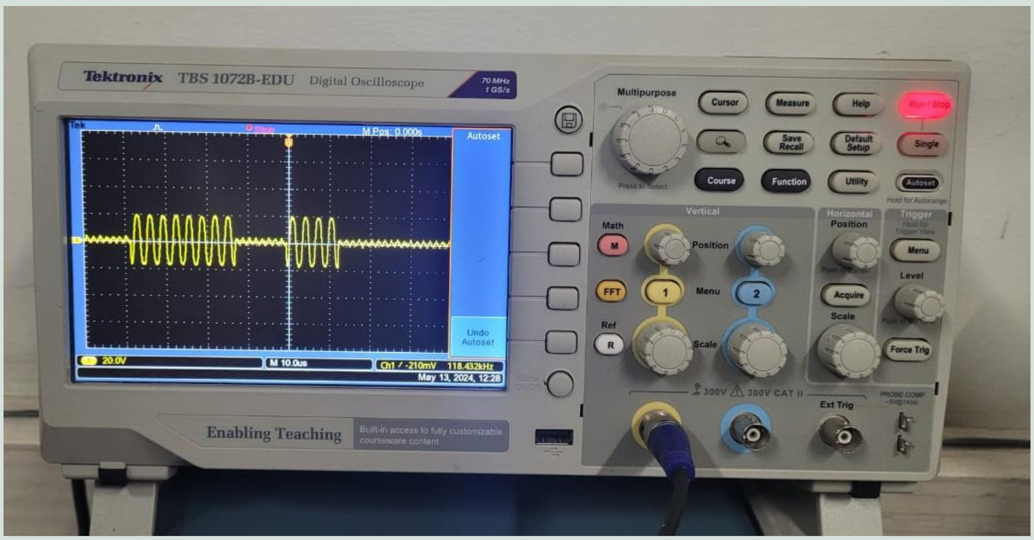



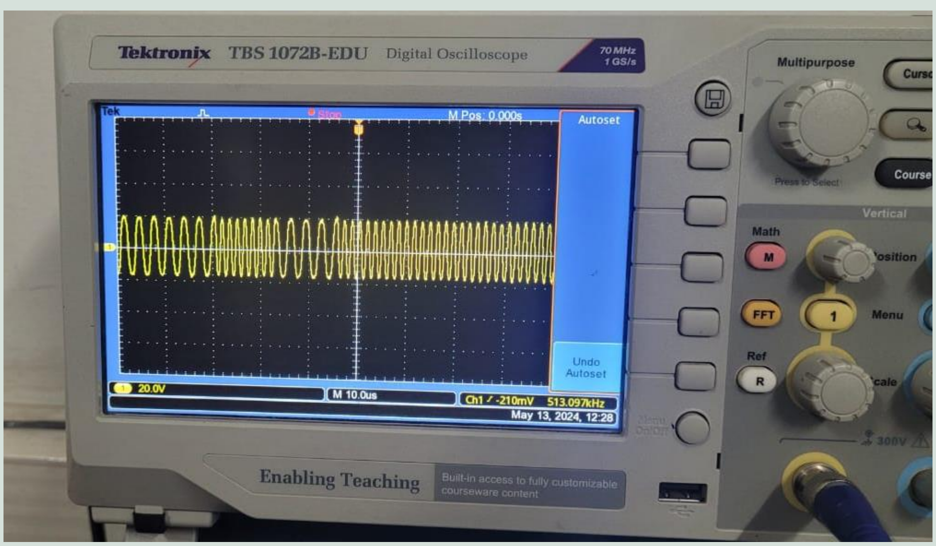

Tektronix
TBS 1072B-EDU
Digital Oscilloscope
Enabling Teaching
Multipurpose
Cursor
Measure
Help
Single
Course
Function
Utility
Autoset
Vertical
Position
Menu
Scale
Math
FFT
Ref
Level
Force Trig
Ext Trig
M 25.0us
May 13, 2024, 12:27

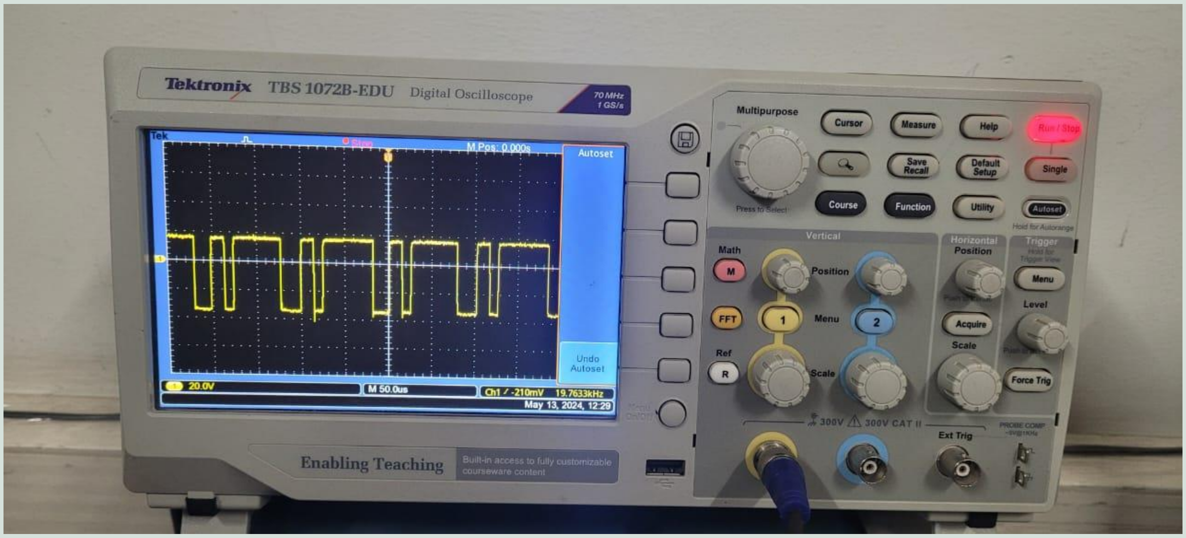

Tektronix
TBS 1072B-EDU
Digital Oscilloscope
Enabling Teaching
Multipurpose
Cursor
Measure
Help
Single
Course
Function
Utility
Autoset
Vertical
Position
Menu
Scale
Math
FFT
Ref
Level
Force Trig
Ext Trig
M 5.00us
315.727kHz
May 13, 2024, 12:27

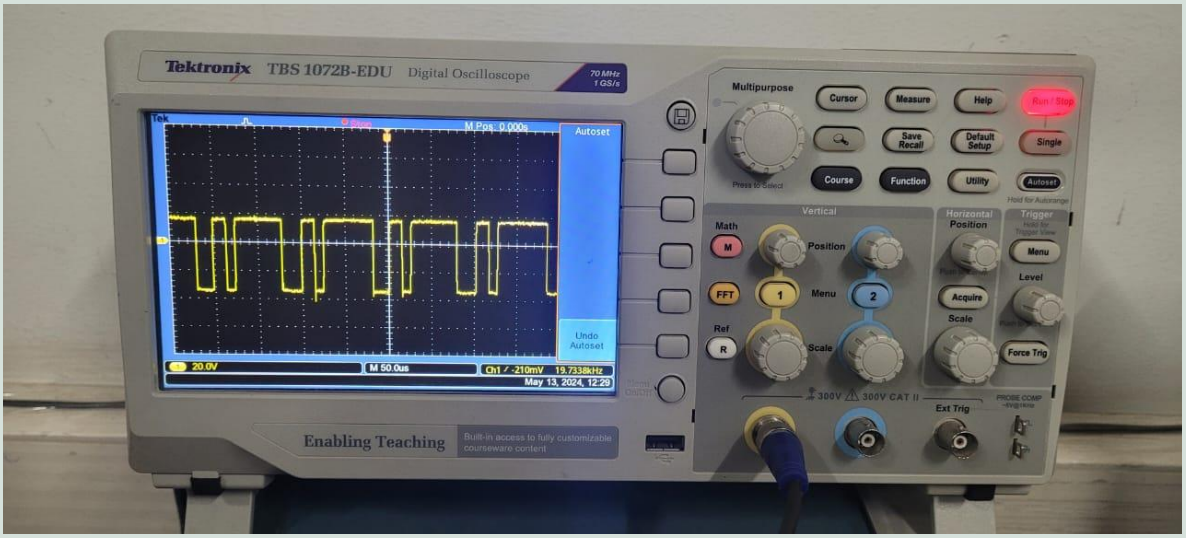

Tektronix
TBS 1072B-EDU
Digital Oscilloscope
Enabling Teaching
Multipurpose
Cursor
Measure
Help
Save Recall
Default Setup
Course
Function
Utility
Vertical
Position
Menu
Scale
Math
FFT
Ref
Acquire
Ext Trig
Autoset
Undo Autoset
M Pos: 0.000s
20.0V
M 10.0us
Ch1 / -210mV
394.631kHz
May 13, 2024, 12:28


Tektronix TBS 1072B-EDU Digital Oscilloscope
70 MHz 1 GS/s
Tek
Stop
M Pos: 0.000s
Autoset
Undo Autoset
20.0V
M 10.0us
Ch1 -210mV 394.646kHz
May 13, 2024, 12:28
Multipurpose
Cursor
Measure
Help
Run / Stop
Single
Save Recall
Default Setup
Course
Function
Utility
Autoset
Vertical
Math
Position
FFT
Menu
Ref
Scale
Horizontal Position
Trigger
Acquire
Level
Force Trig
Ext Trig
Enabling Teaching
Built-in access to fully customizable courseware content


Tektronix TBS 1072B-EDU Digital Oscilloscope
70 MHz 1 GS/s
Tek
Stop
M Pos: 0.000s
Autoset
Undo Autoset
20.0V
M 10.0us
Ch1 -210mV 118.432kHz
May 13, 2024, 12:28
Multipurpose
Cursor
Measure
Help
Run / Stop
Single
Save Recall
Default Setup
Course
Function
Utility
Autoset
Vertical
Math
Position
FFT
Menu
Ref
Scale
Horizontal Position
Trigger
Acquire
Level
Force Trig
Ext Trig
Enabling Teaching
Built-in access to fully customizable courseware content


Tektronix TBS 1072B-EDU Digital Oscilloscope
70 MHz 1 GS/s
Tek
Stop
M Pos: 0.000s
Autoset
Undo Autoset
20.0V
M 10.0us
Ch1 -210mV 513.097kHz
May 13, 2024, 12:28
Multipurpose
Press to Select
Course
Vertical
Math
FFT
Menu
Ref
Enabling Teaching
Built-in access to fully customizable courseware content




## Conclusion:

In this practical session, the focus was on Frequency Shift Keying (FSK) modulation and demodulation techniques, crucial in digital data transmission for their ability to enhance signal reception and quality. Through practical experimentation, students explored how FSK modulated signals can represent binary information by shifting between discrete frequency values. The demodulation process, involving the conversion of FSK to Amplitude Shift Keying (ASK) through filtering, followed by ASK demodulation, was also illustrated. By analyzing different binary data sequences and their corresponding FSK modulated and demodulated waveforms, students gained practical insights into the working principles and applications of FSK modulation and demodulation in real-world communication systems.