Shri Ramdeobaba College of Engineering and Management, Nagpur-13.
Department of Electronics Engineering
Analog and Digital Communication Engineering Lab [ENP357]

Even Semester – 2023-24

Lab 01

Amplitude Modulation

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Batch / Roll No:	A1/12
Semester/Section:	6th/ A
Date of Performance:	16/1/2024
Date of Submission:	17/4/2024
Name & Signature of Faculty:	Mrs.Rohini Ochawar

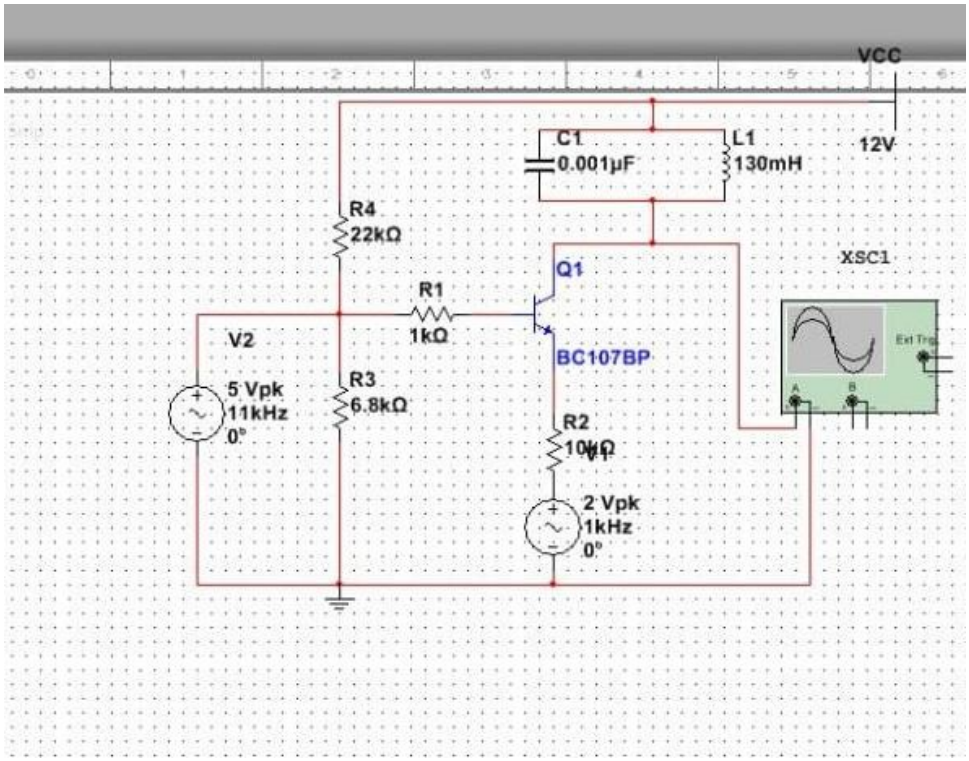
Lab-01

1. **Aim:** Design, Simulate and Implementation of transistor based AM Modulator and plotting AM signals for modulation indices $\square = 1$, $\square < 1$ and $\square > 1$

✓ **Apparatus: CRO,DSO,Transistor BC107,Resistors,inductor,capacitor**

✓ **Software Used: Multisim**

✓ **Circuit Diagram:**



✓ **Observation Table**

Table No. 1: Calculation of m based on simulation results

Frequency of Modulating signal (Hz): **Frequency of Carrier signal (Hz):**

Case	Modulating Signal Voltage (Vm)	Carrier Signal Voltage (Vc)	Modulation Index (m)
m<1	2V	5V	0.4
m>1			
m=1	5V	5V	1

Table No. 2: Calculation of m based on circuit implementation on bread board

Frequency of Modulating signal (Hz): Frequency of Carrier signal (Hz):

Case	Modulating Signal Voltage (Vm)	Carrier Signal Voltage (Vc)	Modulation Index (m)
m<1	**4.096**	**4.75**	**0.857**
m>1	**10**	**5**	**2**
m=1	**5.445**	**6.019**	**0.98**

✓ **Calculations:**

Modulation index ,

$m = \frac{V_m}{V_c}$

$m = \frac{V_{max} - V_{min}}{V_{max} + V_{min}}$

1. m<1

Vmax = 4.423 V

vmin =0.3276V

$m = \frac{V_{max} - V_{min}}{V_{max} + V_{min}}$

$= \frac{4.423 - 0.3279}{4.423 + 0.3276}$

=0.857 V

2. m=1

Vmax= 5.732V

Vmin =0.287V

$m = \frac{V_{max} - V_{min}}{V_{max} + V_{min}}$

$= \frac{5.732 - 0.287}{5.732 + 0.287}$

=0.98V

1. m>1

Vc=5Vpp

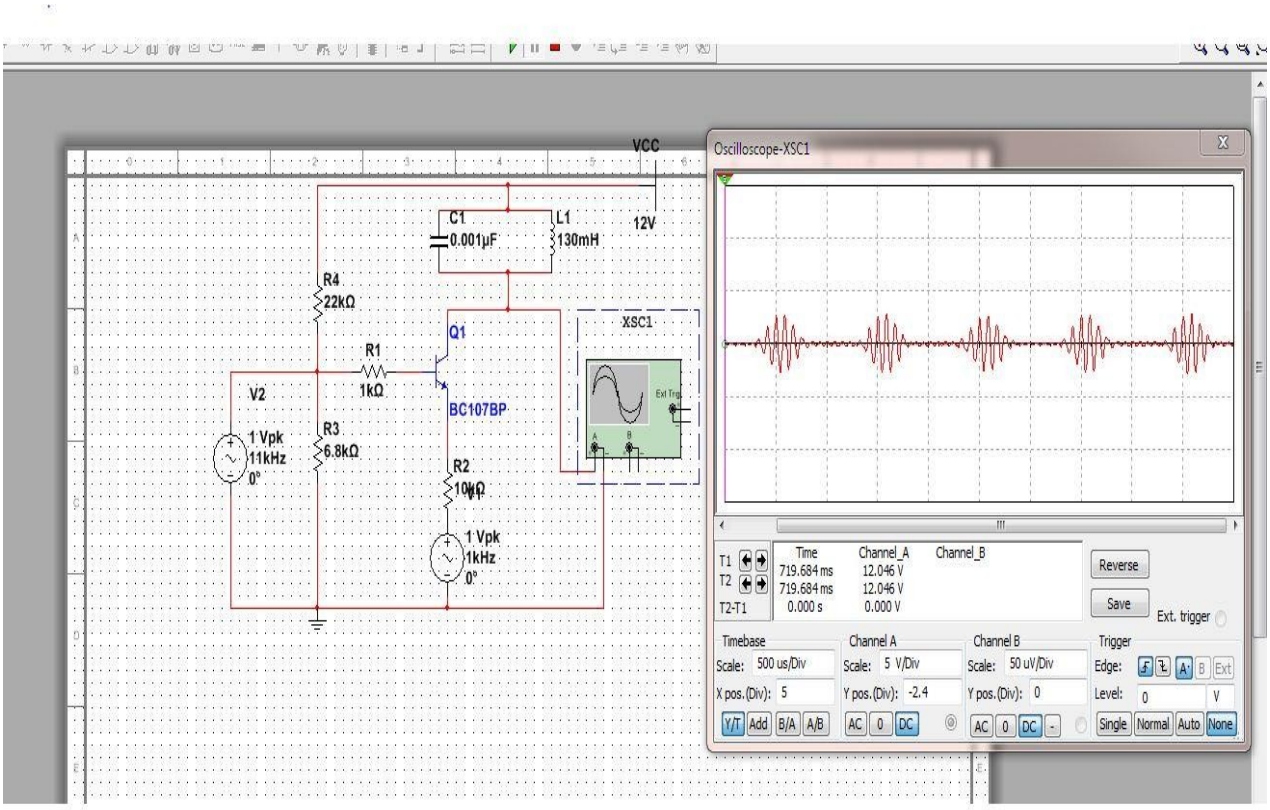
Vm=10Vpp

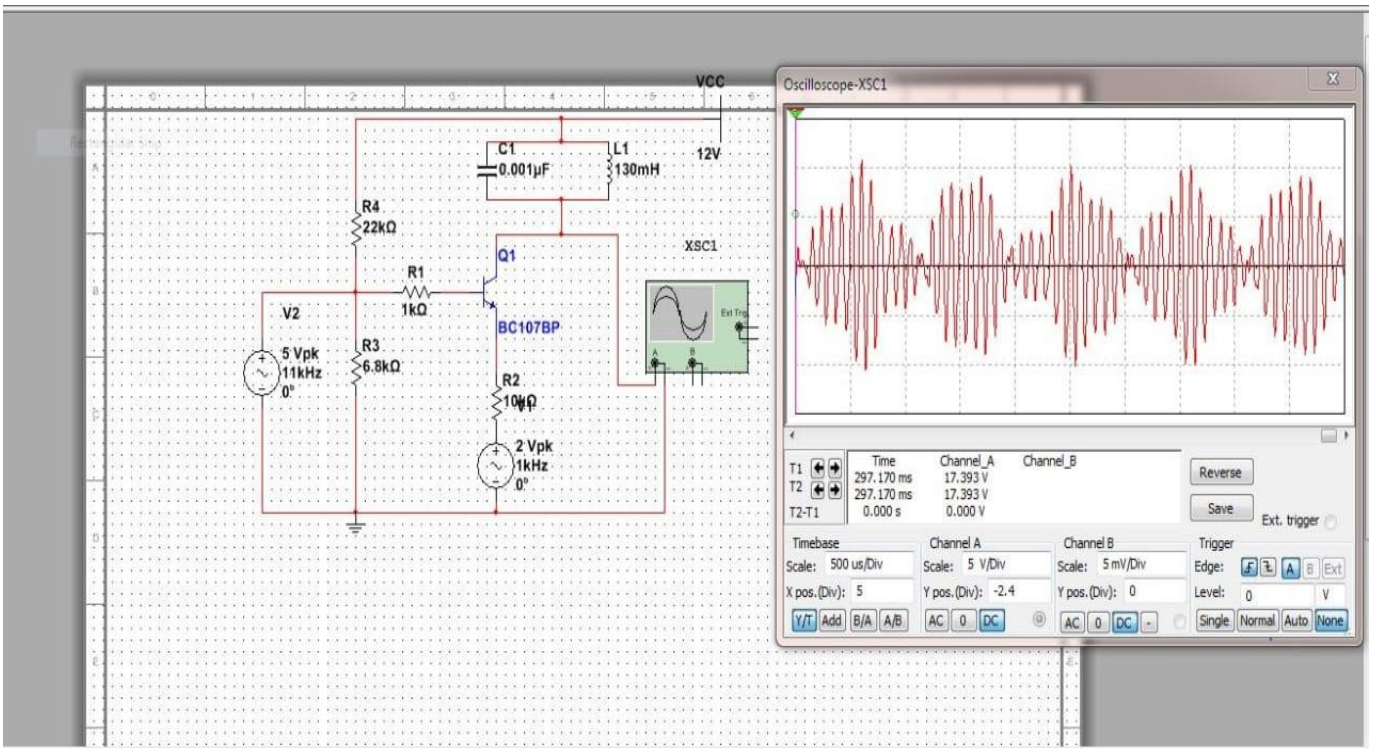
m=10/5

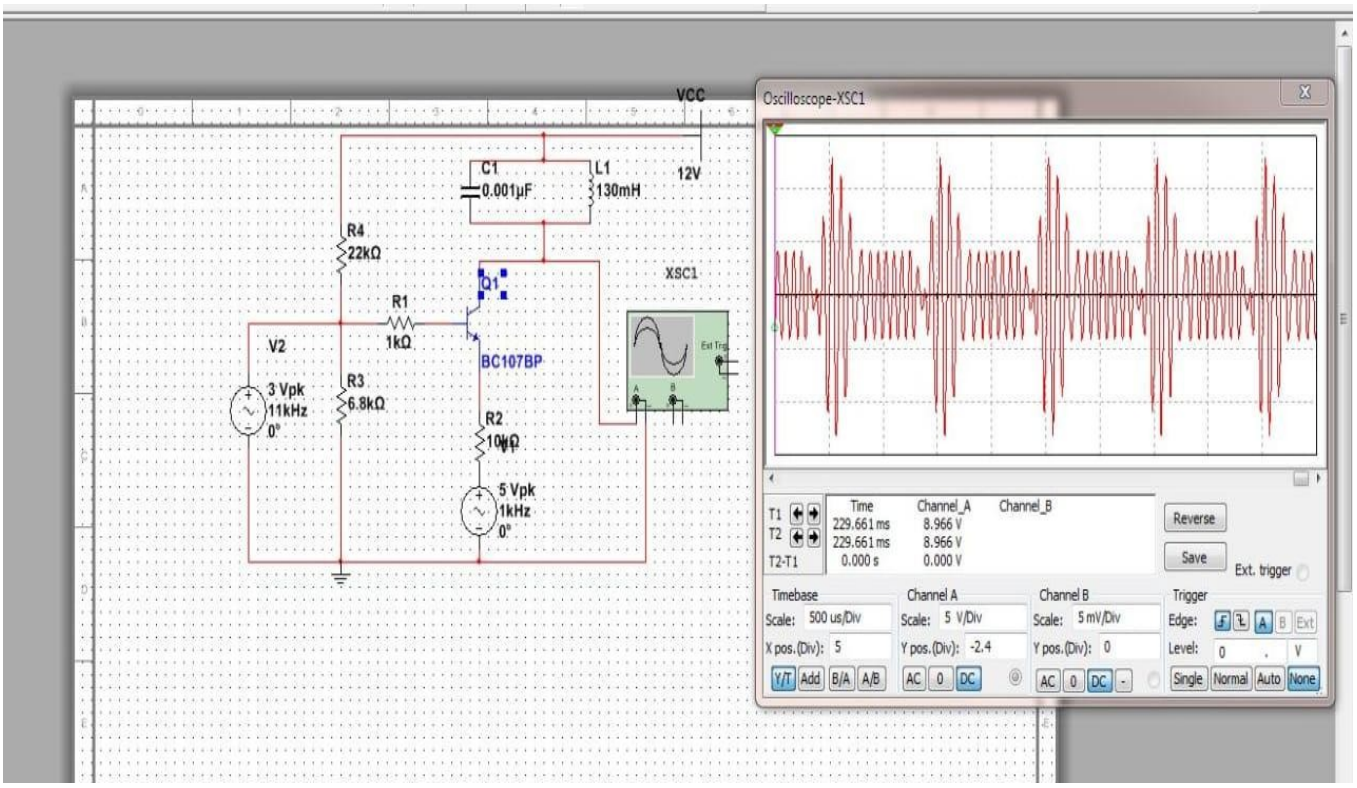
=2

✓ Obtained Waveforms/Simulation Results:

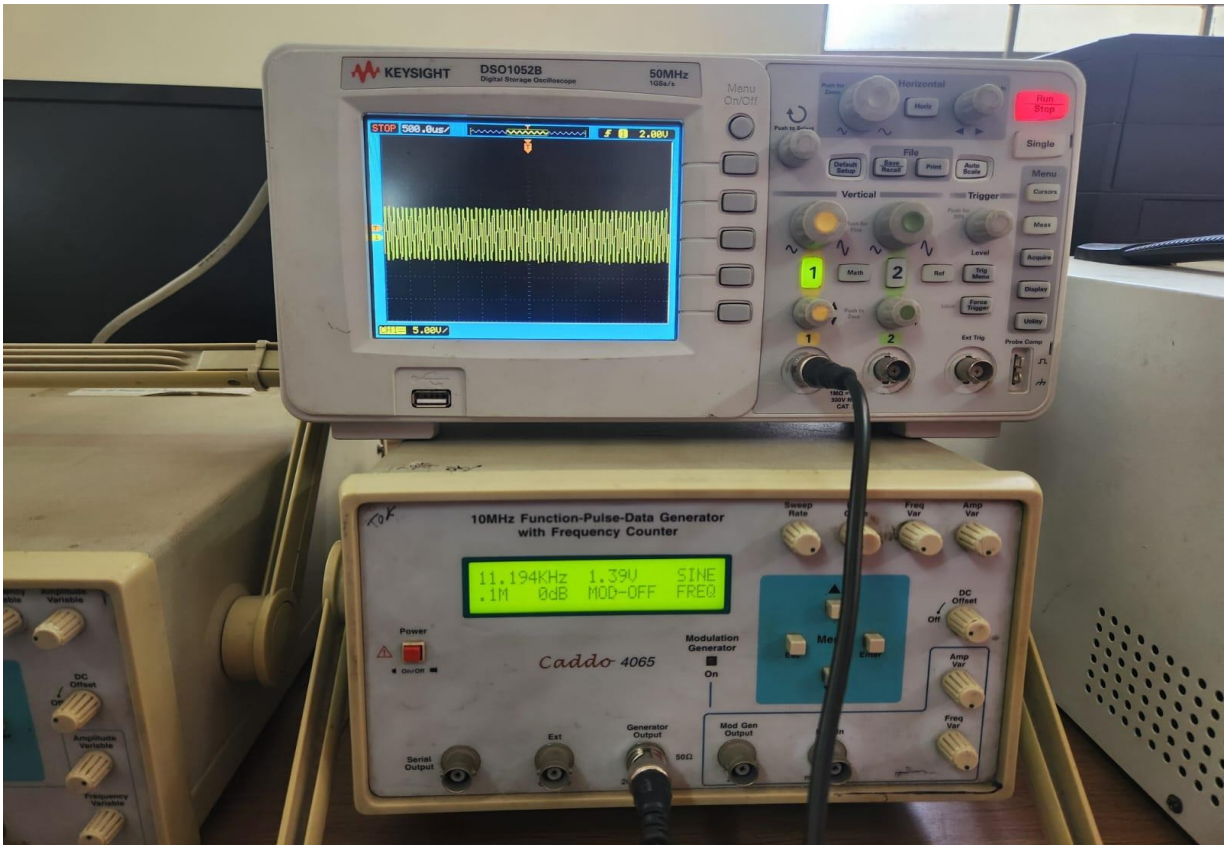
Part 1:

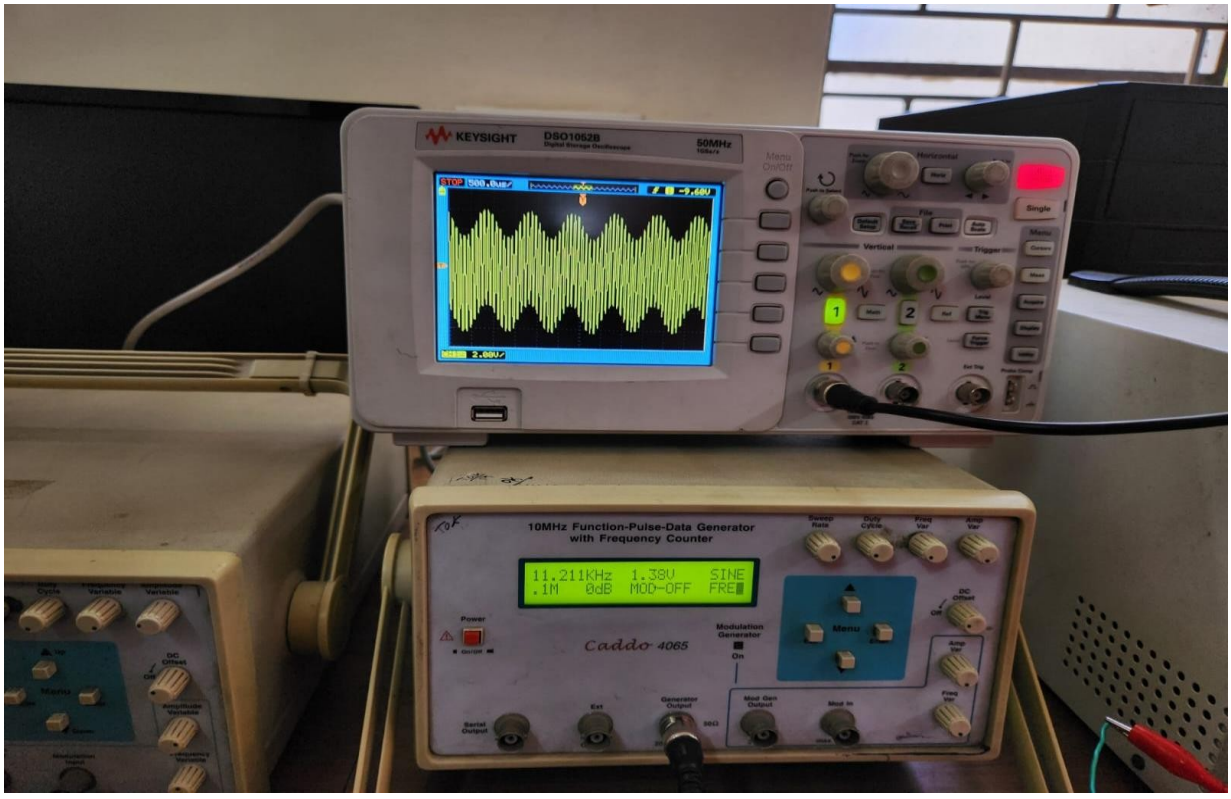



VCC
12V
C1
0.001µF
L1
130mH
R4
22kΩ
R1
1kΩ
Q1
BC107BP
XSC1
V2
5 Vpk
11kHz
0°
R3
6.8kΩ
R2
10kΩ
2 Vpk
1kHz
0°
Oscilloscope-XSC1
Time
Channel_A
Channel_B
297.170 ms
17.393 V
297.170 ms
17.393 V
0.000 s
0.000 V
T2-T1
Reverse
Save
Ext. trigger
Timebase
Scale: 500 us/Div
X pos.(Div): 5
Channel A
Scale: 5 V/Div
Y pos.(Div): -2.4
Channel B
Scale: 5 mV/Div
Y pos.(Div): 0
Trigger
Edge:
Level: 0 V
Y/T
Add
B/A
A/B
AC
0
DC
Single
Normal
Auto
None


VCC
12V
C1
0.001µF
L1
130mH
R4
22kΩ
R1
1kΩ
Q1
BC107BP
XSC1
V2
3 Vpk
11kHz
0°
R3
6.8kΩ
R2
10kΩ
5 Vpk
1kHz
0°
Oscilloscope-XSC1
Time
Channel_A
Channel_B
229.661 ms
8.966 V
229.661 ms
8.966 V
0.000 s
0.000 V
T2-T1
Reverse
Save
Ext. trigger
Timebase
Scale: 500 us/Div
X pos.(Div): 5
Channel A
Scale: 5 V/Div
Y pos.(Div): -2.4
Channel B
Scale: 5 mV/Div
Y pos.(Div): 0
Trigger
Edge:
Level: 0 V
Y/T
Add
B/A
A/B
AC
0
DC
Single
Normal
Auto
None

Part 2:


KEYSIGHT
DSO1052B
50MHz
10MHz Function-Pulse-Data Generator
with Frequency Counter
11.194KHz 1.39V SINE
.1M 0dB MOD-OFF FREQ
Caddo 4065


KEYSIGHT
DSO1052B
50MHz
10MHz Function-Pulse-Data Generator
with Frequency Counter
11.211KHz 1.38V SINE
.1M 0dB MOD-OFF
Caddo 4065

✓ Discussion and Conclusion:

The waveform for modulation index m>1,m=1,m<1 was observed according to Modulation index the change in the waveform was observed. It is observed that an amplitude of modulating signal increases, the amplitude of envelope also incrcases and as amplitude message signal decreases, the amplitude of AM envelope also decreases.It is observed that the frequency of envelope is equal to frequency of modulating Signal.