EE 321 Lab Report

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1904132

# EXPERIMENT - 2

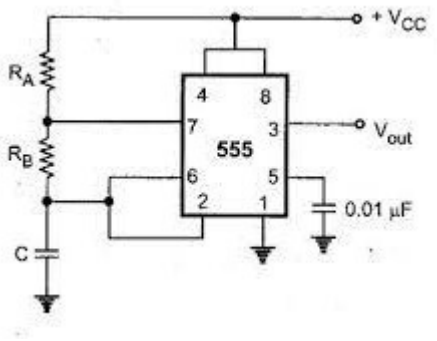
**AIM** :-

1. Generation of FM signals using IC555 configured as voltage-controlled oscillator.

**THEOROTICAL BACKGROUND**: -

Frequency Modulation (FM) is a type of modulation in which the message varies the instantaneous frequency of the carrier and this is how the message is transmitted in FM modulation. To generate FM signals, we will use 555 timer IC as Voltage controlled oscillator in which the voltage of message signal will control the instantaneous frequency of carrier signal to generate the FM modulated signal.

**WORKING PRINCIPLE** :-



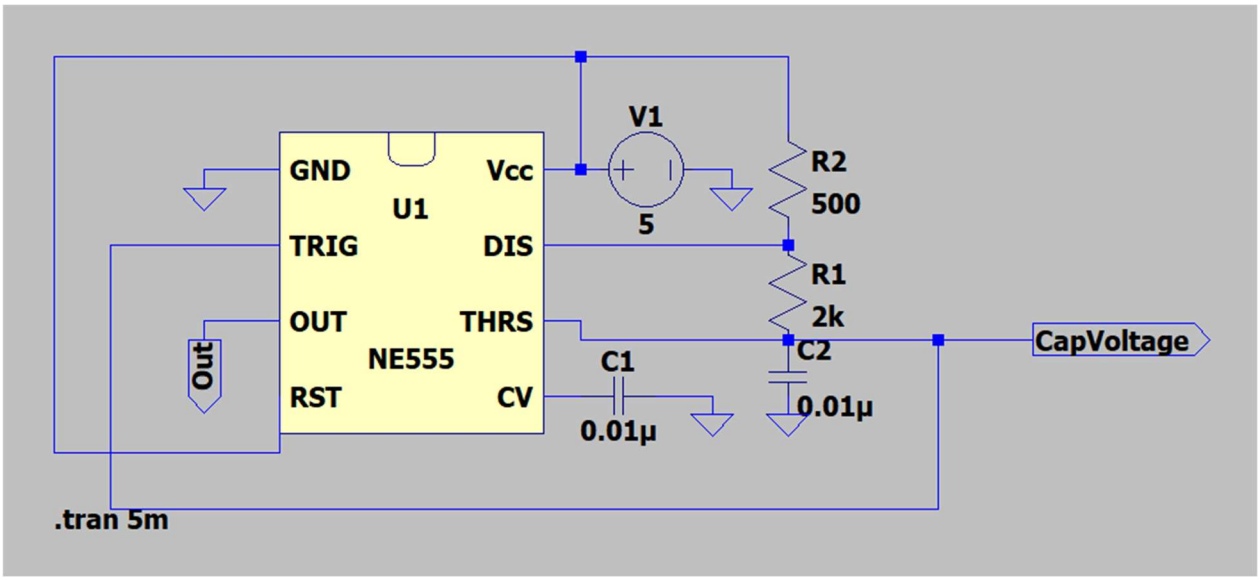

We can configure 555 IC as Astable multivibrator as shown in the figure and then we can add the message signal to the control pin of the IC to get the required output across the capacitor C.

**STEPS OF SIMULATION: -**

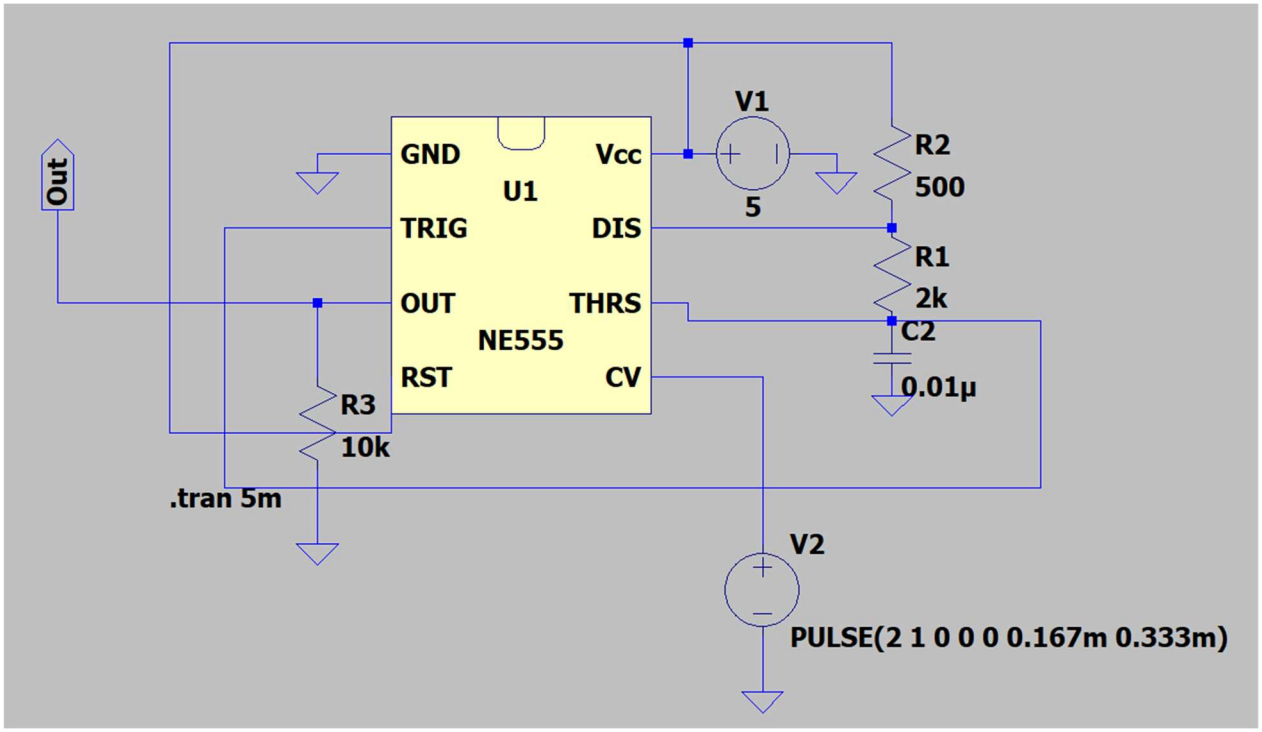
1. Configure the 555 timer as Astable multivibrator and then find out its free running frequency.
2. Apply the pulse signal to the control pin and then obtain the FM modulated output.
3. Adjust the amplitude and frequency of square wave to obtain appropriate output.
4. No instead of square wave apply the sinusoidal input and obtain the FM modulated signal.

**CIRCUIT DIAGRAMS**: -

1. 555 Timer in Astable Multivibrator

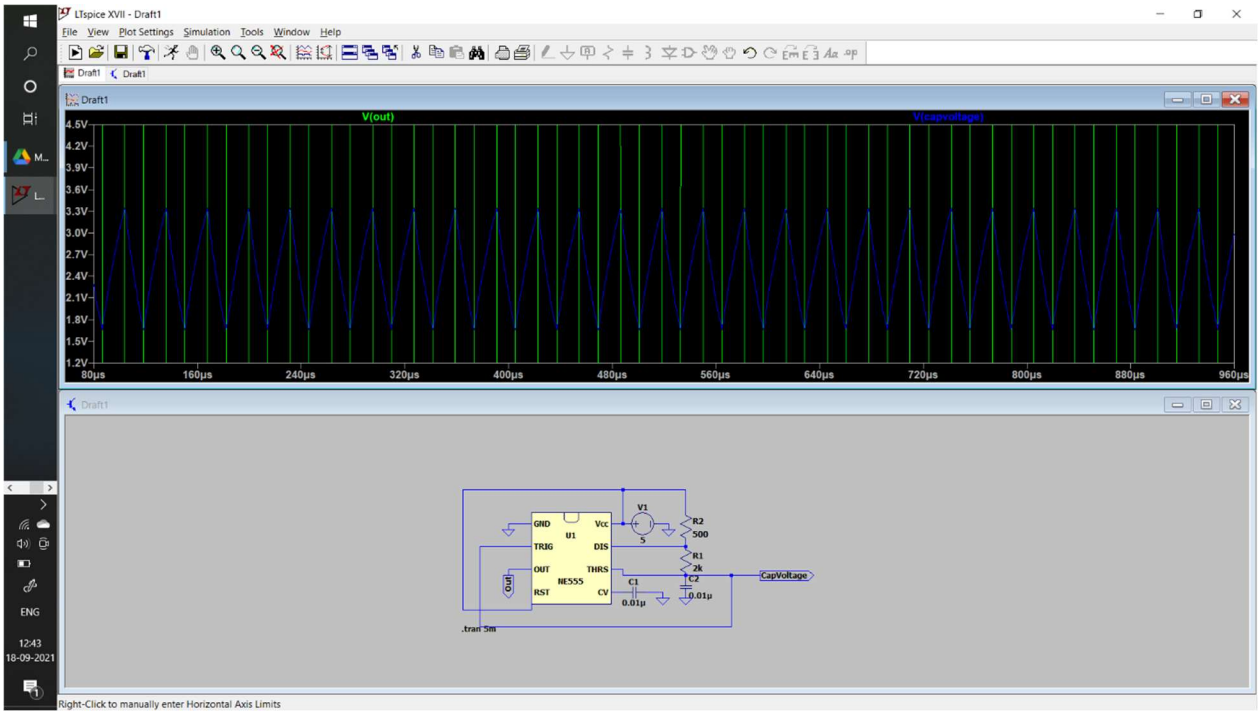


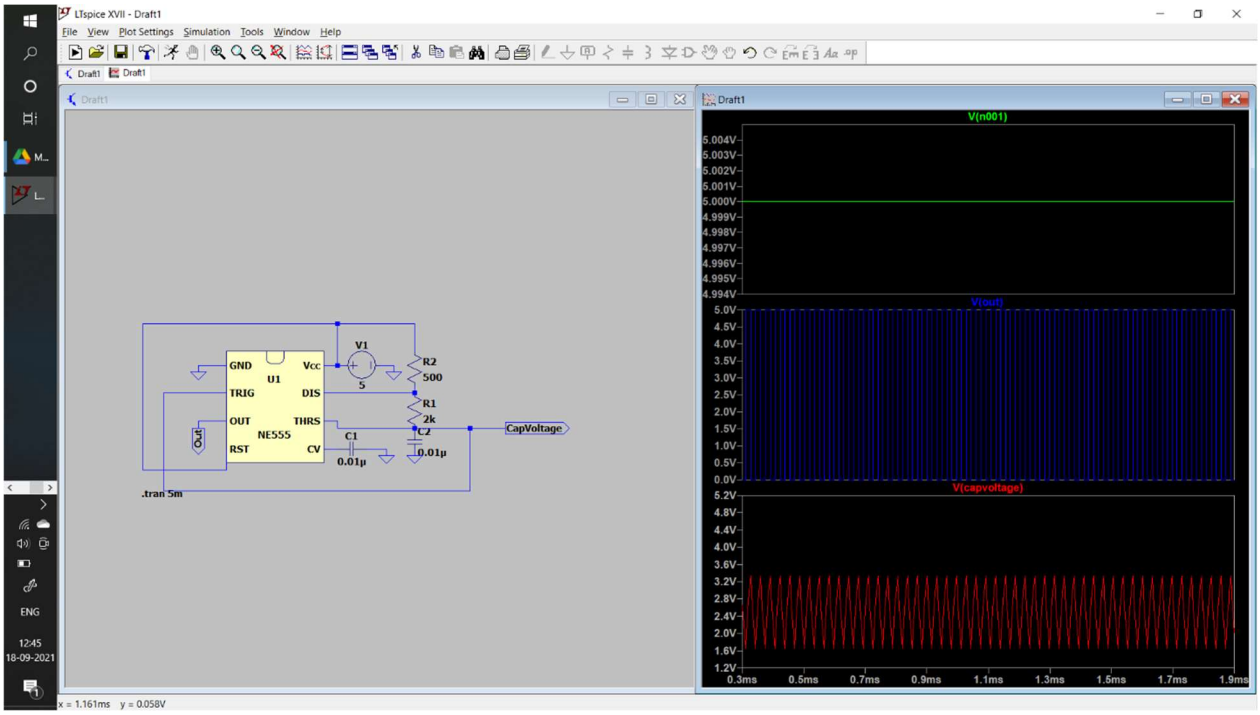

2. 555 Timer as FM signal generator.



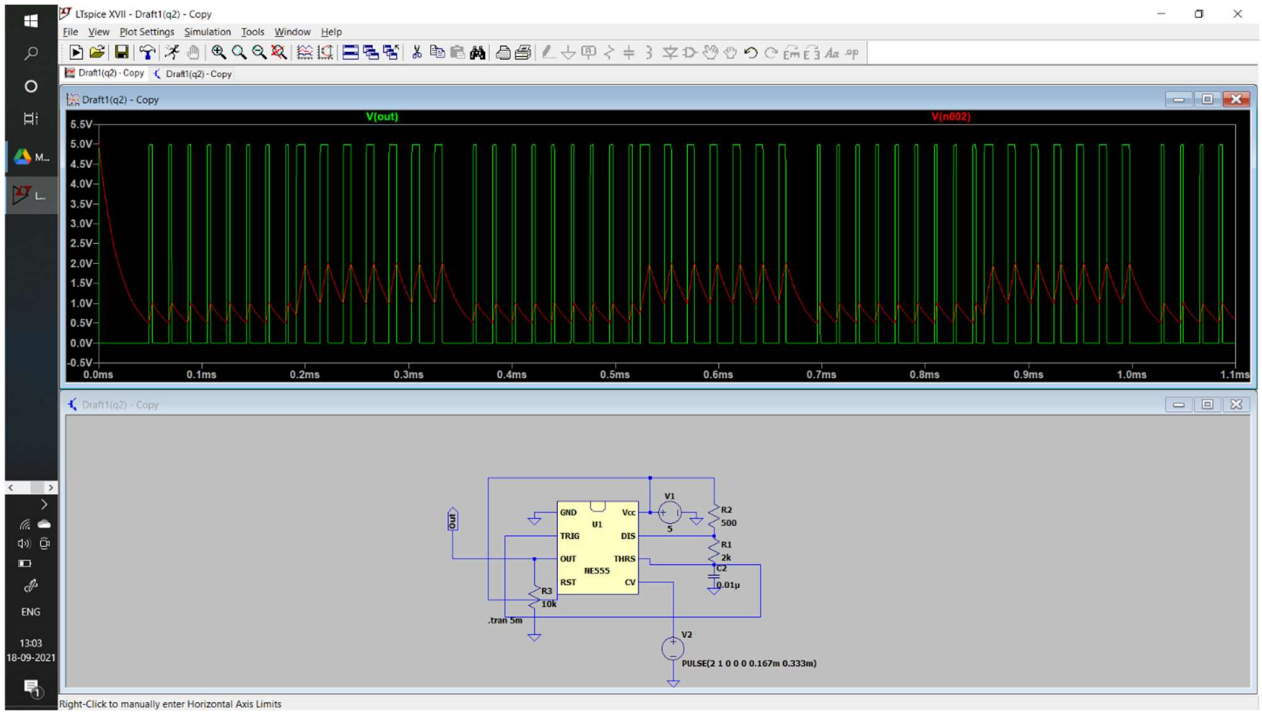
**OUTPUT WAVEFORMS, CALCULATIONS AND RESULTS**: -

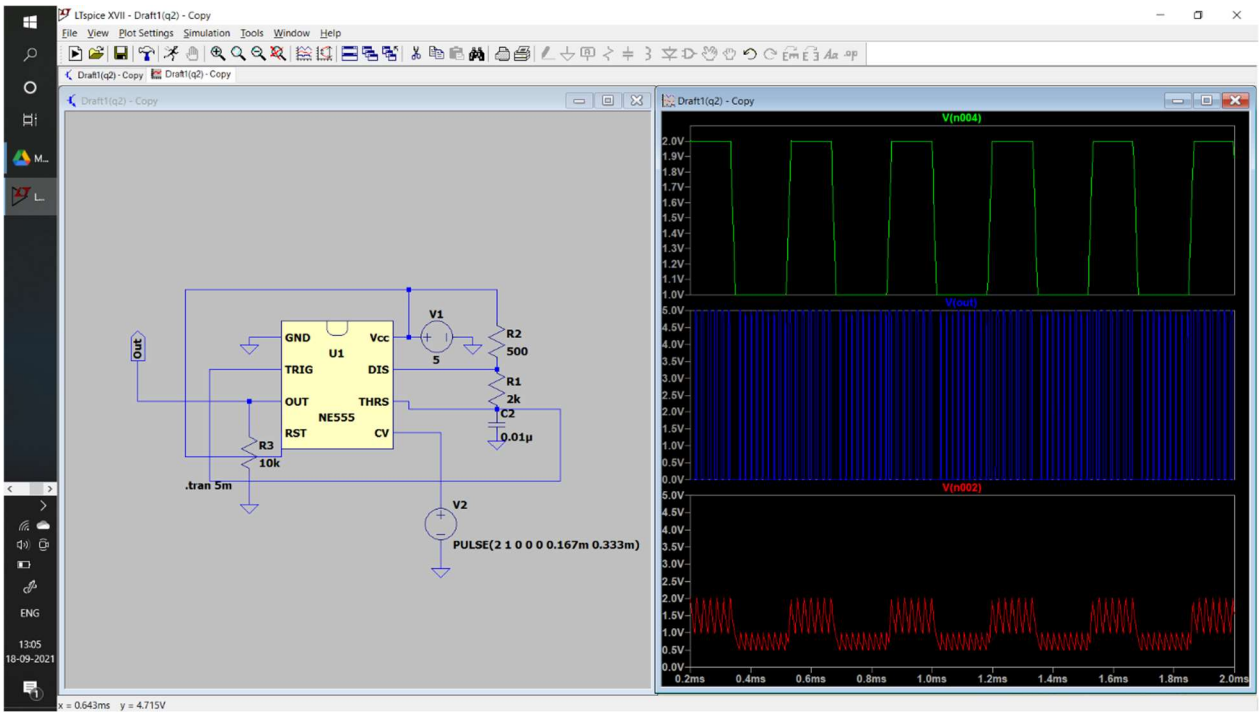
1. 555 Timer as Astable Multivibrator



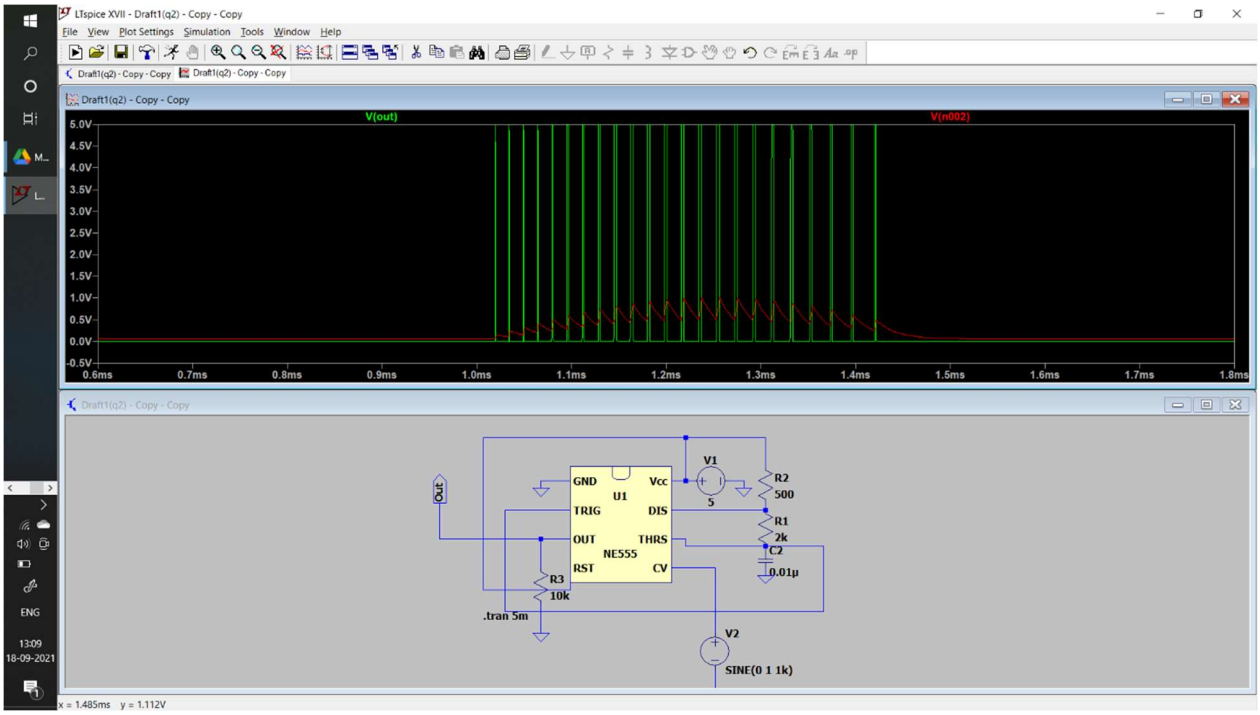



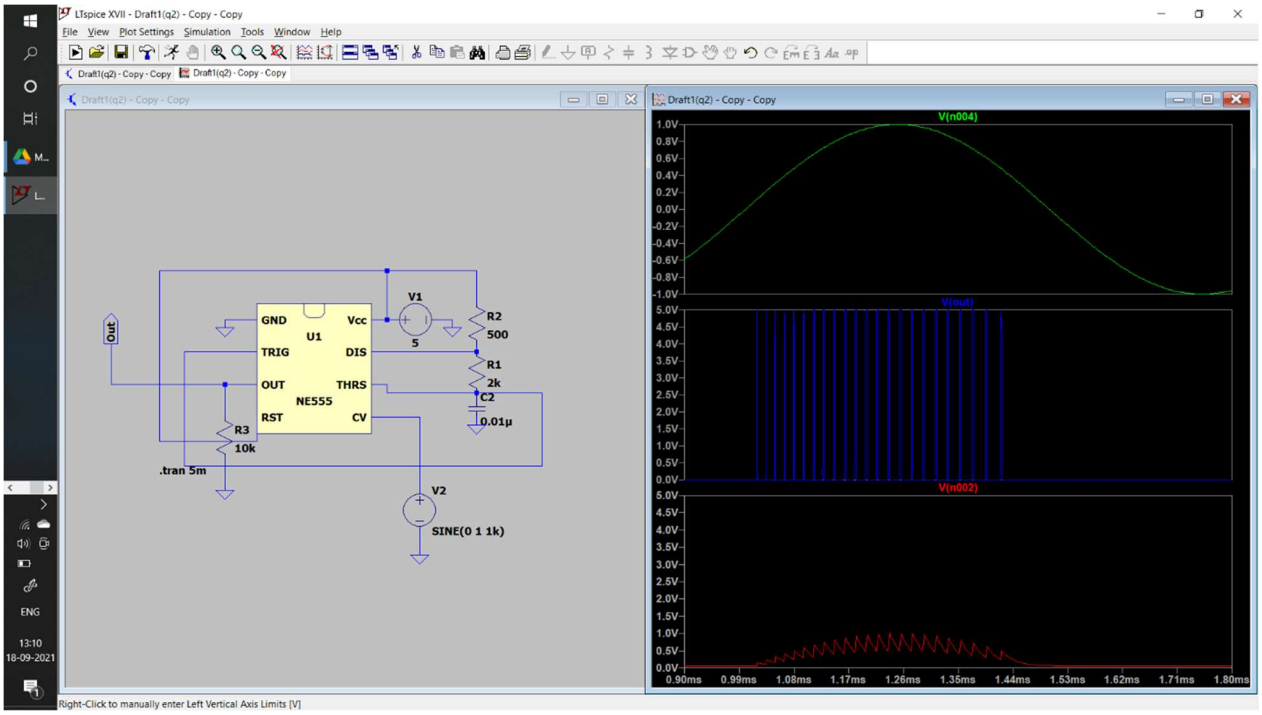
2. 555 Timer as FM signal Generator

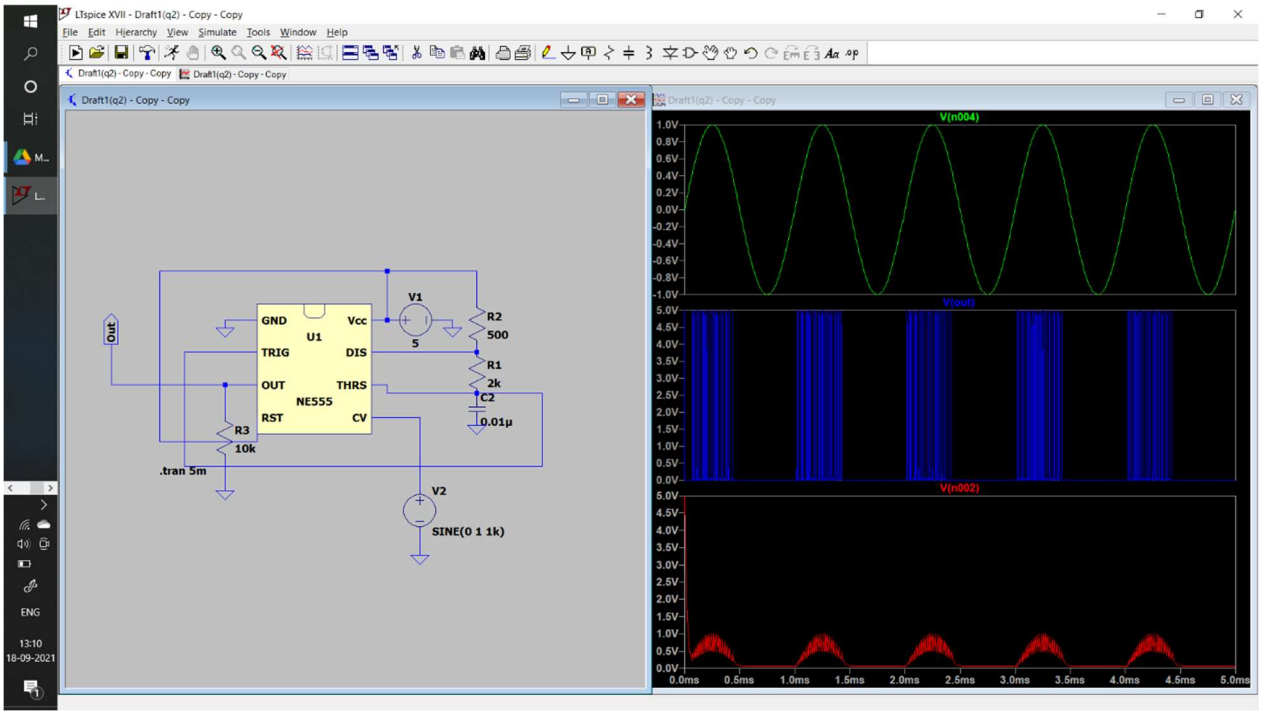


3. FM modulation of a sinosuidal input

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Draft1(q2) - Copy - Copy
Out
GND
Vcc
U1
TRIG
DIS
OUT
THRS
NE555
RST
CV
V1
5
R2
500
R1
2k
C2
0.01µ
R3
10k
.tran 5m
V2
SINE(0 1 1k)
V(n004)
V(out)
V(n002)
1.0V
0.8V
0.6V
0.4V
0.2V
0.0V
-0.2V
-0.4V
-0.6V
-0.8V
-1.0V
5.0V
4.5V
4.0V
3.5V
3.0V
2.5V
2.0V
1.5V
1.0V
0.5V
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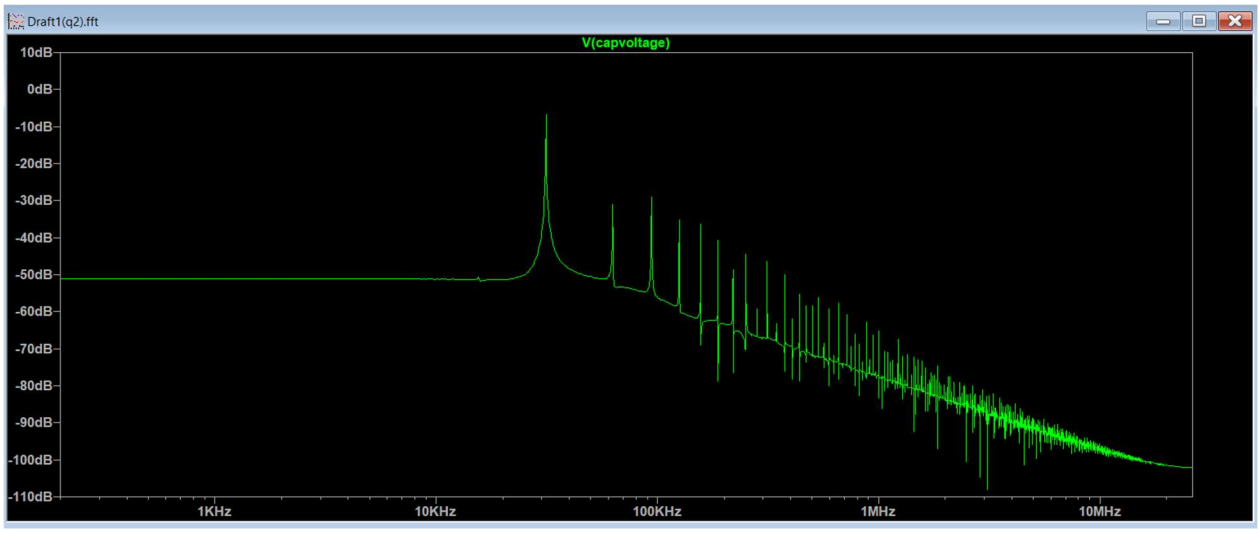
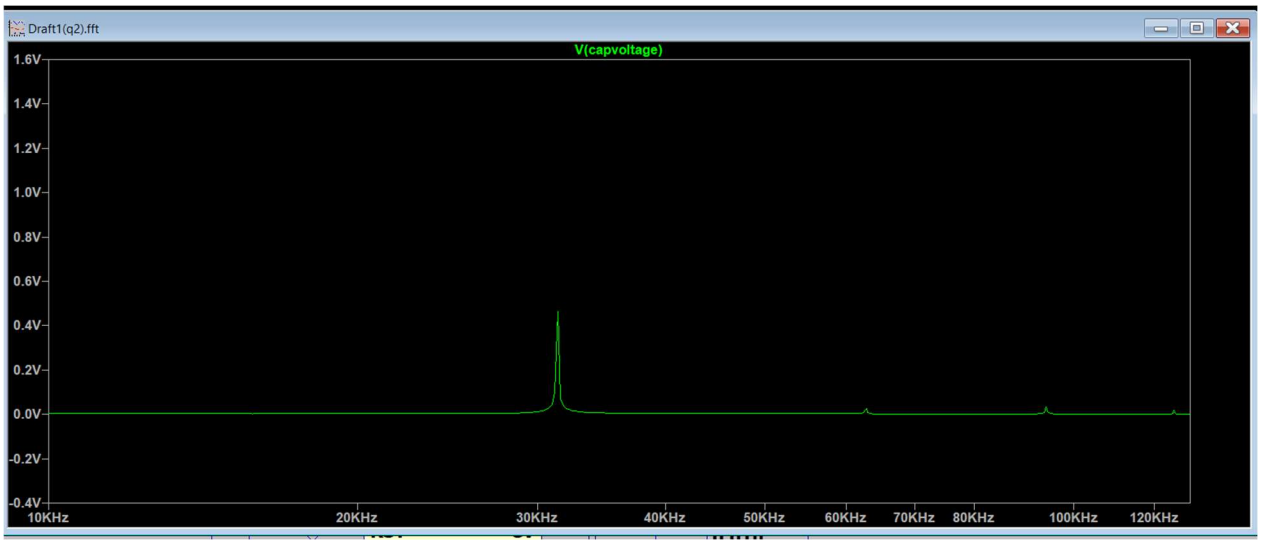
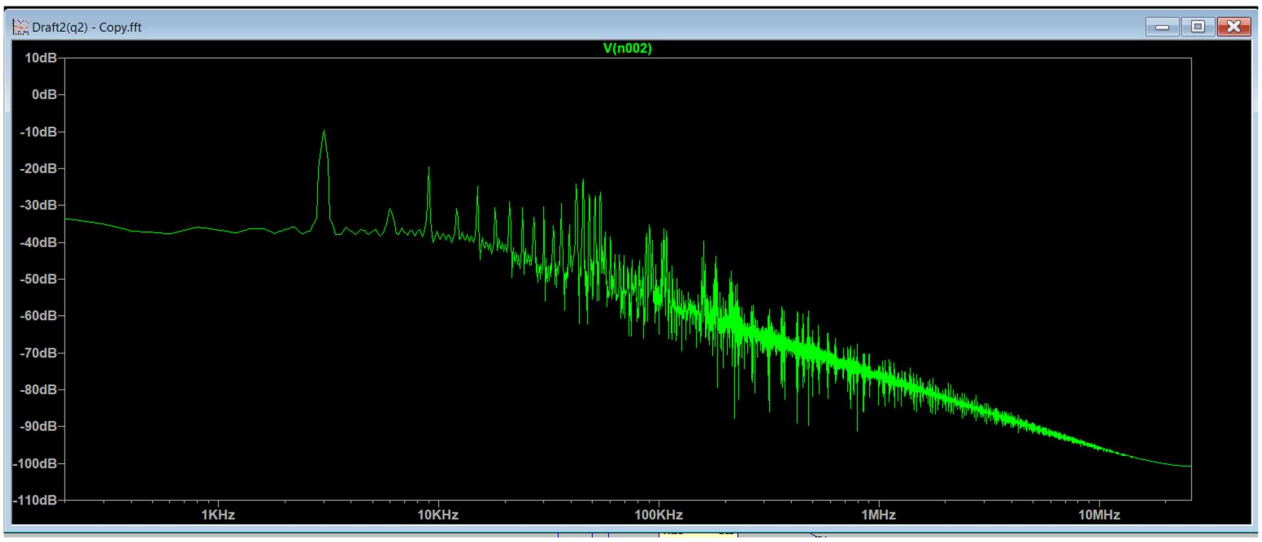
Output in Frequency Domain :-

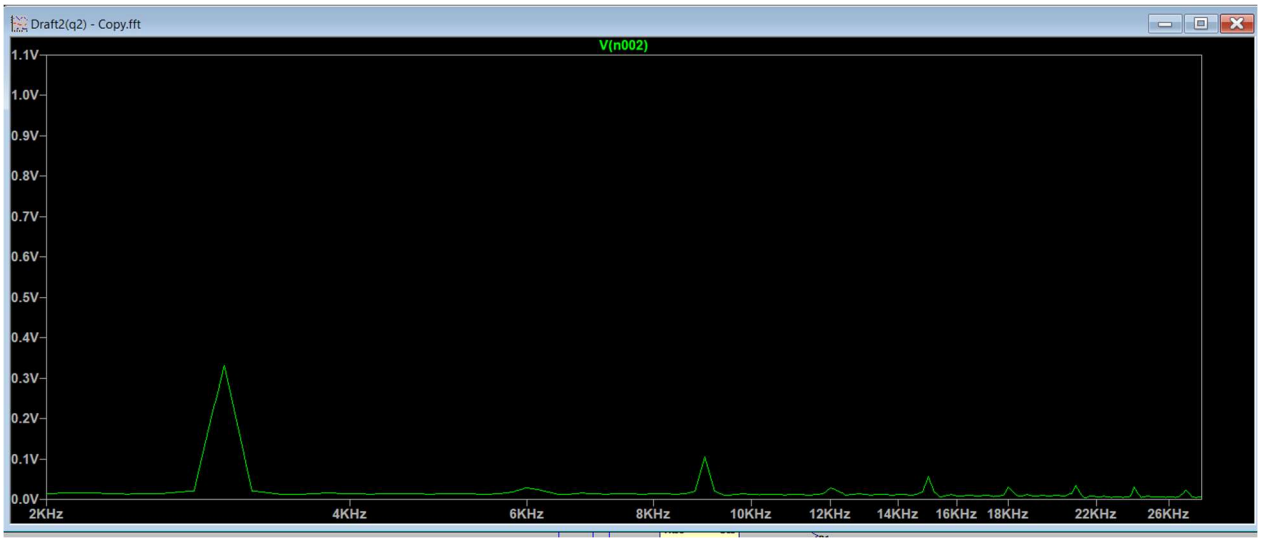
1. 555 Timer as Astable multivibrator



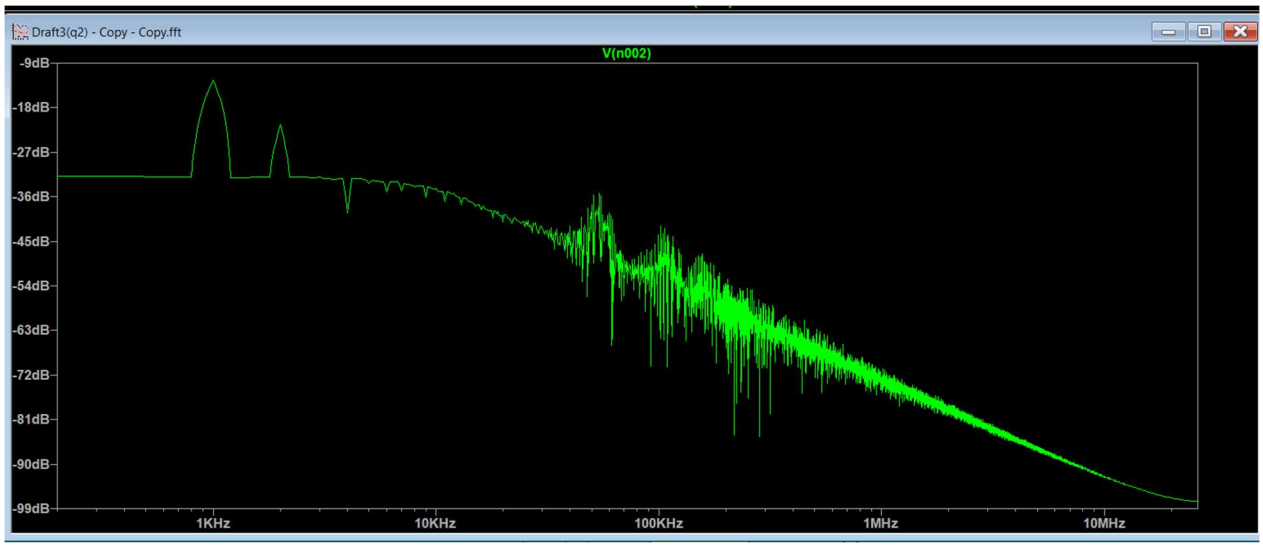



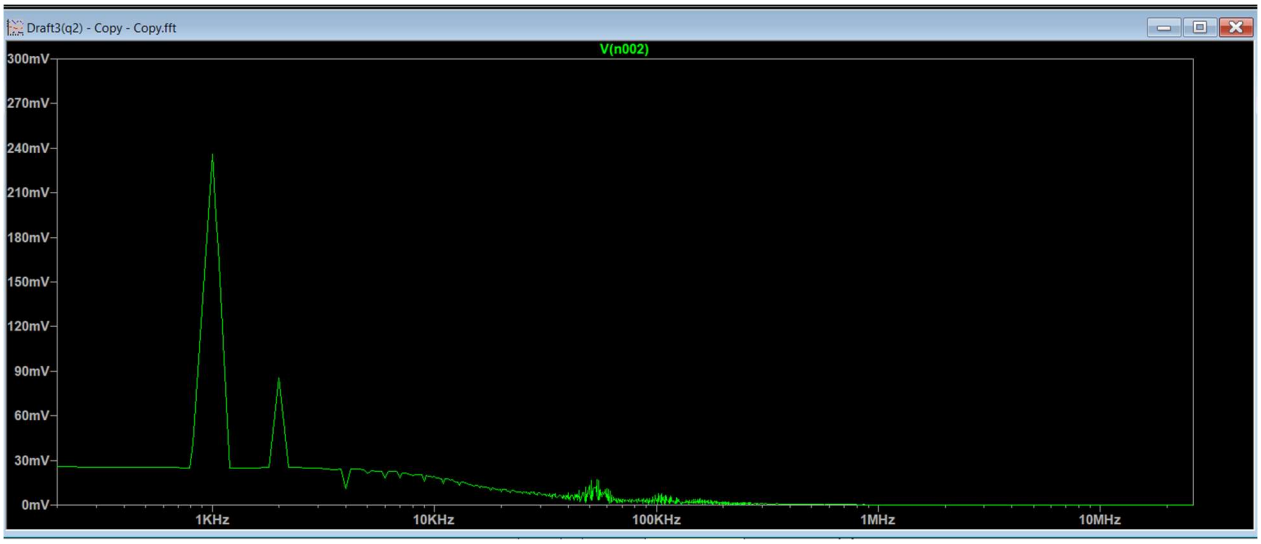

2. 555 Timer as FM signal Generator






3. FM modulation of a sinusoidal input




Peaks are observed at 1 kHz and high frequency noise are also observed.

Answers of Questions :-

Free running frequency of 555 timer working as astable multivibrator is 31.389 kHz. Theoretically I am able to obtain the free running frequency as 31.111 kHz.

Fhigh = 55.23 kHz
Flow = 44.56 kHz

Frequency deviation = (Fhigh – Flow)/2 = 5.335 kHz

Modulation Index = 4.9969/4.9975 = 0.9998

Thank you!