ECCF MINI PROJECT
AM WAVEFORM GENERATOR

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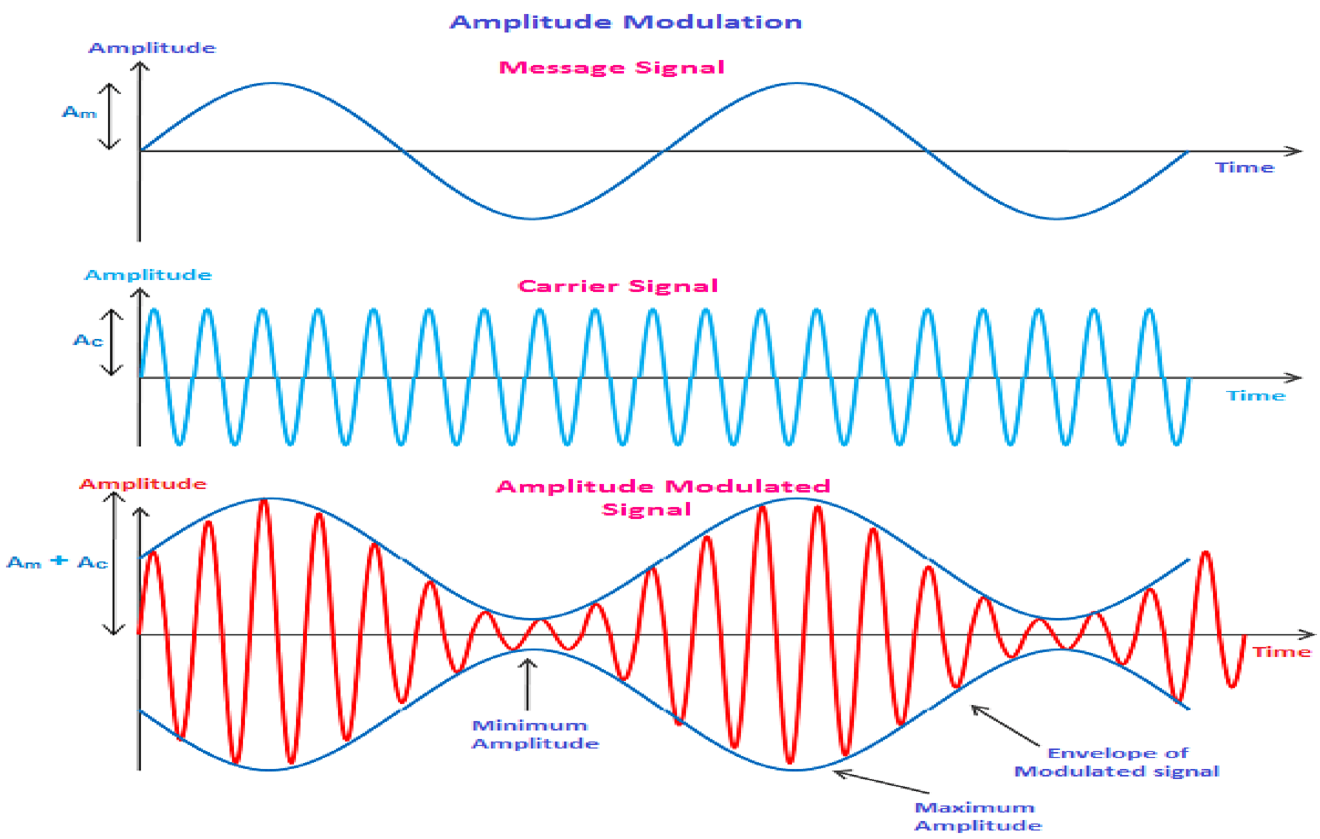
AIM: To write a program to generate AM Waveform.

REQUIREMENTS: Laptop, python compiler, python packages required are numpy and matplotlib.

THEORY: Amplitude modulation (AM) is a modulation technique used in electronic communication, most commonly for transmitting information via a radio carrier wave. In amplitude modulation, the amplitude (signal strength) of the carrier wave is varied in proportion to that of the message signal being transmitted. The message signal is, for example, a function of the sound to be reproduced by a loudspeaker, or the light intensity of pixels of a television screen. This technique contrasts with frequency modulation, in which the frequency of the carrier signal is varied, and phase modulation, in which its phase is varied.In AM, the carrier itself does not fluctuate in amplitude. Instead, the modulating data appears in the form of signal components at frequencies slightly higher and lower than that of the carrier. These components are called sidebands. The lower sideband (LSB) appears at frequencies below the carrier frequency; the upper sideband (USB) appears at frequencies above the carrier frequency. The LSB and USB are essentially "mirror images" of each other in a graph of signal amplitude versus frequency, as shown in the illustration. The sideband power accounts for the variations in the overall amplitude of the signal.

Amplitude Modulation Formula: $s(t)=[A_c+A_m\cos(2\pi f_m t)]\cos(2\pi f_c t)$



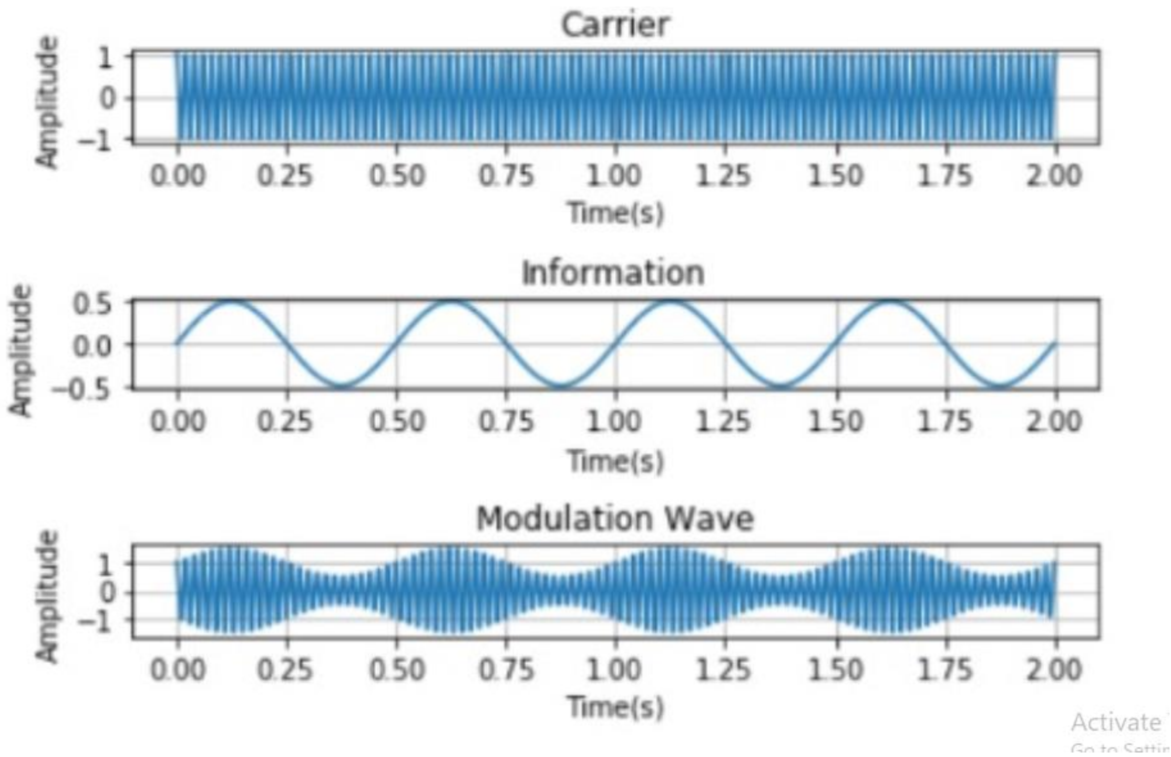
Applications of Amplitude Modulation

1. Broadcast Transmission
2. Airband Radio
3. Quadrature Amplitude Modulation
4. Signal Sidebands

PROGRAM:

```
import matplotlib.pyplot as plt
import numpy as np
from math import pi

plt.close('all')

# Create Time axis
Fs = 2000;
n = np.arange(0,2,1/Fs)

# Generate Carrier wave
Fc = 50
Ac = 1
c = Ac*np.cos(2*pi*Fc*n) # Carrier wave
plt.subplot(3,1,1)
plt.plot(n,c); plt.title('Carrier')
plt.xlabel('Time(s)'); plt.ylabel('Amplitude');
plt.grid(True)

# Generate message signal
Fm = 2
Am = 0.5
m = Am*np.sin(2*pi*Fm*n) # message signal
plt.subplot(3,1,2)
plt.plot(n,m); plt.title('Information')
plt.xlabel('Time(s)'); plt.ylabel('Amplitude');
plt.grid(True)

# Amplitude modulated signal
s = c * (1 + m/Ac)

# plot
plt.subplot(3,1,3)
plt.plot(n,s); plt.title('Modulation Wave')
plt.xlabel('Time(s)'); plt.ylabel('Amplitude');
plt.grid(True)

plt.tight_layout()
```

OUTPUT:



CONCLUSION:

We have successfully generated the output of a AM Waveform in python.