Aim ↬ To perform ASK [Amplitude Shift Keying] using Trainer Kit & MATLAB.

Apparatus Required ↬ MATLAB.

Theory ↬

Amplitude Shift Keying is a form of modulation used in digital communication systems. In ASK, the amplitude of a carrier wave is varied in proportion to the binary data signal. Two distinct amplitudes are used to represent binary values '1' and '0'. For example, a high amplitude represents a '1' and a low or zero amplitude represents a '0'.

ASK is widely used due to its simplicity in implementation and its effective use in bandwidth-constrained systems. However, it is also more susceptible to noise compared to other modulation techniques such as Frequency Shift Keying (FSK) and Phase Shift Keying (PSK), because any amplitude fluctuation in the channel can lead to data errors.

Working Principle:

1. **Binary Data Representation:** Binary data, a stream of 1s and 0s, is first defined. In the MATLAB implementation, this data is manually set as [1 1 0 1 0 1 1 1 0 1].
2. **Carrier Wave Generation:** A carrier signal is generated at a specific frequency $[f_c = 5\ Hz]$. This signal has a constant frequency and will undergo changes in amplitude to represent the binary data.
3. **Amplitude Modulation:**

- For a binary 1, the carrier signal is transmitted at full amplitude $[A_1 = 1]$.
- For a binary 0, the carrier signal is either completely suppressed or transmitted at zero amplitude $[A_0 = 0]$. The binary data stream is modulated onto the carrier wave by varying its amplitude in this way.

ASK is used in several applications such as RFID (Radio Frequency Identification), low-cost wireless communication systems, and optical fiber communication systems.

Code ↬

```
clc;
clear;
close all;

Fs = 100;
Fc = 5;
bit_rate = 1;
A1 = 1;
A0 = 0;
Tb = 1/bit_rate;
t = 0:1/Fs:Tb-1/Fs;

data = [1 1 0 1 0 1 1 1 0 1];
N = length(data);

ask_signal = [];

for i = 1:N
    if data(i) == 1
        ask_bit = A1 * cos(2*pi*Fc*t);
    else
        ask_bit = A0 * cos(2*pi*Fc*t);
    end
    ask_signal = [ask_signal ask_bit];
end

t_total = 0:1/Fs:Tb*N-1/Fs;

figure;
subplot(3,1,1);
stairs([0:N-1]*Tb, data);
xlabel('Time (s)');
ylabel('Amplitude');
title('Binary Data');
ylim([-0.5 1.5]);

subplot(3,1,2);
plot(t_total, cos(2*pi*Fc*t_total));
xlabel('Time (s)');
ylabel('Amplitude');
title('Carrier Signal');

subplot(3,1,3);
plot(t_total, ask_signal);
```

```
xlabel('Time (s)');
ylabel('Amplitude');
title('ASK Modulated Signal');
```

Output ↬

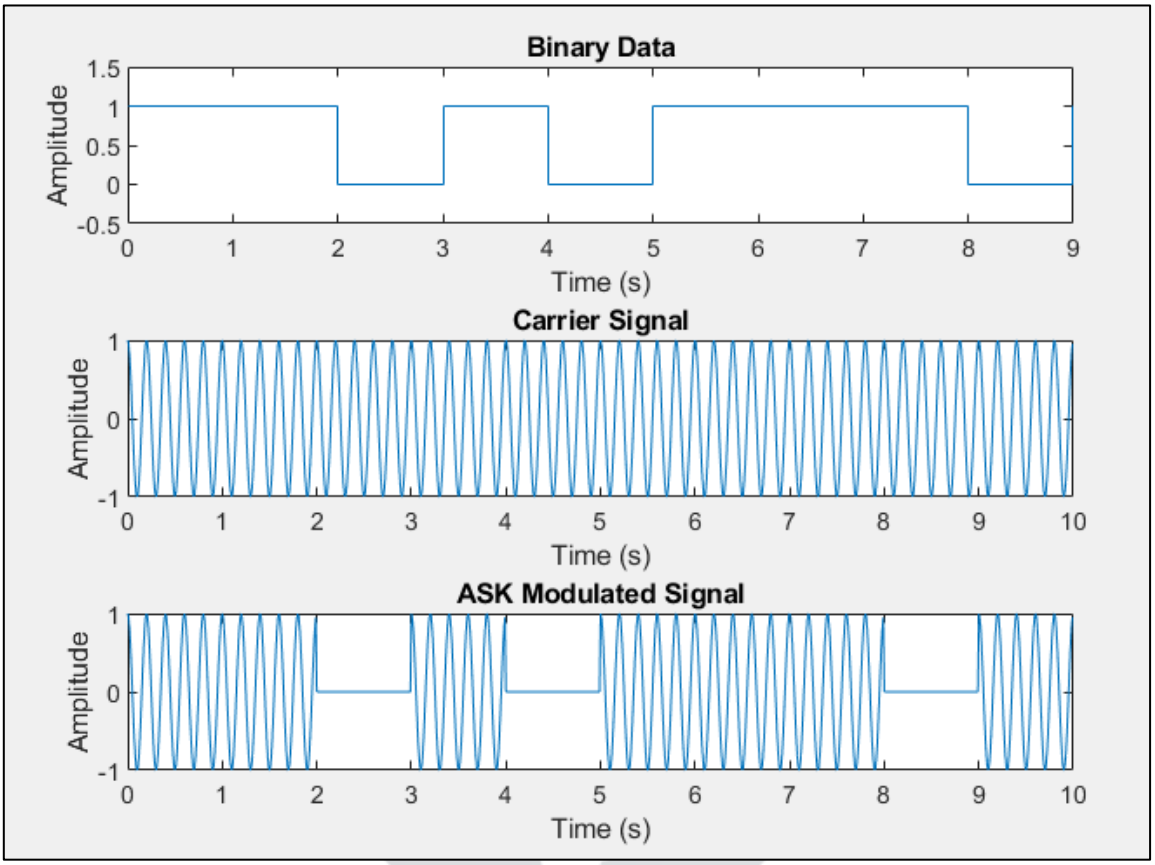

Fig. i) MATLAB Output

Result ↬

The ASK modulation was successfully demonstrated using MATLAB. The generated ASK signal clearly reflected the binary data with distinct amplitude variations for 1 and 0.

Conclusion ↬

The experiment confirmed that ASK efficiently modulates binary data by varying the carrier signal's amplitude. Proper tuning of the carrier and synchronization are essential for accurate transmission.

Precautions ↬

- Ensure that the carrier frequency is properly selected to avoid distortion of the ASK signal.

- Check that the binary data and modulation settings are correctly inputted into MATLAB for accurate signal generation.
- Verify the time and amplitude scales on the MATLAB plot to clearly visualize the modulated signal.