Date _____

Expt. No. 03 Page No. 05

Task-3

Design and Generation of Frequency modulation

Aim: To construct the frequency modulated circuit and observe it's waveform.

Components required:

→ IC
→ Resistor
→ Capacitor
→ Bread-board
→ Function generator

Procedure

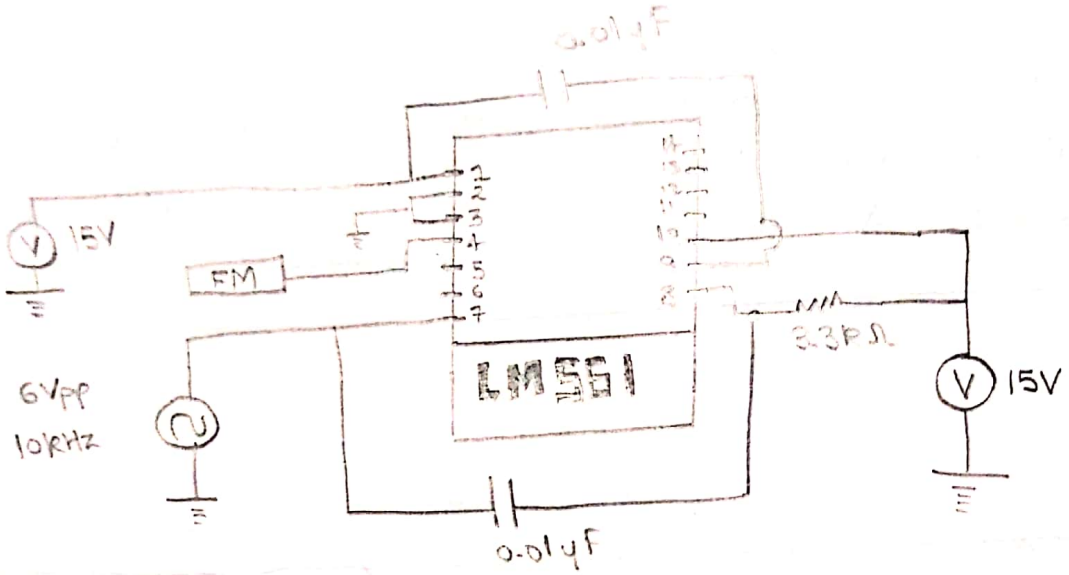
1) Make the following connections with respect to LM561 IC
2) Provide the frequency modulated signal with message and carrier signal.
3) In the output with varying frequency at the closer nodes and the furthur nodes.
4) Calculate the change in the frequency.

Inference

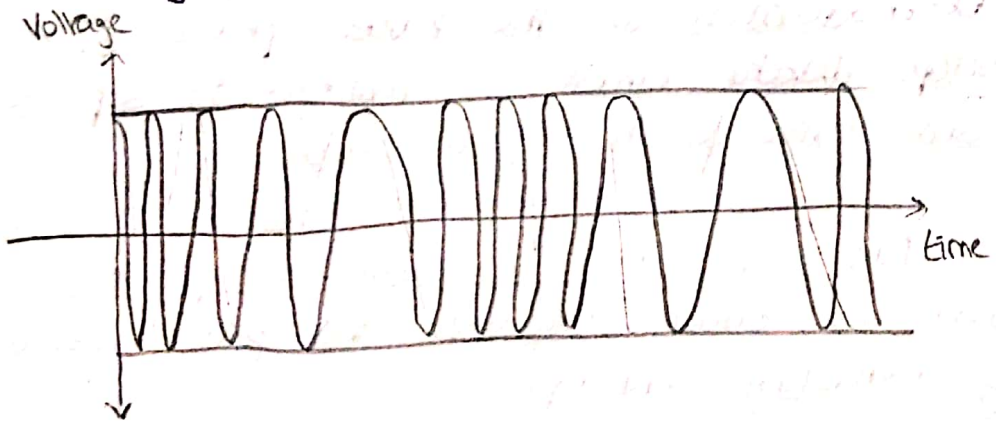
→ FM is non-linear when compared to AM
→ Spectrum bandwidth will not be equal to twice the bandwidth unlike AM.

Teacher's Signature : _____

Circuit design



Model graph.



Tabulation

Signal	Frequency	Amplitude
message signal	100Hz	14.3V
carrier signal	T_{off} = 18.4μs; T_{on} = 16.6μs	12V
modulated signal	T_{on} = 6.4μs; T_{off} = 12.2μs T_{off} = 7.4μs; T_{on} = 10.6μs	11.8V

Date _____

Expt. No. _____ Page No. _____

Theory:

In frequency modulation, the instantaneous frequency of carrier wave is varied from the center frequency by an amount proportional to the instantaneous amplitude of modulating signal

Main advantages of FM are improved signal to noise ratio and less radiation power

The FM signal is expressed as:

$$s(t) = A_c \cos(2\pi f_c + \beta \sin(2\pi f_m t))$$

β = modulation index of FM wave.

Result: The frequency modulated wave was detected at the output.

Teacher's Signature : _____

```
clc
clear all
close all
t = 0:0.001:1; %upto 1000 samples
vm = input('Enter Amplitude (Message) = ');
vc = input('Enter Amplitude (Carrier) = ');
fM = input('Enter Message frequency = ');
fc = input('Enter Carrier frequency = ');
m = input('Enter Modulation Index = ');
msg = vm*sin(2*pi*fM*t);
subplot(3,1,1); %plotting message signal
plot(t,msg);
xlabel('Time');
ylabel('Amplitude');
title('Message ');

carrier = vc*sin(2*pi*fc*t);
subplot(3,1,2); %plotting carrier signal
plot(t,carrier);
xlabel('Time');
ylabel('Amplitude');
title('Carrier Signal');

y = vc*sin(2*pi*fc*t+m.*cos(2*pi*fM*t));
subplot(3,1,3);%plotting FM (Frequency
Modulated) signal
plot(t,y);
xlabel('Time');
```

```
fM = input('Enter Message frequency = ');
fc = input('Enter Carrier frequency = ');
m = input('Enter Modulation Index = ');
msg = vm*sin(2*pi*fM*t);
subplot(3,1,1); %plotting message signal
plot(t,msg);
xlabel('Time');
ylabel('Amplitude');
title('Message ');

carrier = vc*sin(2*pi*fc*t);
subplot(3,1,2); %plotting carrier signal
plot(t,carrier);
xlabel('Time');
ylabel('Amplitude');
title('Carrier Signal');

y = vc*sin(2*pi*fc*t+m.*cos(2*pi*fM*t));
subplot(3,1,3);%plotting FM (Frequency Modulated) signal
plot(t,y);
xlabel('Time');
ylabel('Amplitude');
title('FM Signal');
```