Ganpat University

Faculty of Engineering & Technology

Computer Science & Engineering

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Sem:- 2

Sub: - BCS

Enrollment No.:- 23162121027

Prac:- 7

Date:- 15/4/2024

Practical – 7

Aim: To perform Frequency Modulation and Demodulation.

Student Group Detail

No	Enrollment No.	Student Name
1	23162121012	Om Koradiya
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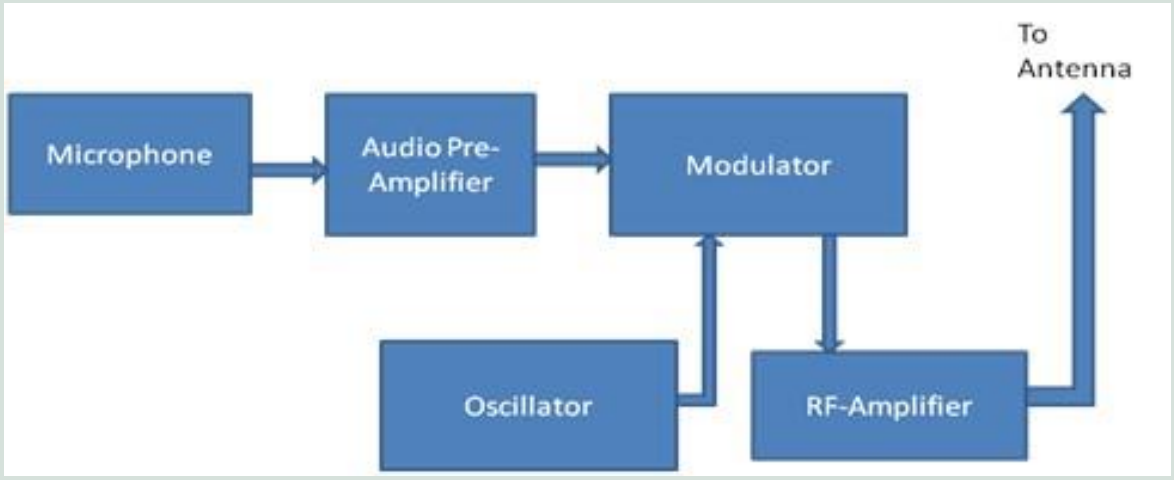
3	23162121027	Dwij Desai

Apparatus:

1. C.R.O (20MHz)
2. Function generator (1MHz).
3. Connecting cords & probes.

Block Diagram



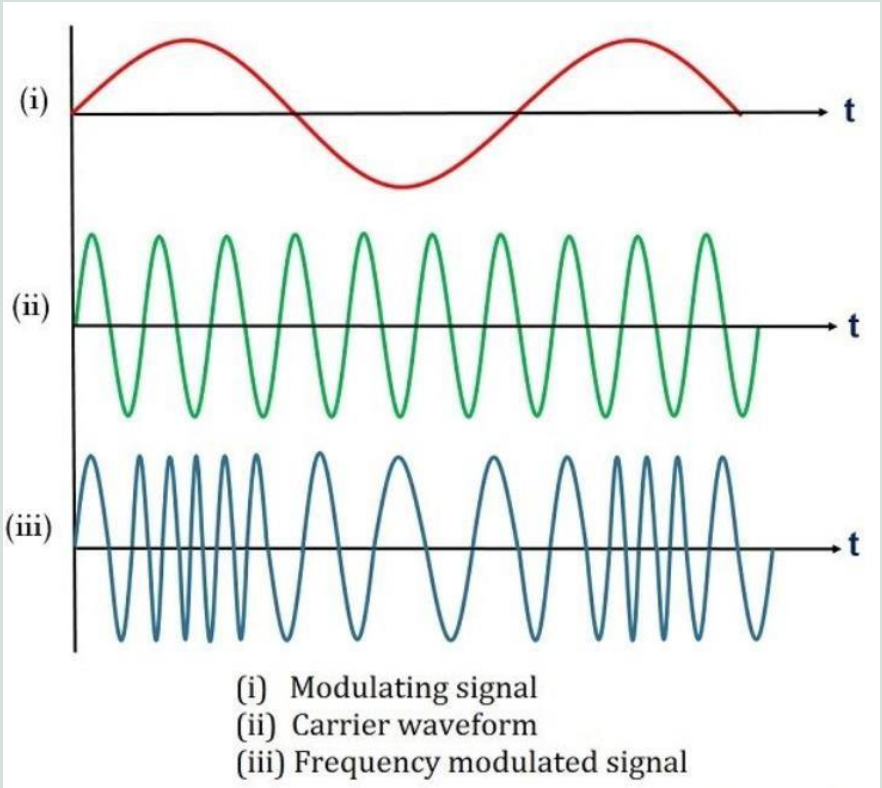
Description:

The process, in which the frequency of the carrier is varied in accordance with the instantaneous amplitude of the; modulating signal, is called "Frequency Modulation". The FM signal is expressed as:

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

Where A_c is amplitude the carrier signal, f_c is the carrier frequency f_m is the frequency on information signal.

Expected Waveforms:



(i) Modulating signal
(ii) Carrier waveform
(iii) Frequency modulated signal

Procedure:

- Slowly increase the amplitude of modulating signal and measure f_{min} and f_{max} frequencies.
- Measure the frequency deviation Δf at each step.
- Evaluate the modulating index (β) using $\Delta f / f_m$ where $\Delta f = \frac{|f_{max} - f_{min}|}{2}$
- Calculate Bandwidth. $BW = 2(\beta + 1)f_m = 2(\Delta f + f_m)$

Observation Table:

Note: Here we will take all frequencies in terms of KHz in following table:

Deviation	f_c	f_m	$fmax$	$fmin$	Δf	β	BW
1	69	7	75.41	62.65	6.38	1.063	24.76
2	75	11	85.76	64.29	10.73	1.34	37.46
3	80	7	97.65	61.50	18.07	2.58	50.14
Demo. reading	10kh	5kh	59.8kh	40.5kh	9.65kh	1.92kh	29.3kh

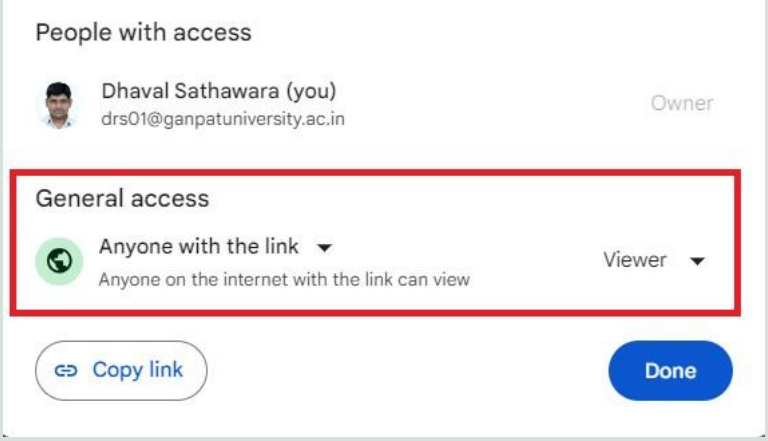
Observation Video URL:

Observation	Video URL
1	https://drive.google.com/drive/folders/1cqtdSiOVEa4VHGMg-bbSyxHINC3mfP3N

Note: Make sure you are providing a link of video that uploaded in google drive and shared with **"Anyone can view this who have link"** access rights.

For example, refer following Image which will prompt when you click

"Share" Button of any document in drive



Failing to do will be treated as misguiding in evaluation process and said task will be treated and **"Incomplete"**.

Conclusion:

- Frequency modulation (FM) is a technique where the frequency of a carrier signal varies with the instantaneous amplitude of the modulating signal. In this experiment, we studied FM using a carrier frequency of 69 kHz and modulating frequencies ranging from 7 kHz to 11 kHz. By measuring frequency deviations, we calculated the modulating index and bandwidth of the FM signal.

- As the modulating frequency increased, so did the frequency deviation and modulating index, leading to a wider bandwidth. FM is commonly used in radio broadcasting for its noise resistance and high-fidelity audio transmission capabilities.

Post Practical questions:

1. How FM differs than AM?
   A. In AM, a radio wave known as the "carrier" or "carrier wave" is modulated in amplitude by the signal that is to be transmitted. In FM, a radio wave known as the "carrier" or "carrier wave" is modulated in frequency by the signal that is to be transmitted.

2. What is the range of FM?
   a) Concept: FM broadcast: Frequency Modulation is the most widely used modulation system in radio transmission, in FM the audio signals are modulated onto carrier frequencies in bands 88 MHz to 108 MHz.