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SYSTEMS

REG NO 15PWELE4370

SECTION D

UNIVERSITY OF ENGINEERING AND TECHNOLOGY PESHAWAR

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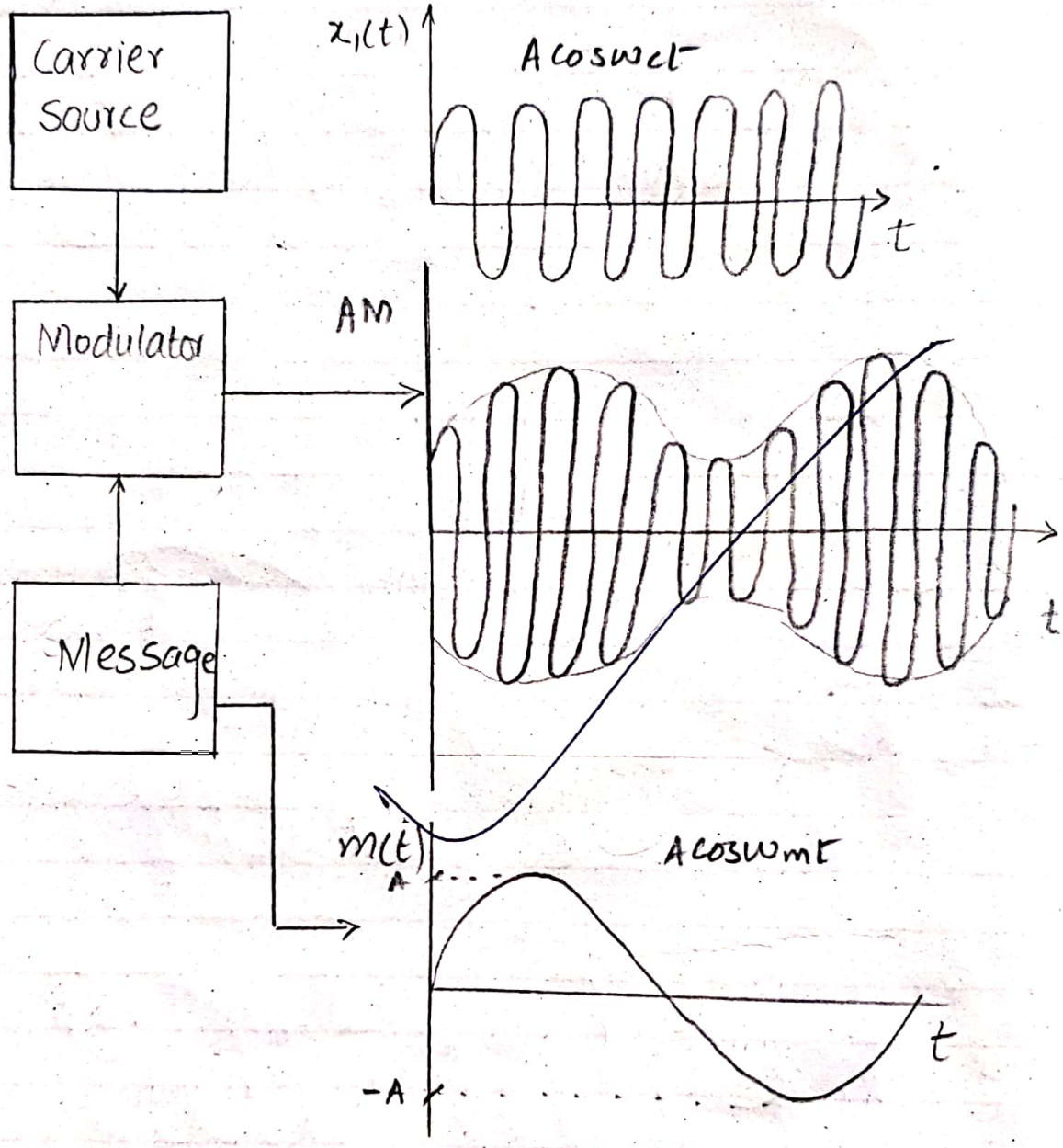
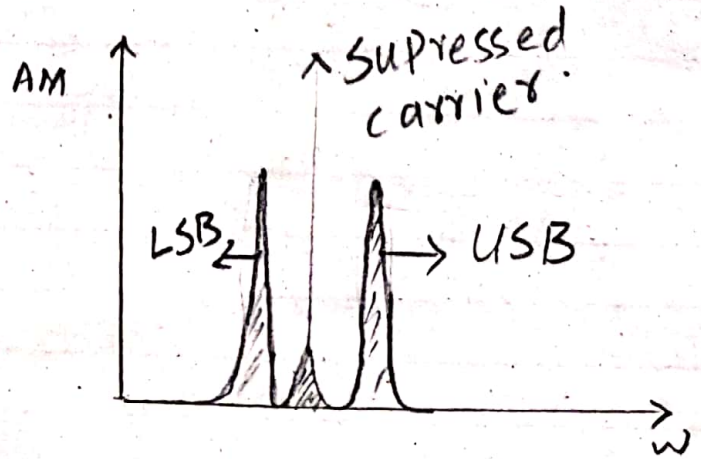


Specturm Analyser



Lab #01 Date:-

Title:-

OBSERVATION OF DOUBLE SIDE BAND WITH SUPRESSED CARRIER.-

Apparatus:-

Carrier source, Modulator, Message signal generator, Oscillioscope, Spectrum analyser-

Procedure:

First of all we arranged all the devices required to carryout the above experiment in correct order- Similarly we are observing double side band which has further upper side band and lower side band in division-

In this experiment we modulated a signal which is usually considered as a message signal - We observed them on the oscillioscope in continous time domain But we also observed the same signal in frequency domain by using spectrum analyser where we observed supressed carrier-

The problem with communication with the help of modulated signals

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with supressed carrier is that it need a simple transmitter and cheap also - But it needs very complicated and expensive reciever - while in point to point or in multicasting it can be marked as feasable But in broadcasting it is not feasible.

Defination:

In amplitude modulation using Double side band we use suppressed carrier which is folded between the upper side band and lower side band - Such Type of modulation is known as double side band modulation with supressed carrier. Similarly in amplitude modulation we vary the amplitude of the carrier signal which is of high frequency in accordance with the message signal which is of lower frequency and lower amplitude than that of the carrier signal amplitude -

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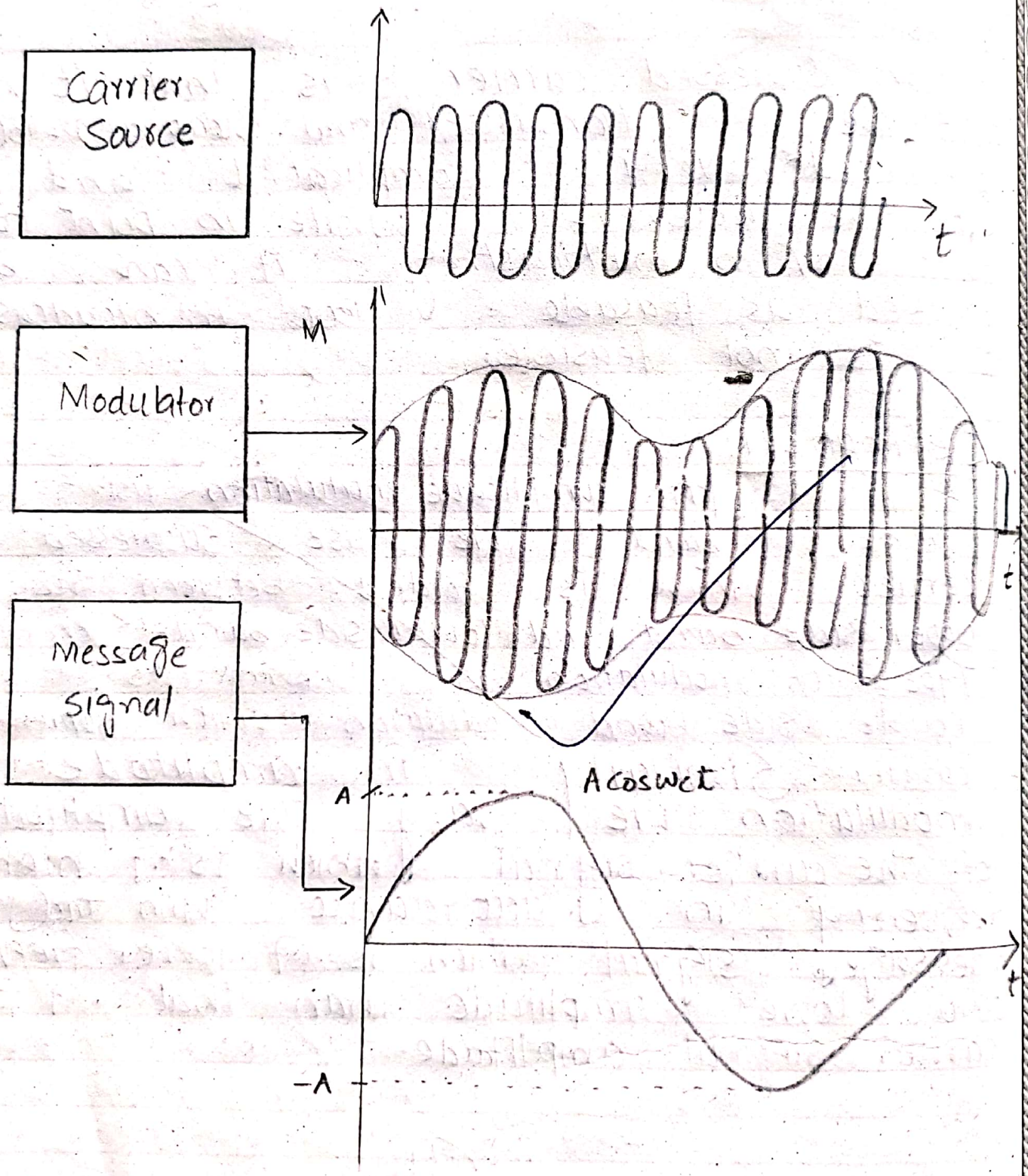

Lab #02 Date:

Title:

OBSERVING AMPLITUDE MODULATION WITH FULL CARRIER

Apparatus:

Signal generator, modulator, Oscillioscope, Specturm analyser

Procedure:-

In amplitude modulation we can have the full carrier. This has helped us in Designing compiex and expensive transmitters while cheap and simple recievers. This method has been broadly used in broadcasting. For this experiment we 1st arranged all the devices and instruments in order. Then we connected them in proper order according to the circuit Diagram. when we modulated the message signal with the help of malulator. Then we studied it through oscillioscope in continous time domain. Then for the frequency Domain to study the frequency components of the modulated signal we used spectrum

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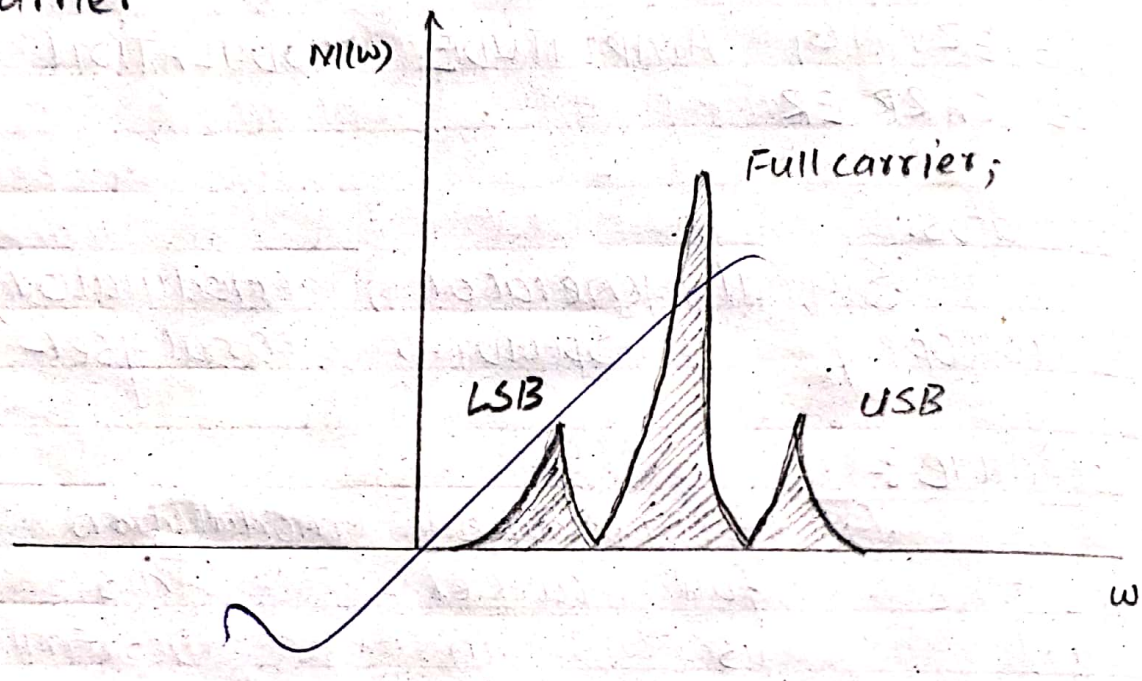
Spectrum anlyser

Full carrier



analyser- Where the carrier was not supressed- But it was a full carrier- But amplitude modulation with full carrier needs very high power transmitter.

Defination. The type of modulation in which we use Double side Bond But the carrier is not suppressed is called Double side band with full carrier- Similarly in amplitude modulation we vary the amplitude of the carrier signal which is a high frequency signal in accordance with the amplitude of the message signal which is of lower frequency and amplitude to that of the carrier frequency and amplitude;

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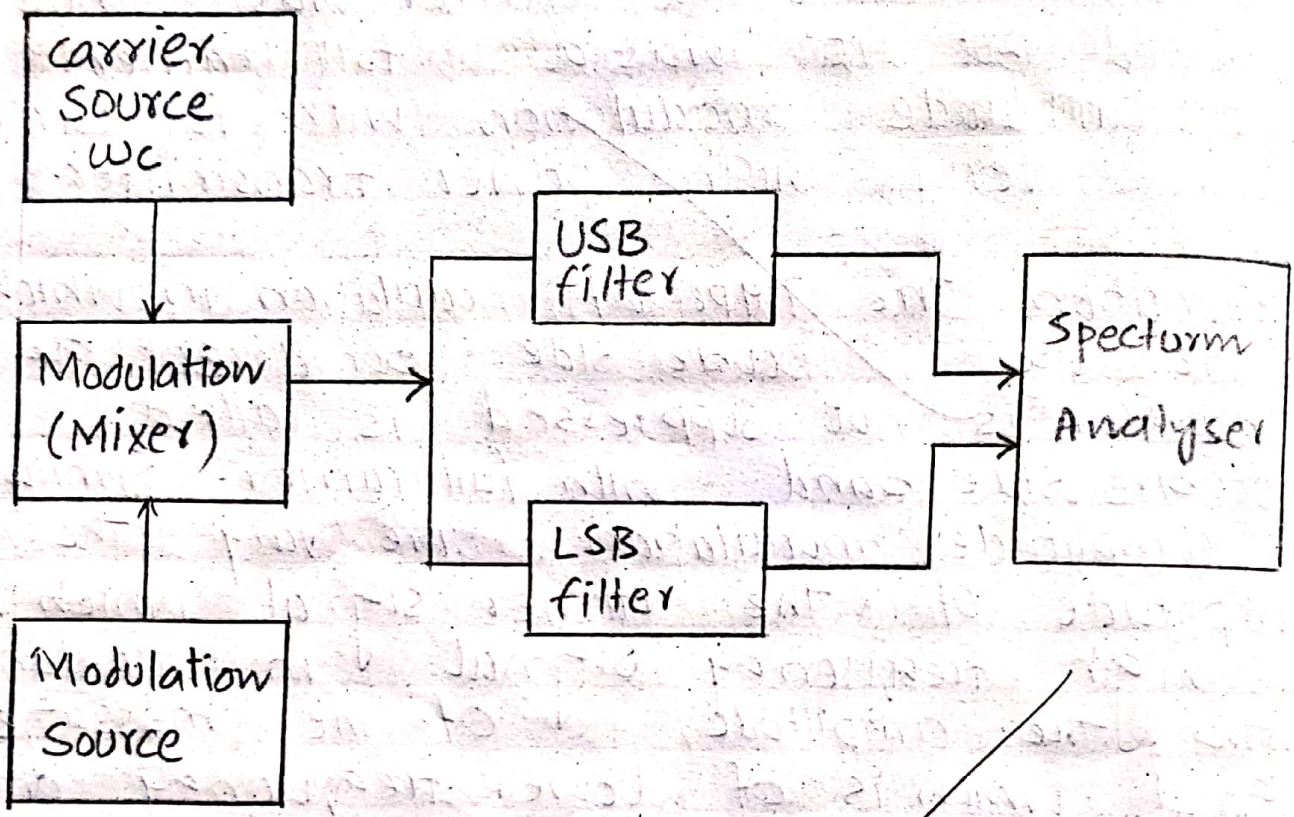
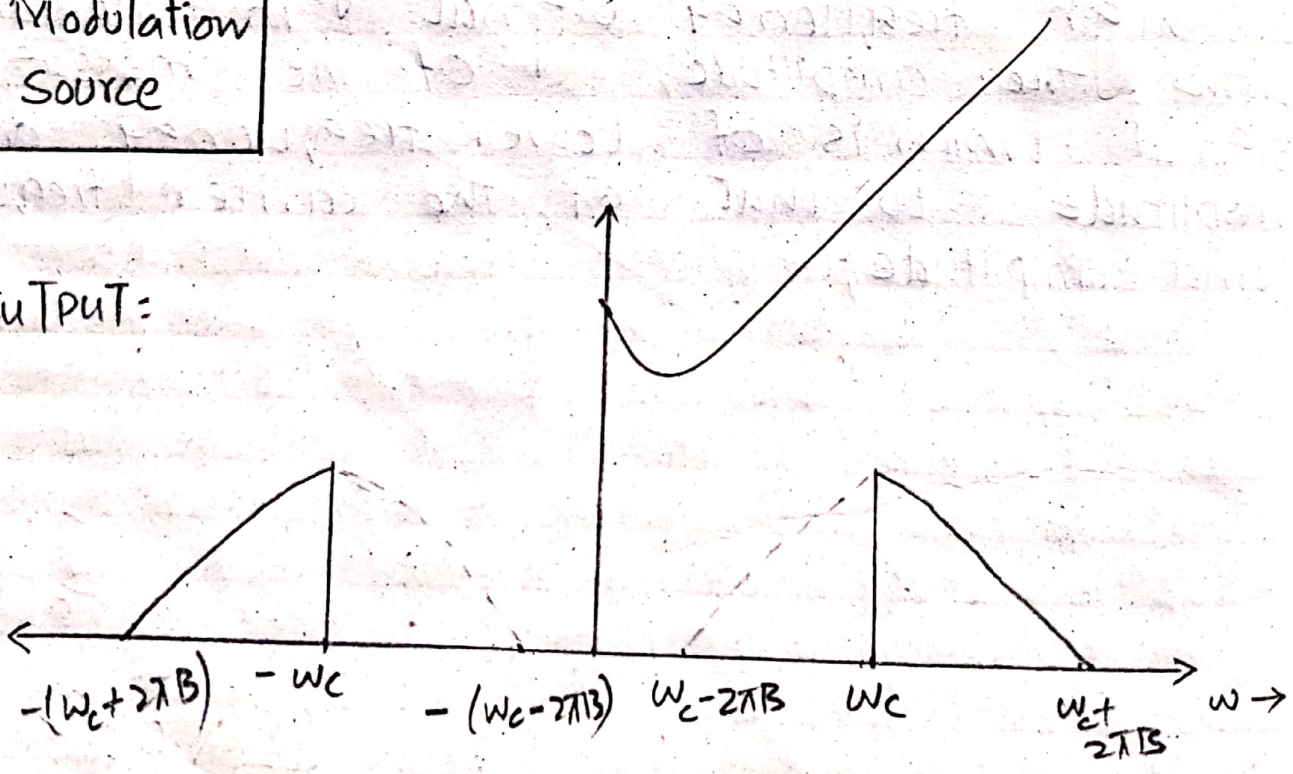


OUTPUT:



Lab #03

Title:

Generation of Single side band signals from Double side band signals.

Defination:

As we know DSB is not BW efficient which needs more BW Because it has USB and LSB both contain the same information. So we need another scheme which is called SSB and it is BW efficient.

Procedure:

The generator is a balanced modulator producing DSB, followed By a band Pass filter for the required side band. To have a good shape factor Because of normal carrier and audio frequencies, USB and LSB are quite close in frequency domain when observed on the analyser. So for USB we use High Pass filter & for LSB we use low Pass filter.

Uses & advantages:

It is used in transmission through radio links, its transmitter Power requirement is also very low.

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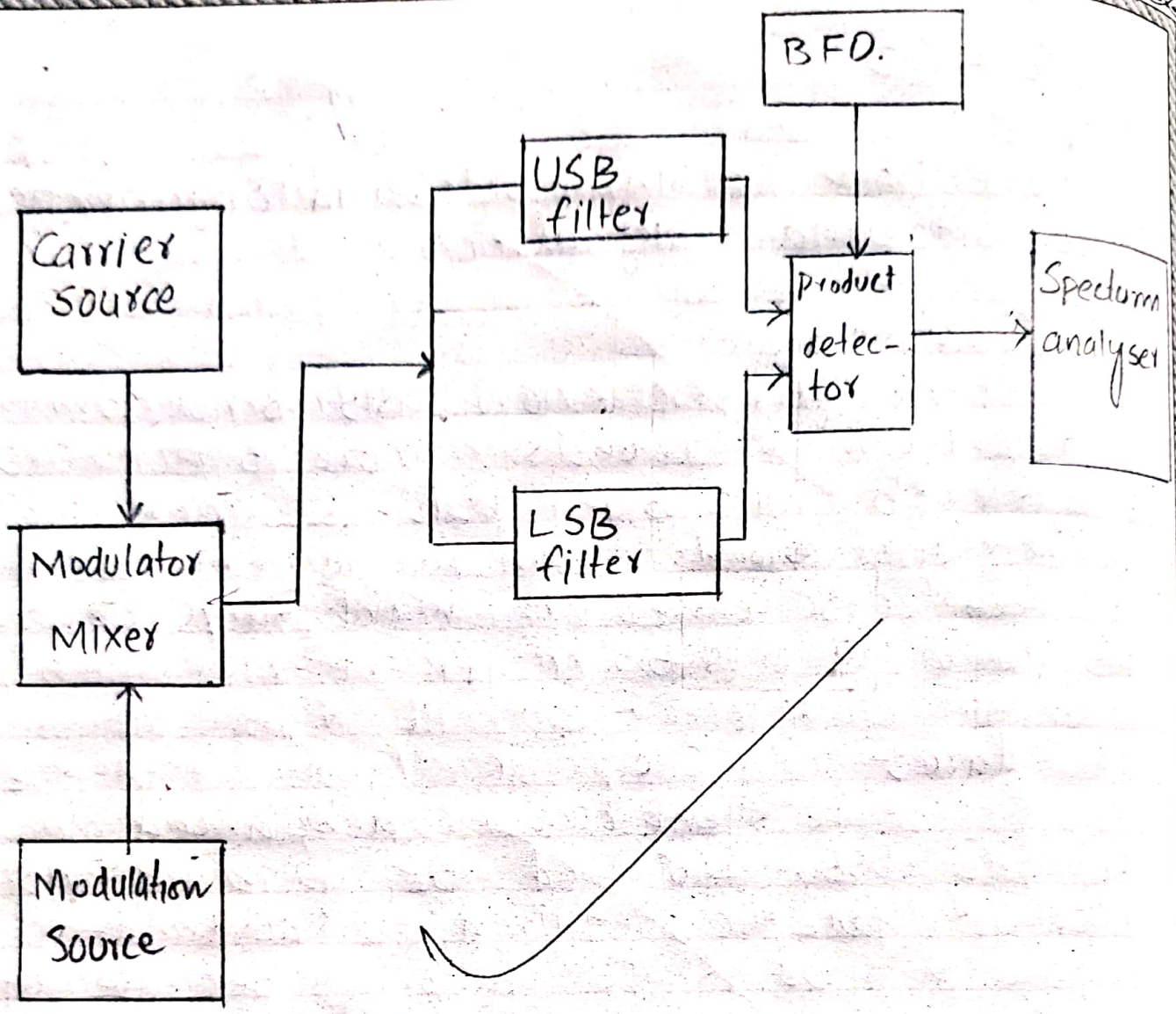
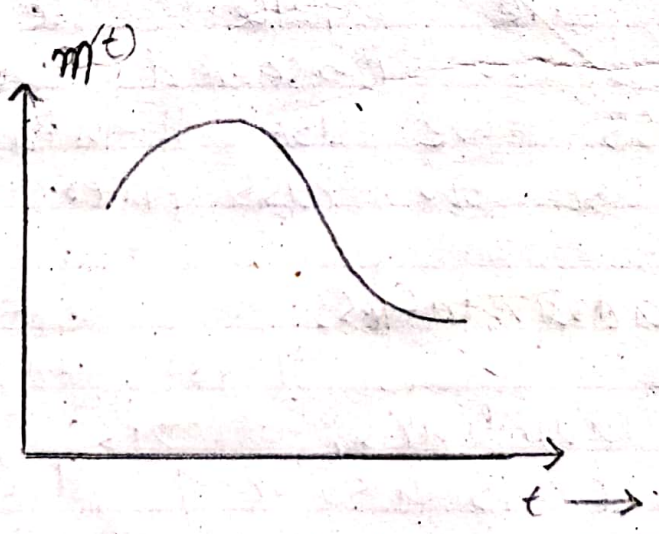


output



Lab #04.

Title:-

Demodulation of SSB.

Defination:-

It is basically the reverse process to retrieve the transmitted msg / signal.

Procedure:-

In DSB-SC Demodulation was done using BFO to reinsert the carrier. The BFO was inphase, with the original carrier- or it will't work. But for demodulation we don't need the same frequency- we can use both USB & LSB- & see that with BFO set correctly near to the original carrier- frequenty even though the two sidebands are at different frequencies - The demodulated output is same, changing BFO frequency causes the demodulated changing BFO frequency 1/10 causes to change in frequency by some amount.

Uses & advantages:-

SSB is one of the most Powerful technique for transmitting audio frequencies over radio links. With its narrow BW & efficient use of adorable transmitted Power.

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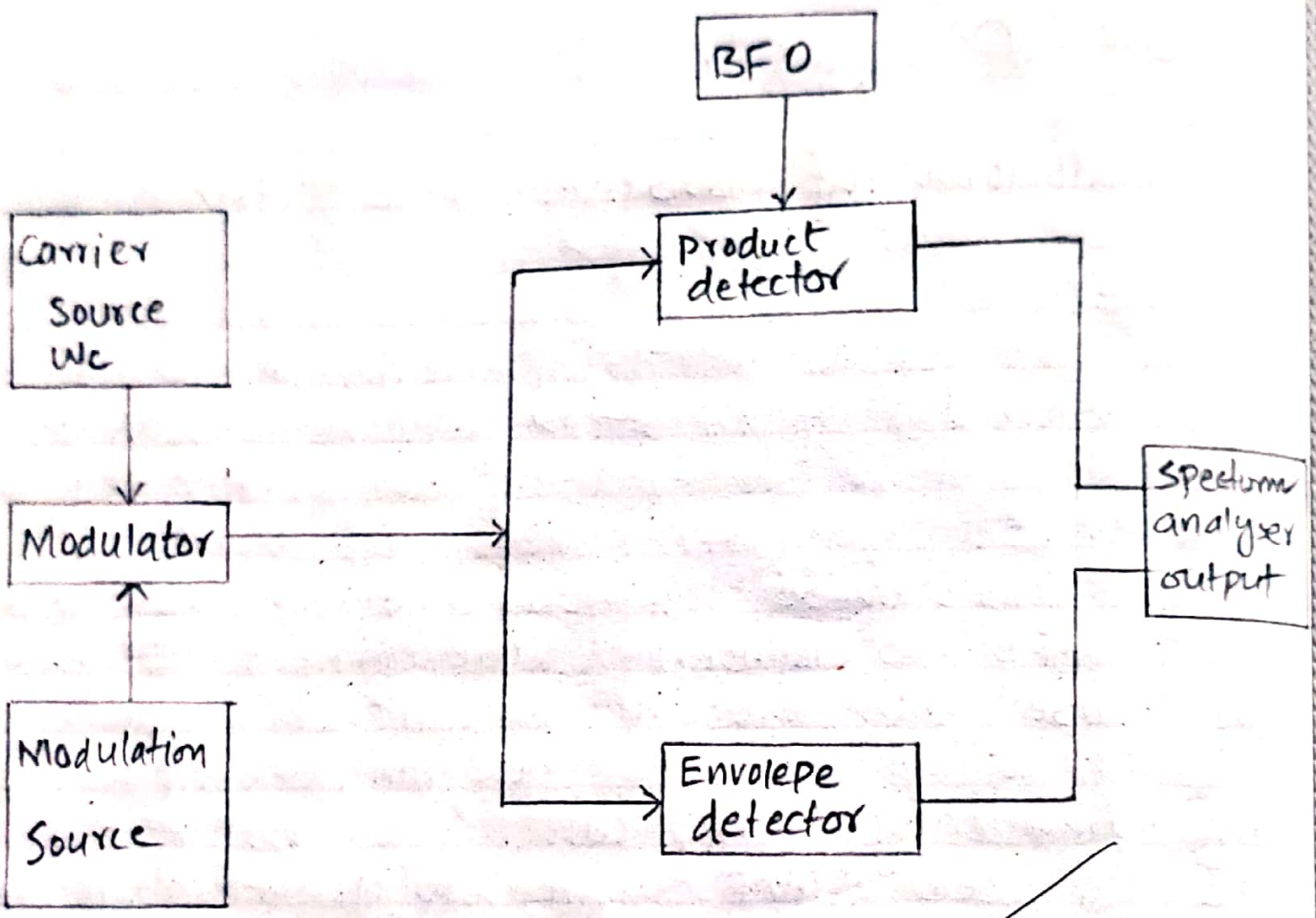

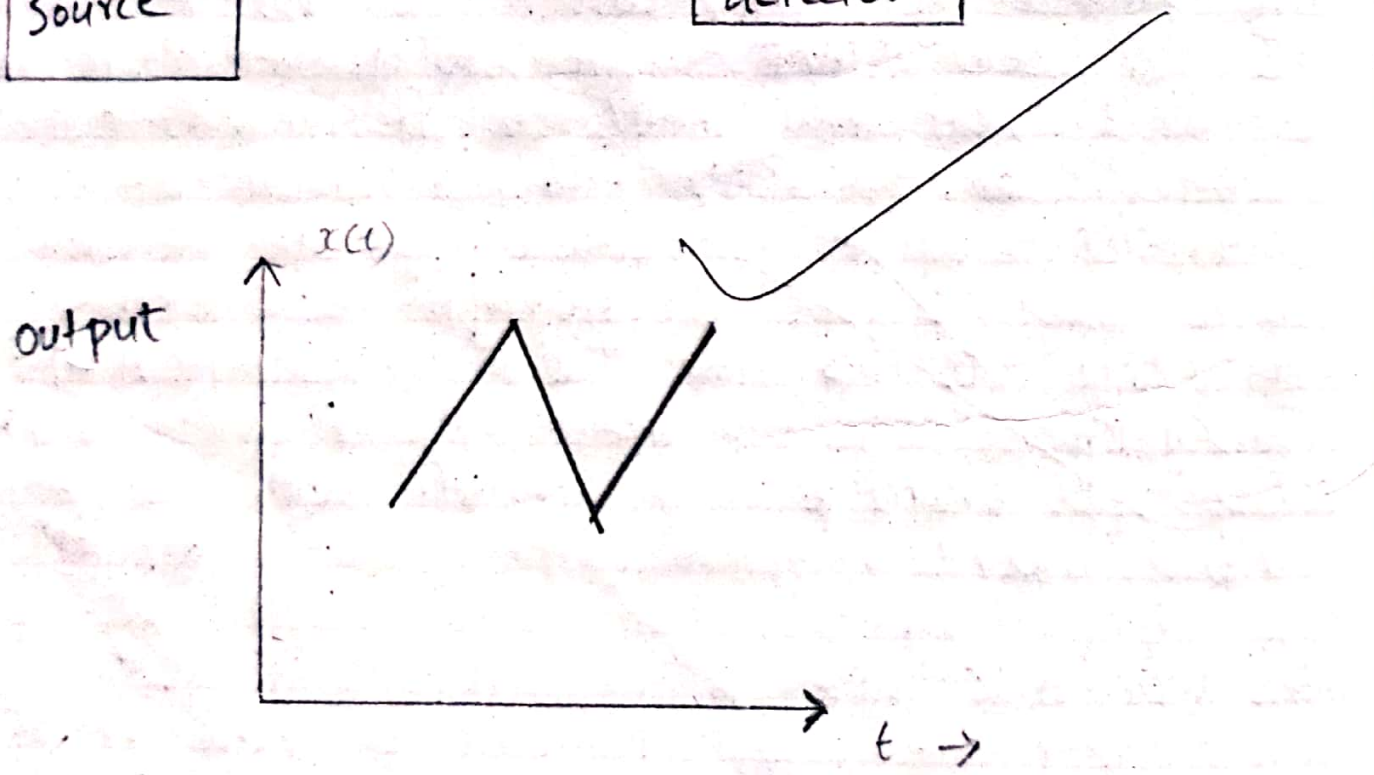

Lab # 05

Title:

To study Double side Band (DSB) with supressed carrier (SC) -

Defination:-

The modulated signal spectum centered at carrier freqency of USB & LSB when this scheme doesn't contain a discrete component of carrier freqency when observed by spectum analyser-

Requirements.

① Carrier source ② Balanced Modulator.
③ Modulation source ④ Beat freqency Oscillator.
⑤ Product detector ⑥ Envolepe detector.

Procedure:-

A DSB-SC is generated from a carrier source and a modulating signal - In the same way the same carrier is remultiplied at demodulator using BFO and then passed through envolepe detector & product detector and then results are analysed through Spectum analyser; Local carrier is multiplied using BFO Finally the signal is detected using product detector.

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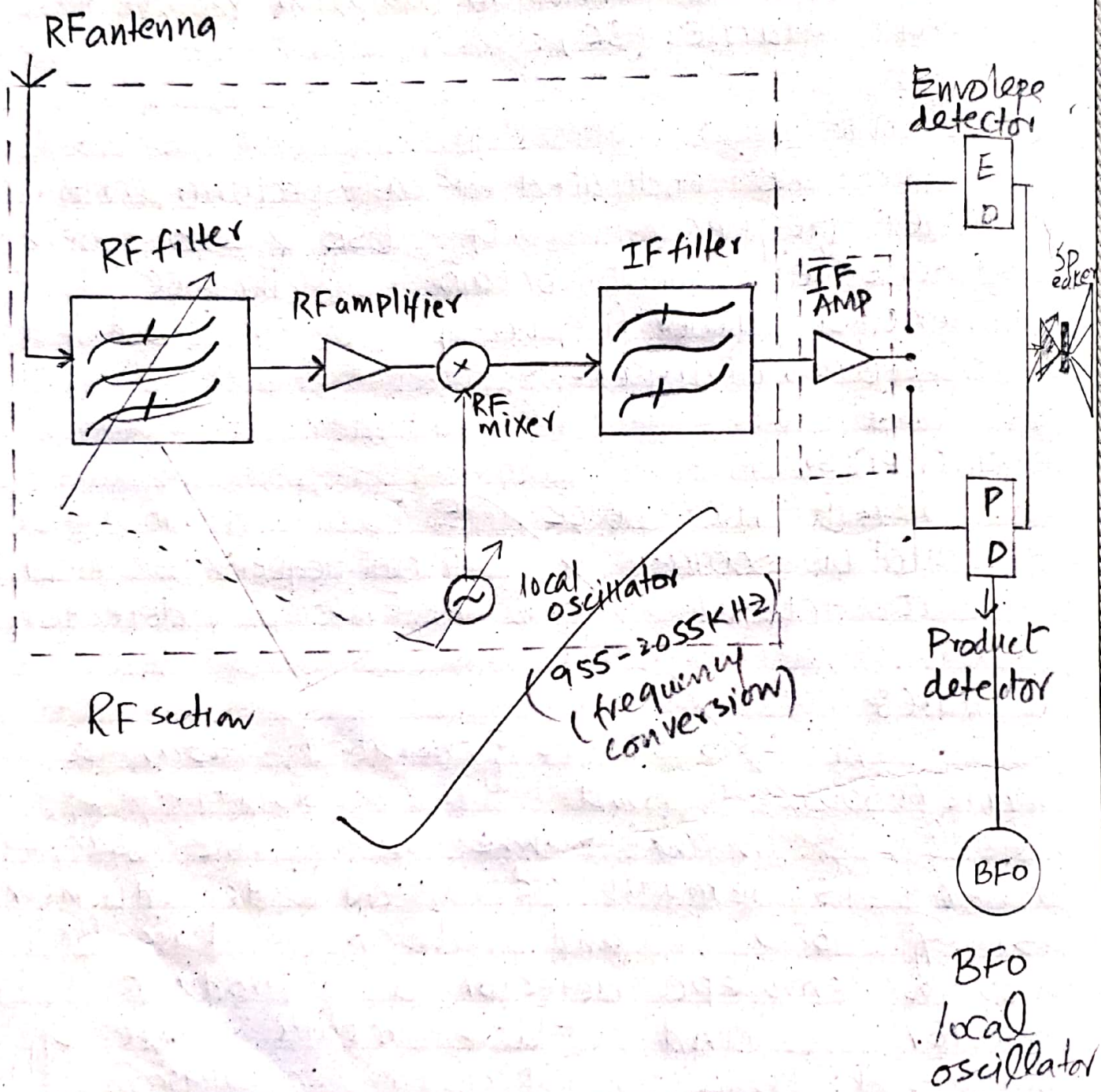
$f_c = 530KHz$; $f = 11KHz$, $f_{IF} = 455KHz$



Lab #06

Title:

To analyse superhetrodyne AM reciever.

Defination:

Superhetrodyne reciever is used for the demodulation of AM waves. It is basically consists of an antenna when recieves elektromagnetic waves, a radio frequency amplifier, a mixer & local oscillator, Intermediate frequency amplifier, Detector, Audio amplifier and a speaker.

Procedure:-

It is basically a radio reciever. The RF section is basically a tunable filter and an amplifier that picks the desired station by tuning the filter to right frequency band. The frequency mixer translates the carrier Wc to a fix IF frequency of 455KHz for this purpose a local oscillator is used. C/D $F_{LO} = 455KHz$ above the incoming carrier frequency fc i-e $F_{LO} = (f_c + f_{IF})$ where $f_{IF} = 455KHz$ which is upconversion. The tuning of local oscillator & RF tunable filter is done by one knob. This means that every station is tuned in is translated to a fix fc of 455KHz by frequency converter for just adequate

selectivity. Then the IF section supress adjacent channel interferance b/c it was high selectivity. & also amplifies signal for envelope detection.
The next is the detector which detects the message signal which was modulated at the transmission side.
After the message signal is recieved its power is very small which is forther amplifier by the audioamplifier circuit which can be common base or a voltage divider bias circuit.
and at the end the message signal is provided to a speaker.

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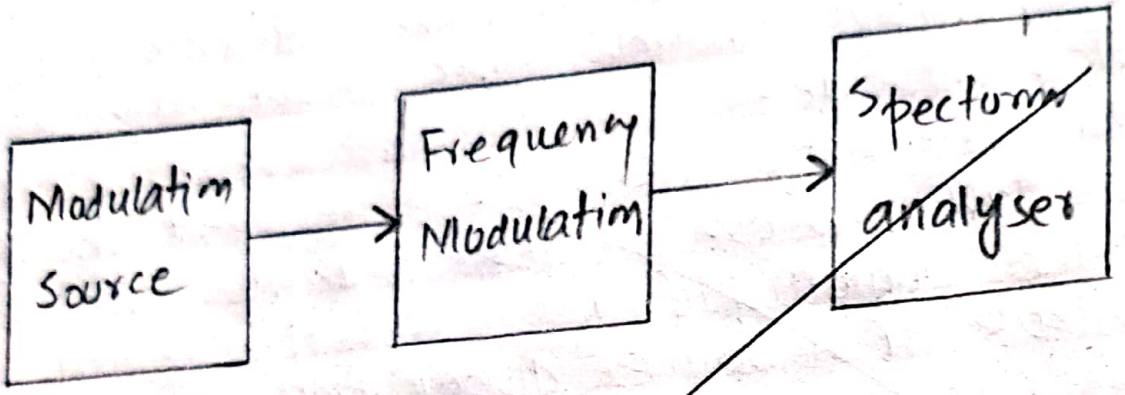
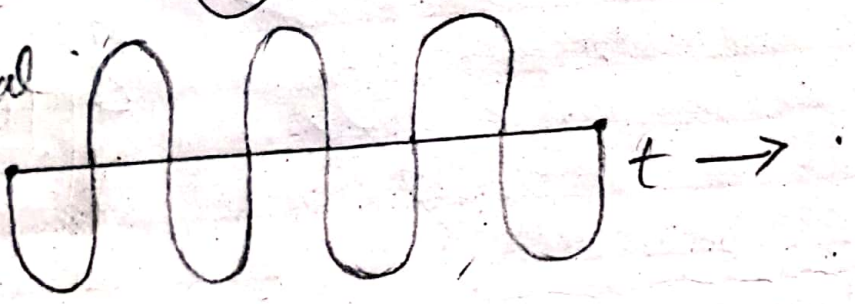
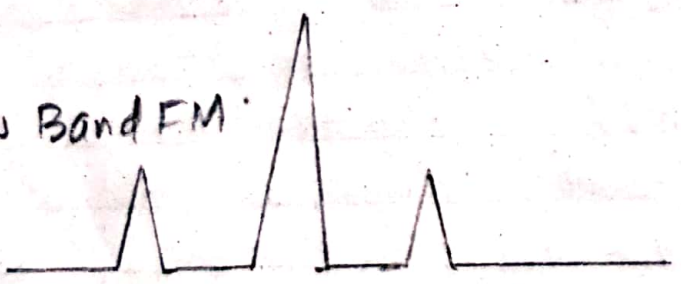


Output:
Oscillioscope.

FM signal.

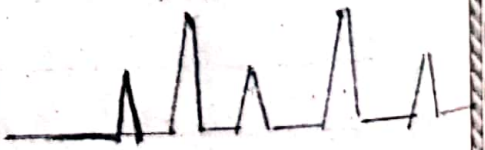


Narrow Band FM.



NBFM

Wide band FM.



WBFM

Lab #=07.

Title:-

To analyse a frequency modulator

Defination:

In frequency modulation the frequency of the carrier signal is varied according to the amplitude of the message signal but keeping the amplitude of the carrier signal constant;

Requirements:-

Modulation Source
Carrier Source
Frequency modulator
Spectrum analyser
Oscillioscope

Procedure:-

Using modulation source message signal is obtained - Similarly carrier signal is also generated by the carrier source; FM produces Frequency modulated signal - By comparing FM & AM both acquire the same BW but FM quality is much better than AM. FM has two main types.

① NBFM (Narrow Band FM) ② Wide band (FM).

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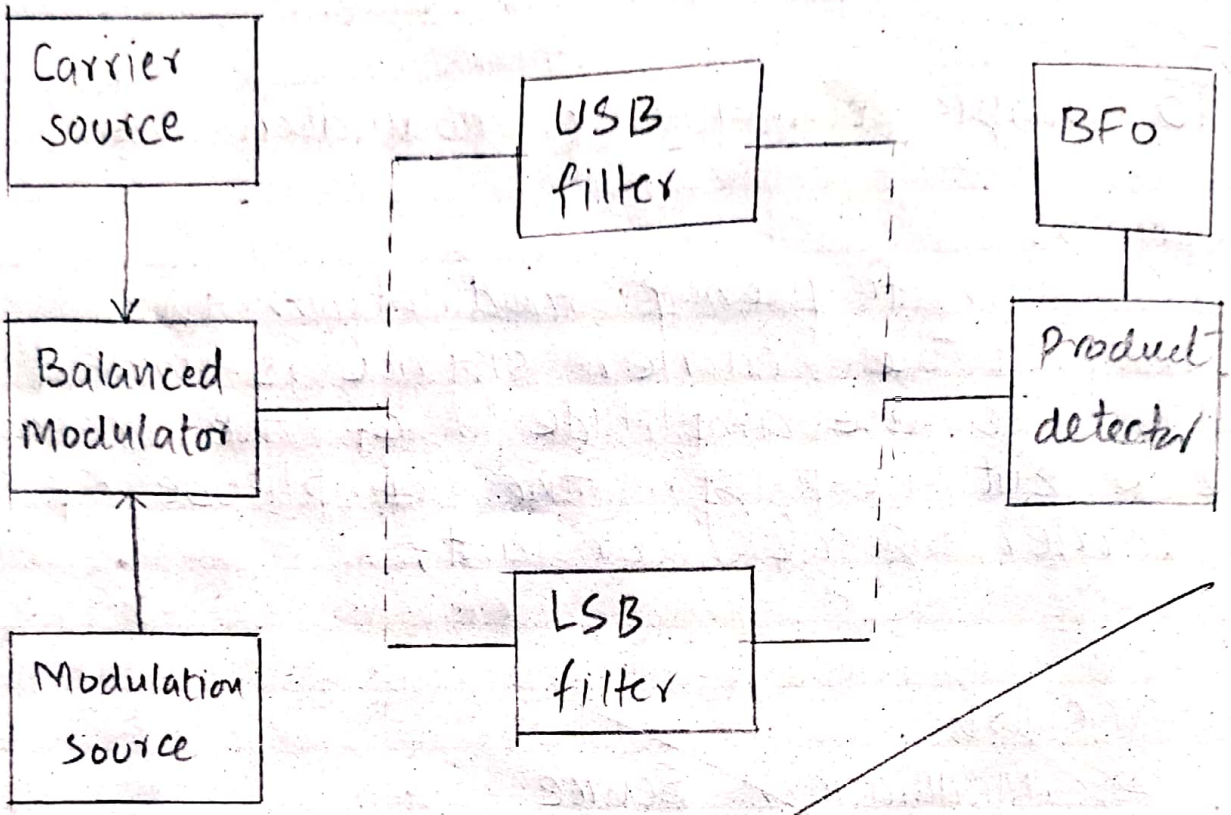
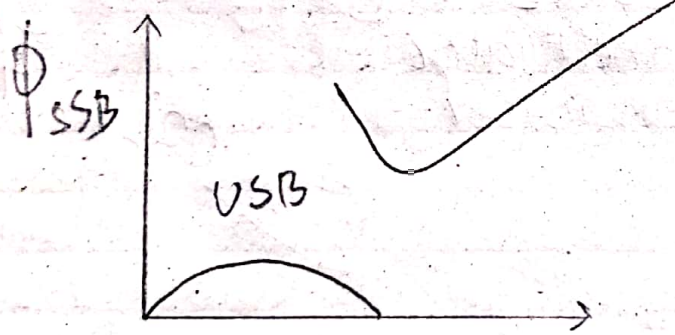
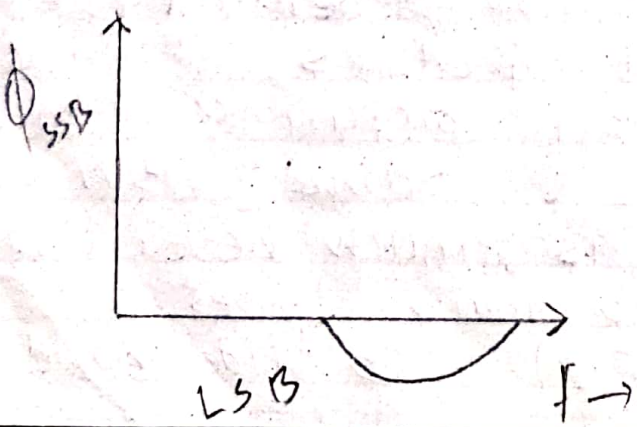






Lab #08.

Title:

Demodulation of Single Side Band (SSB):

Defination:

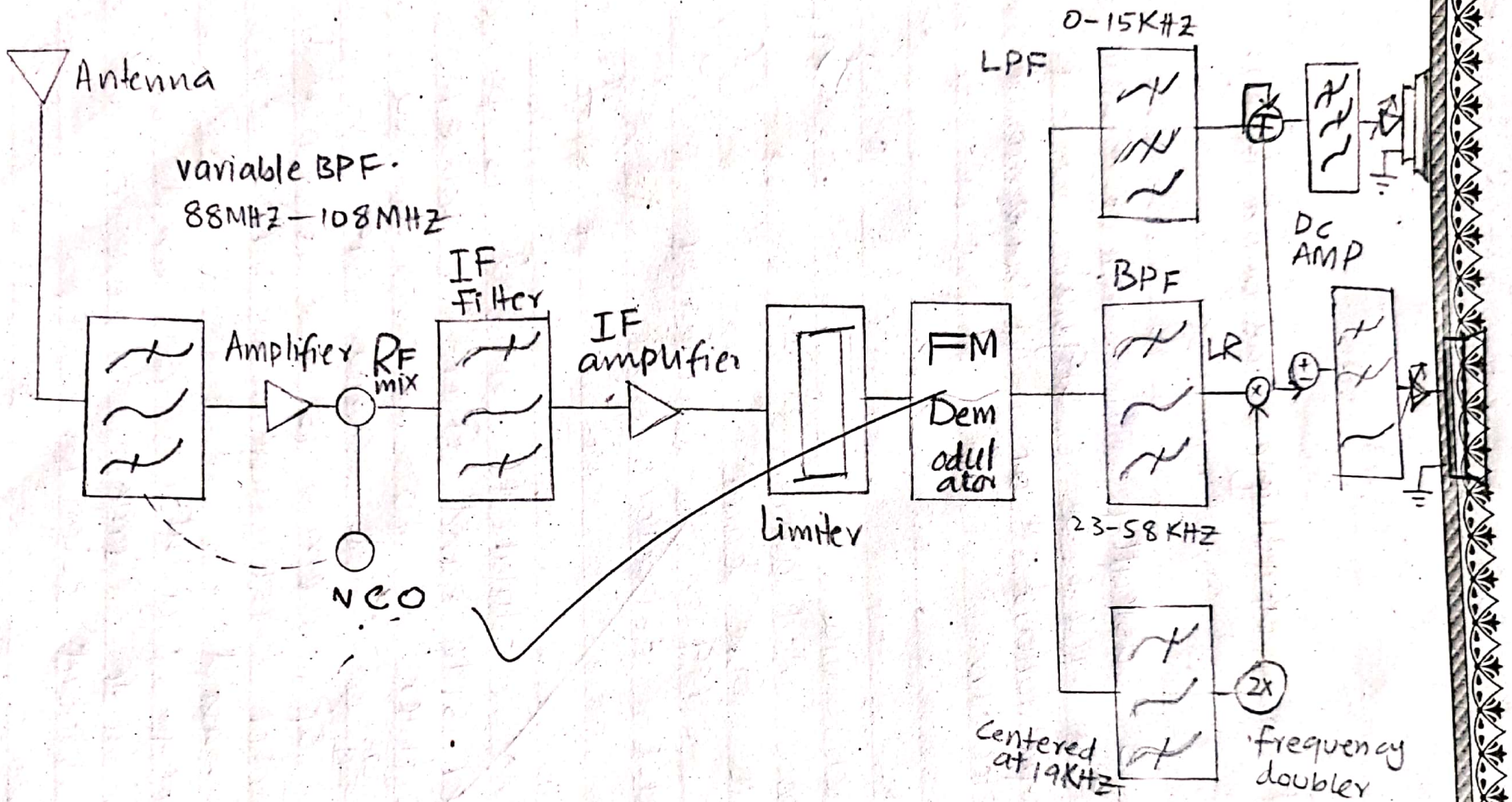
It is basically the reverse process of getting the message signal- It can be synchronous or a synchronous or coherant detection.

Requirements:

Carrier Source
Balance Modulator
Single Side Band filters-
Beat frequency Oscillator
Product detector:

Procedure:

The modulated signal is passed from upper side band filter & lower side band filter to obtain the corresponding side band signals- Then each of them is passed through Product detector for demodulatoron of each side band.
Beat frequency oscillator is used for providing same carrier frequency and phase at product detector-



Lab#9.

Title:-

To analyse Superhetrodyne FM reciever.

Defination:

Superhetrodyne FM reciever is used for demodulation of FM waves; It basically consists of an antenna, RF mixer, IF filter, If amplifier, limiter, FM demodulator, LP, Band Pass, Audio amplifiers and speakers. It has a range from 88 MHZ to 108 MHZ; It has a channel seperation of 200 KHZ and intermediate frequency of 10.7 MHZ;

Procedure:

First of all we generated a message signal of 2.4 KHZ & then we translated it to a high frequency for transmission by using a high frequency carrier lies in 88-108 MHZ; Then the same modulated signal was provided to a demodulator which could easily demodulate FM waves modulated with the message signal. The signal was recieved by the antenna section, then subsequently provided to the intermediate section of frequency which transformed

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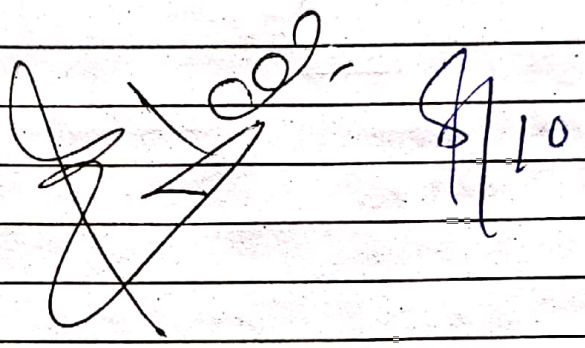
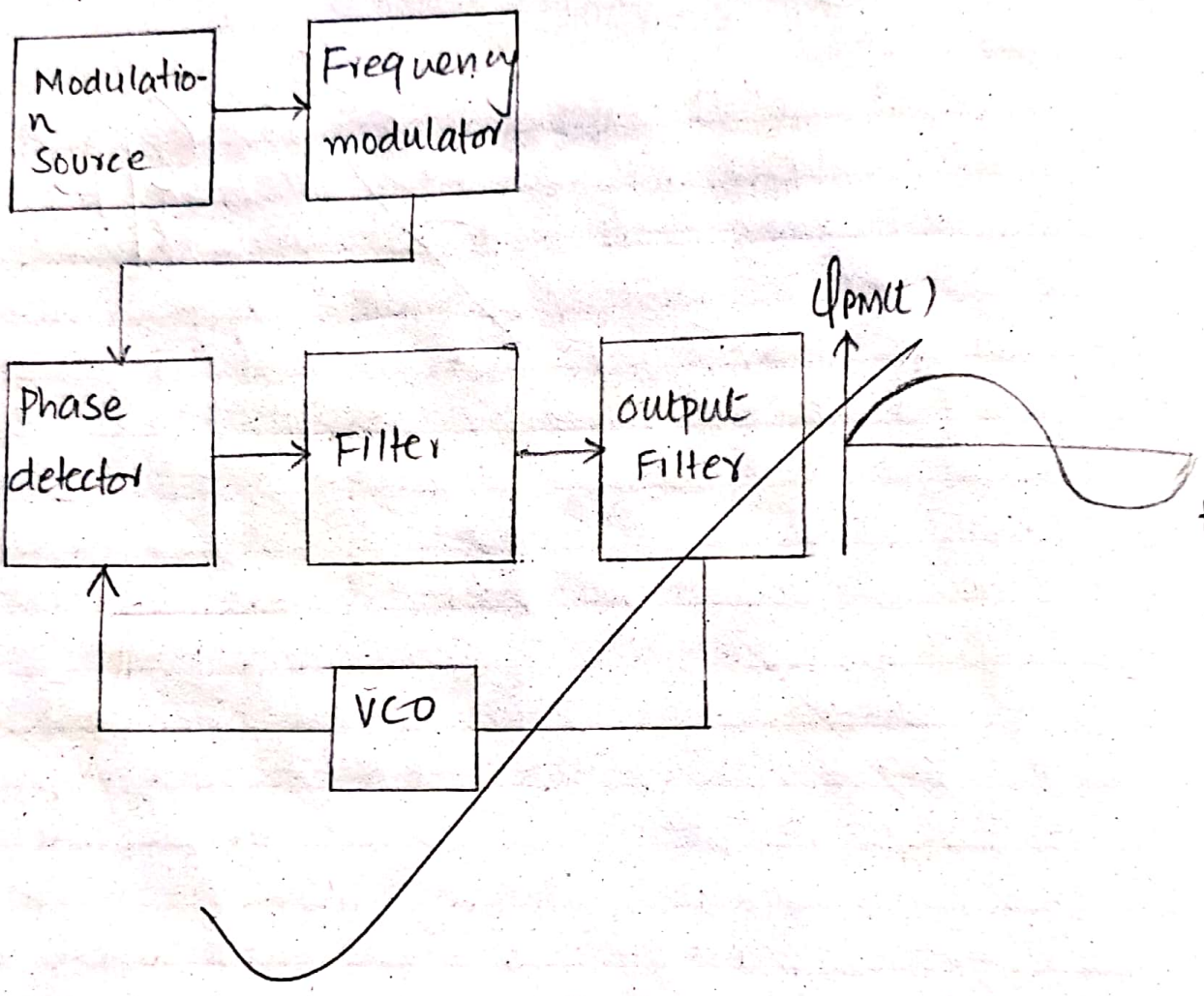
it to a constt frequency of 10.7 MHz.





Lab#10

Title:

Demodulation of FM signals using phase locked loop.

Defination:

The phase locked loop is a better method for the demodulateation of a signal which is of usaually high frequency to recover the message signal- It is capable of operating at the intermediate frequency of the circuit. PLL itself utilising the basic operation of the loop to provide the required output:

Procedure:

As we Know PLL trace & angle & the instantaneous value of the incoming signal- The modulation source provides the msg signal. The frequency of modulator produce frequency modulated signal - VCO (voltage controlled oscillator) provides the feedback signal and input to vco is output to the output filter- The loop made by phase detector filter, o/p filter & VCO is called PLL-

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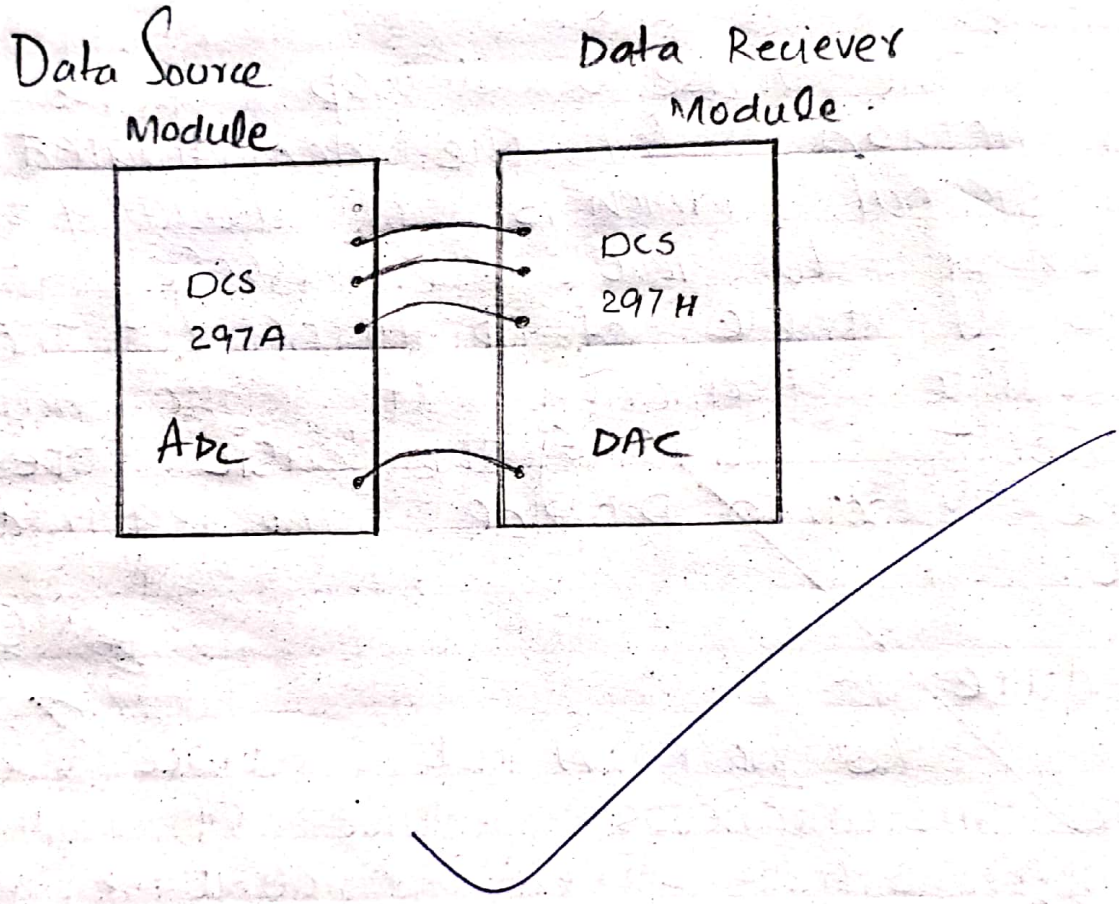

Lab # 11

Title:

Sending and Recieving Binary Data.

Requirement:-

- Data sender module DCS 297A
- Data reciever module DCS 297H
- Connecting wires.

Procedure:-

Connect "16KHZ" clock to "clock w" of Data source module-
Put PRBS/Data source/ADCI switch on Data source position-
Put format switch on 8 bit Data position
Connect the Data source to Data reciever module by connecting the bit clock out - if Data Source module to the bit clock of Data reciever module & Their clocks & grounds-
Also connect NRZ data out of the Datasource module to NRZ data in of Data reciever module-
Now press Data Switches on the data source module according to bits streams- needs to be sent- The LED's will lightup according to their positions;
We observe that the LED's of Data recieving module also glow according to their position-
The bits are sent serially from source to reciever module-

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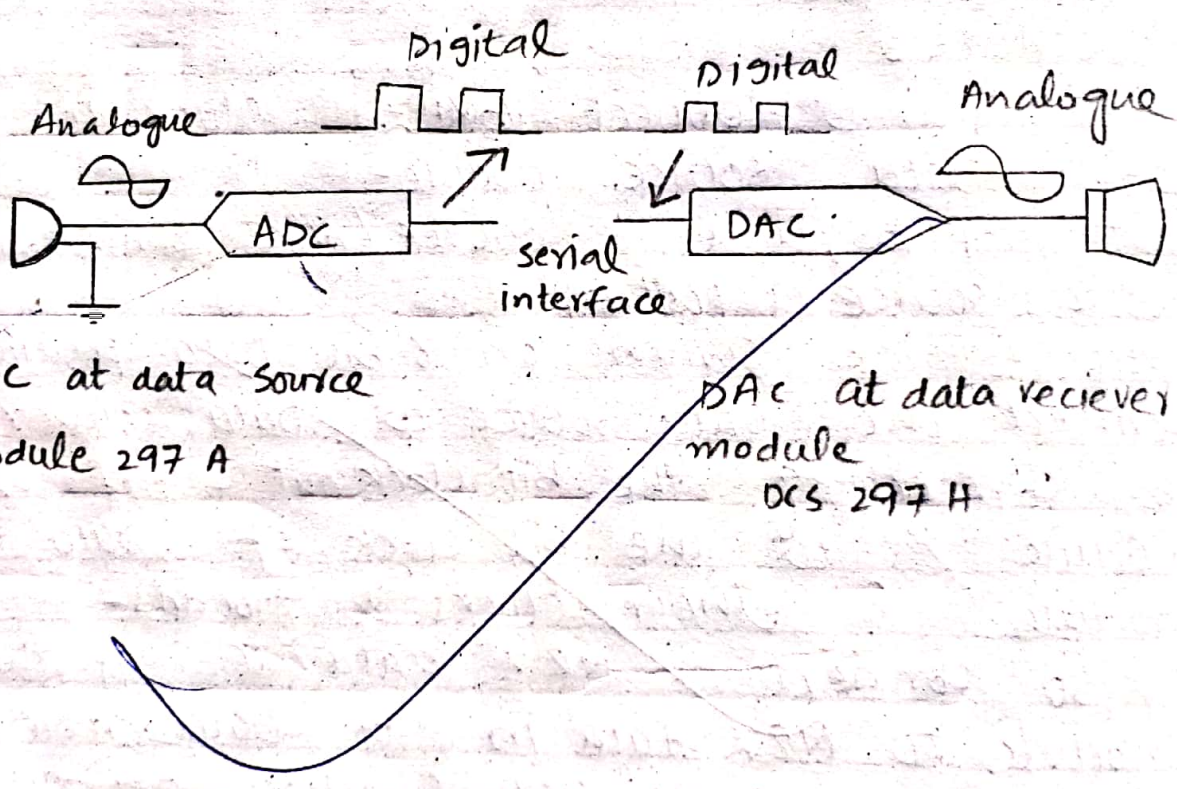

ADC at data source
module 297 A

DAC at data recievey
module
DCS 297 H

Lab #12

Title:-

To establish an ADA link.

Requirements:-

Data source module DCS 297A
Data reciever module DCS 297H
Connecting wires
Two mic Speaker module DCS 297K
Power Supply-

Procedure:-

Connect 1st of all data source module to Data reciever module-
Get reciever module from mic Source & Connect o/p of Data reciever module to the i/p Speaker-
The analogue input from mic is converted to Digital data by ADC at the Data Source module-
The Digital data is sent serially to the Data reciever module where it is converted back to analogue signal and given to speaker
This Conversion from Digital to analogue Data takes place at the Data reciever module by DAC-

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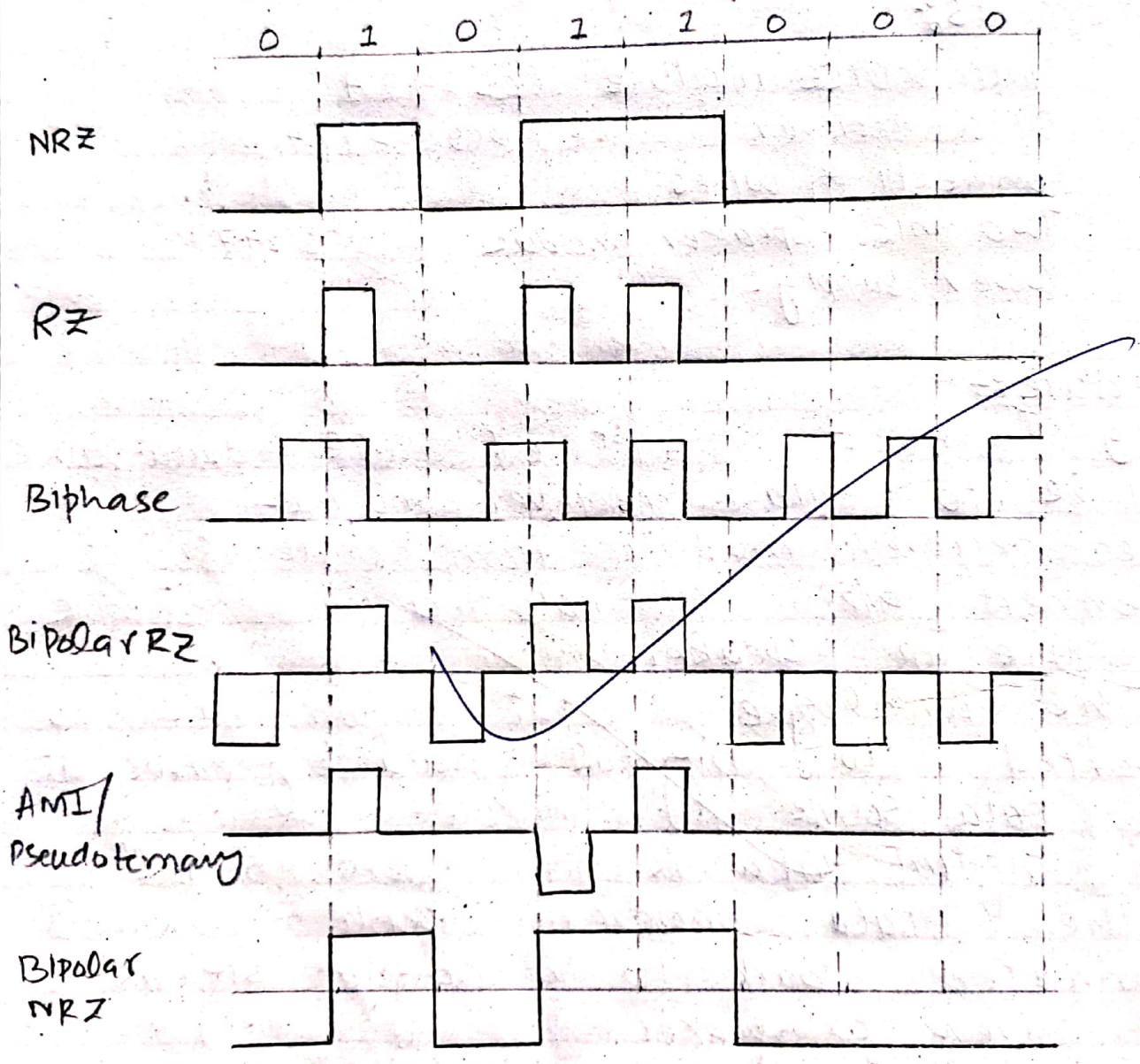

Lab #13

Title:

To study different data formats or coding schemes.

Requirements:-

- Data source module 297A
- Data format module DCS 297B
- Power supply
- Connecting wires
- Oscilloscope

Procedure:-

1st of all I connect data source module to the data recieving module. I gave some stream of bits to Data source module. This Data is sent to data module. We have applied the Data stream of bits 01011000 from Data source module. The oscilloscope is connected to various format outputs & we observed the spectrum pattern.

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