# Part 1.

Plot the message signal and its Fourier transform.



Again part one without using function.



Its Fourier transform.



# Part 2.

## P2.1

C:\Users\ASUS\AppData\Local\Temp\ConnectorClipboard6269829534786994057\image15778182222380.png

sampling theorem, strictly speaking, the theorem only applies to a class of bandlimited signals. Here because our sampling rate is 600 Hz, if we increase the Bandwidth more than 300 Hz we would lose the information.



## P2.2

Fourier transform.



## P2.4

Finding y(t) and z(t) and its MSE





## Part 2.4 & 2.5

Finding the best choice for modulation index



So as we increase the modulation index our error will decrease so the best choice for modulation index will be {+-4}.



So as we explained before near the half of our sampling rate frequency it’s a great probability to lose our data so 150 Hz would be the best choice for carrier frequency.

# Part 3.

DSB modulation.

## 3.1



## 3.2



## 3.3. conventional AM



## P3.5. y(t) & z(t) & MSE



## 

## P3.6



The best choice would still be 150Hz.

# Part4.

SSB is an amplitude modulation technique in which only one side band (upper or lower) is transmitted and DSB is a modulation technique in which both the upper and lower sidebands are transmitted simultaneously.

Advantages of SSB over DSB:

1. The bandwidth requirement of the SSB is half than required by DSB.
2. Since SSB system utilizes half the bandwidth than DSB, the thermal noise power is reduced to half that of DSB system.
3. The full carrier DSB wave has poor efficiency since the major transmitted power is concentrated in the carrier which contains no information. Thus the total power transmitted in SSB is less than the total power in DSB. Percentage of power saving in SSB is 83.33%.
4. Overcome of power wastage in the SSB technique by suppressing undesired sideband.

## 4.1

## 

## 4.2. lower side band



## 4.2. upper side band



# Part 5.

In electrical engineering, and particularly in telecommunication, frequency drift is an unintended and generally arbitrary offset of an oscillator from its nominal frequency.

So here we have DSB is the {min} and AM is the {max}



## P5.2

