Presentation on

Digital Signal Processing Assignment

Md. Saiful Islam Sajol
Matriculation no. 300 428 36

Task 1

Task 1 (a)

$$H(z)=1/2 + (1/3)\frac{z}{z-1} - \frac{1}{2z-1}$$

Task 1 (b)

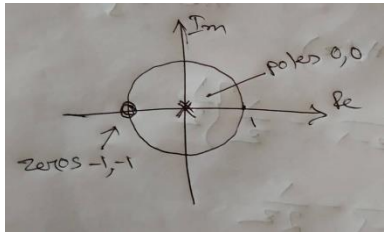
$$H(z)= 4 + \frac{1}{2z-1} - \frac{1}{2z}$$

Task 1 (c)

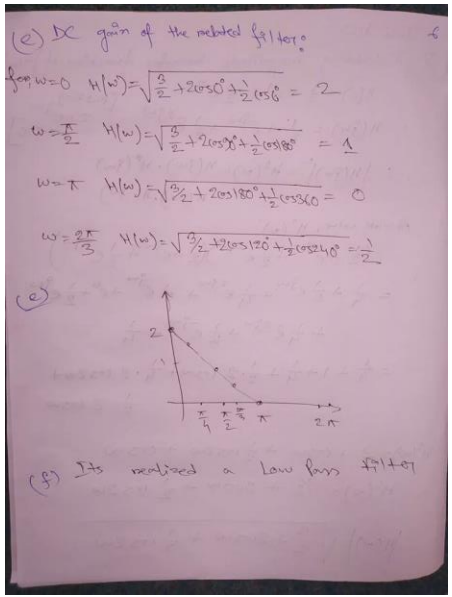
a) $h(n)= 1/2\ \delta(n)+ \delta(n-1)+1/2\ \delta(n-2)$

b) $H(z)=1/2 + 1/z + 1/2z^2$

Zeros, at -1, -1
Poles at 0. 0



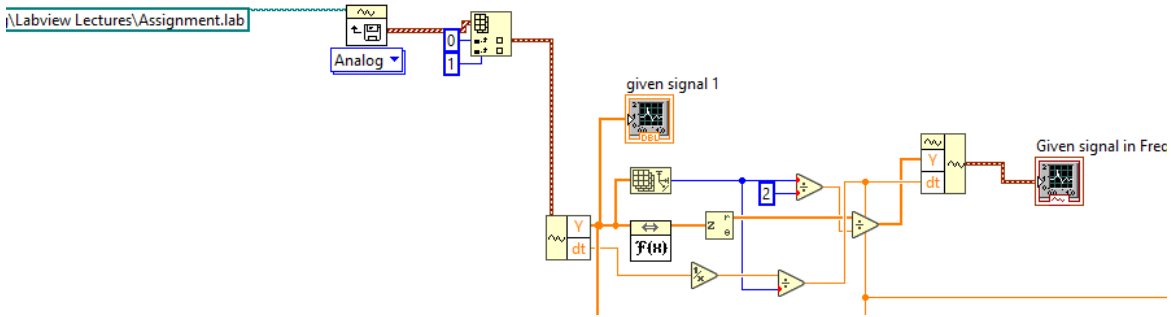
d) $|H(z)|=\sqrt{}(1.5+2\cos w+0.5\cos 2w)$

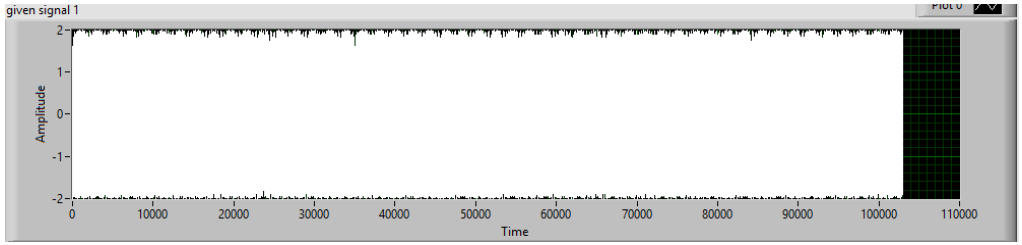


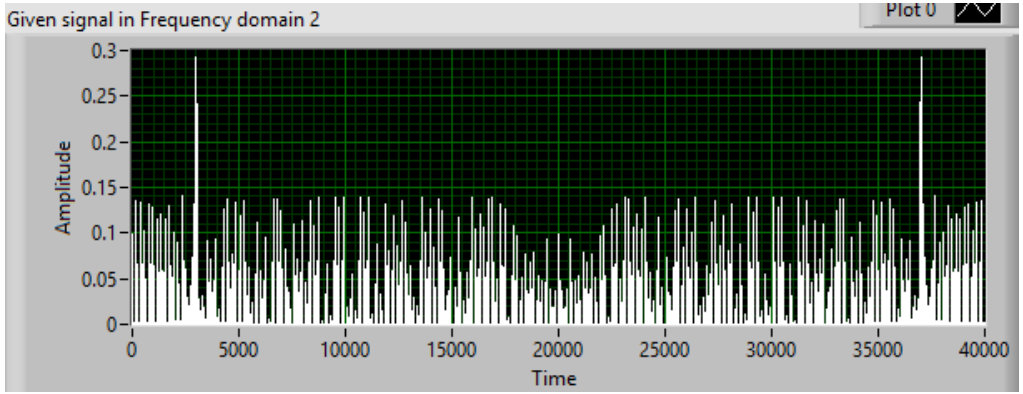
Task 2

The sample frequency of the signal is 40KHz and the signal is modulated using a 3KHz carrier signal.

The message signal is a binary signal, just two dominant phases are available in the BPSK modulated signal. The 180° shift of phase codes a ‘1’ and the 0° of phase codes a ‘0’.







Task 2

Designing Band pass filter

Zeros
For zero at +1→highpass
For zero at -1→lowpass
Zeros at 1,-1→ bandpass

$$H(z)=\frac{(z-1)(z+1)}{(z-Re^{jw})\,(z-Re^{-jw})}$$

Poles
F1=3400Hz
F2=2700Hz
BW=f2-f1=3400-2700=700Hz
Fs=40 000Hz
R=1-(BW/fs)* π
=1-(700/40 000)* π
R=0.945

, **ω =2π(f_0 /Fs)**
f_0 =3000Hz
, **ω**=0.15 π =27dgre

$P1=Re^{jw}$
$P2=Re^{-jw}$

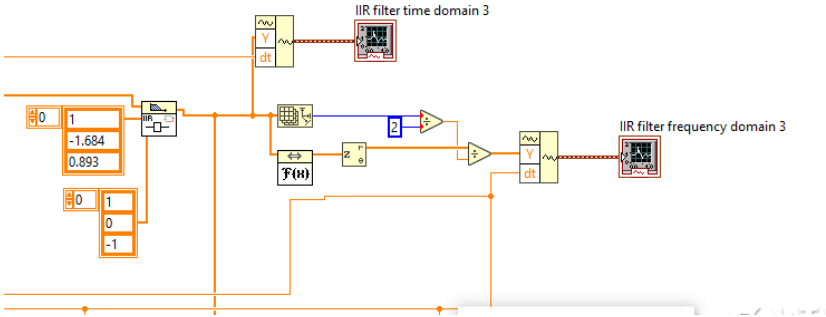
P1=0.945(cos27+ jsin27)
P2=0.945(cos27-jsin27)

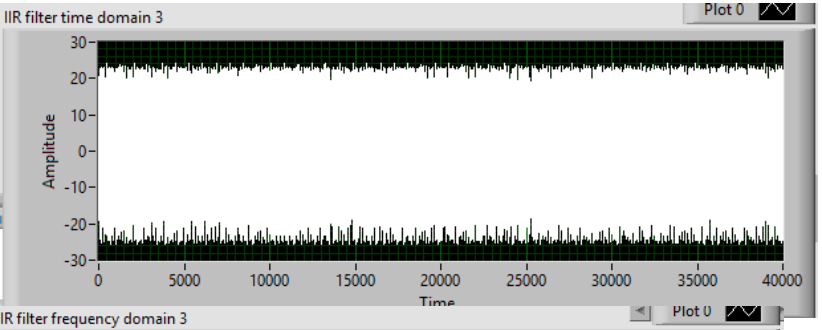
The denominator of the Transfer function
(z-P1)(z-P2)
=(z-0.945*L* 27)(z-0.945*L-27*)
=z^2 -1.684z+0.893

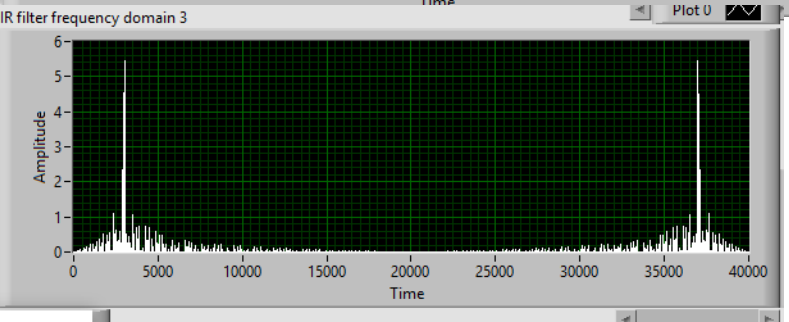
$$H(z)=\frac{z^2-1}{z^2-1.684z+0.893}$$

Reverse coefficients a0=1
a1=-1.684 a2=0.893
Forward coefficients
b0-1 b1=0 b2=-1

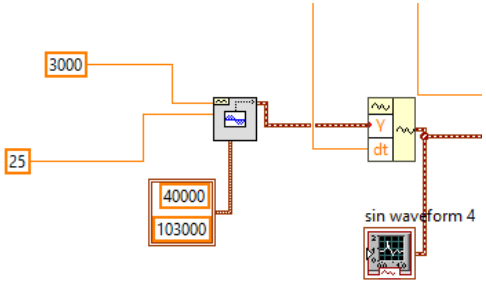
Implementing IIR Filter



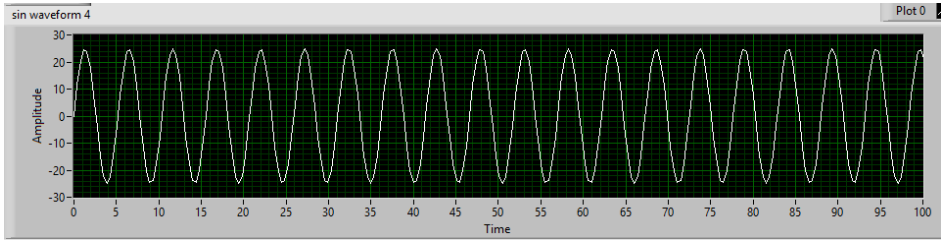




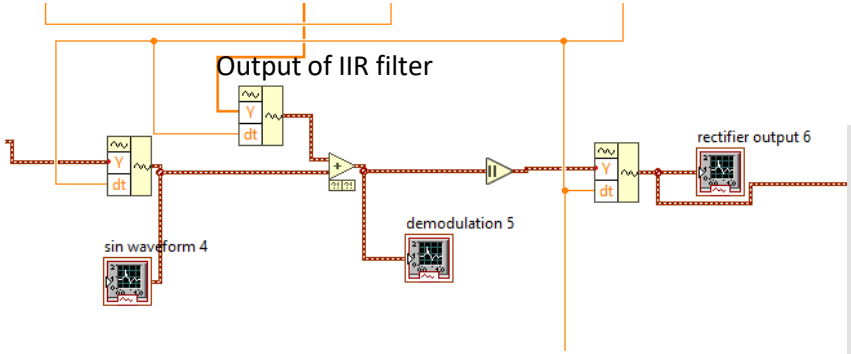
Generating a carrier clock using a sine wave



Fs is the sampling rate in samples per second 40000Hz
#s is the number of samples in the waveform 103000 (from Source signal)
Fc=3000 Amplitude =25 (close to the IIR output)



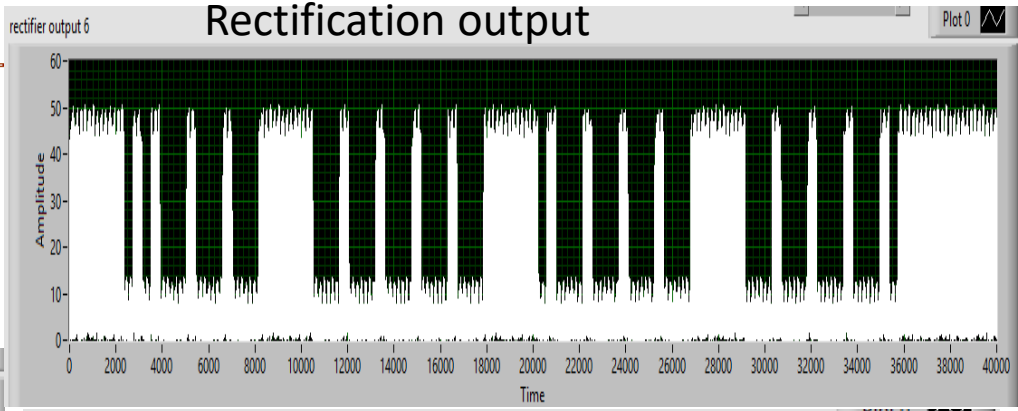
Demodulation



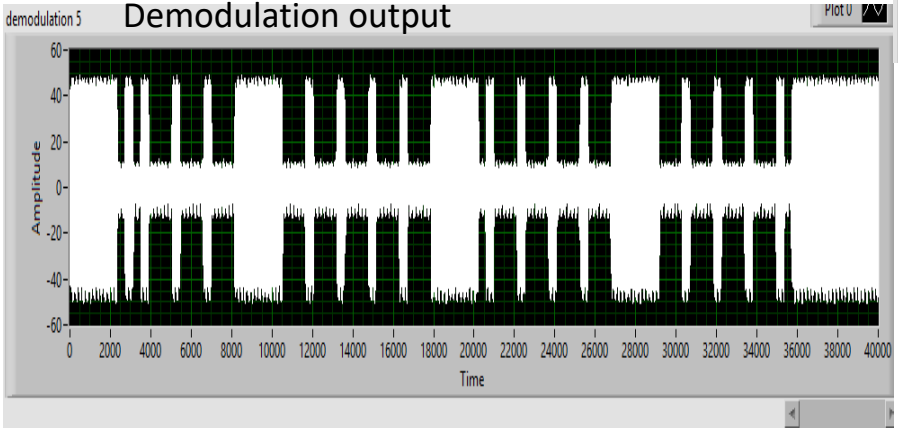
Rectification

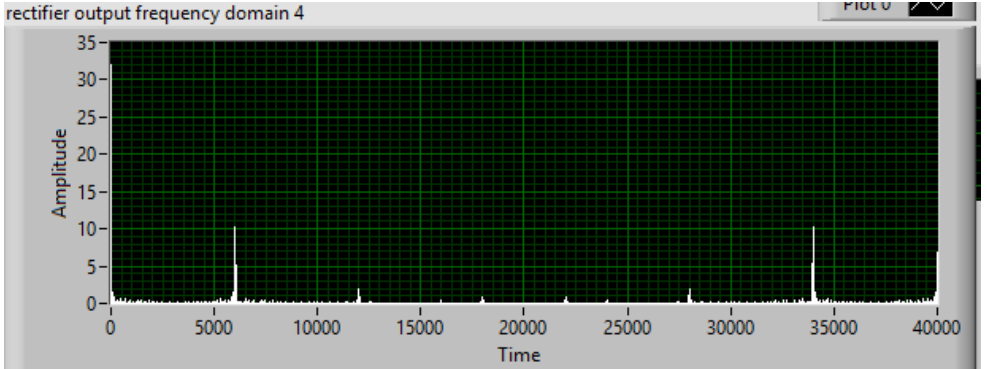
For rectification Absolute value function
Is used

Rectification output

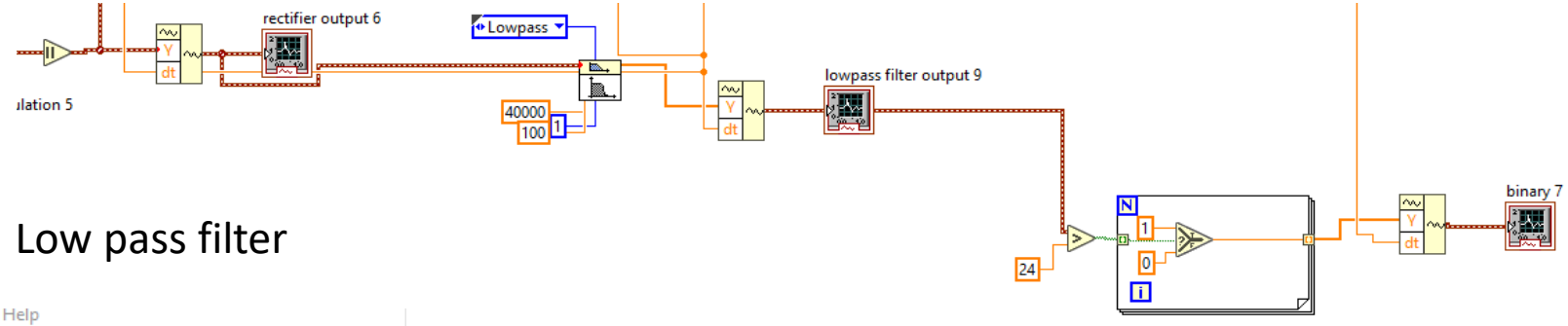


Demodulation output

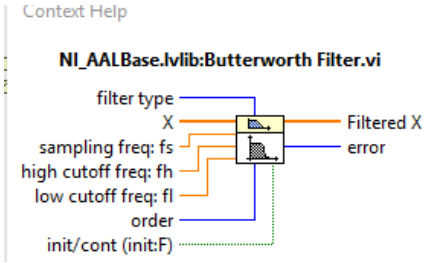




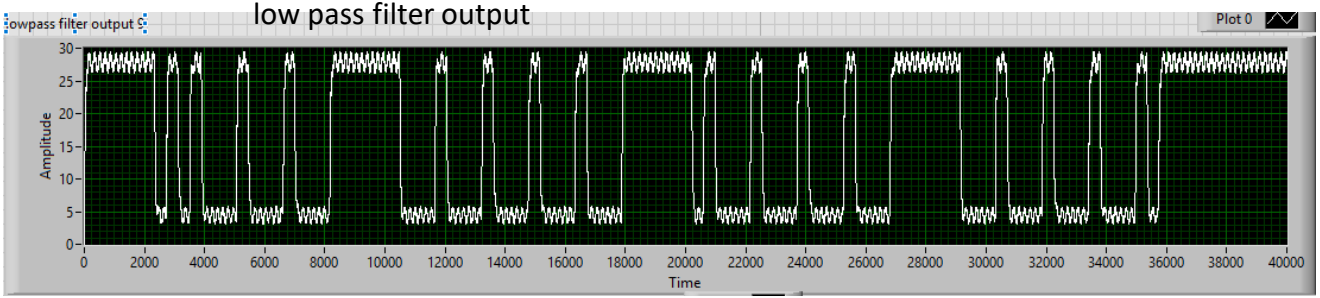
Restricting high frequency components
By using low pass filter



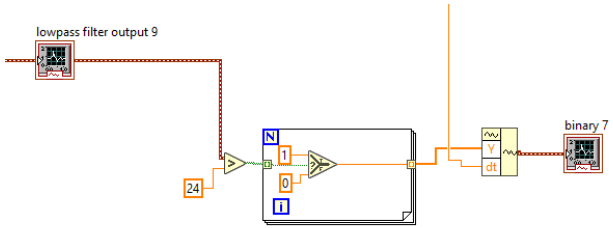
Low pass filter

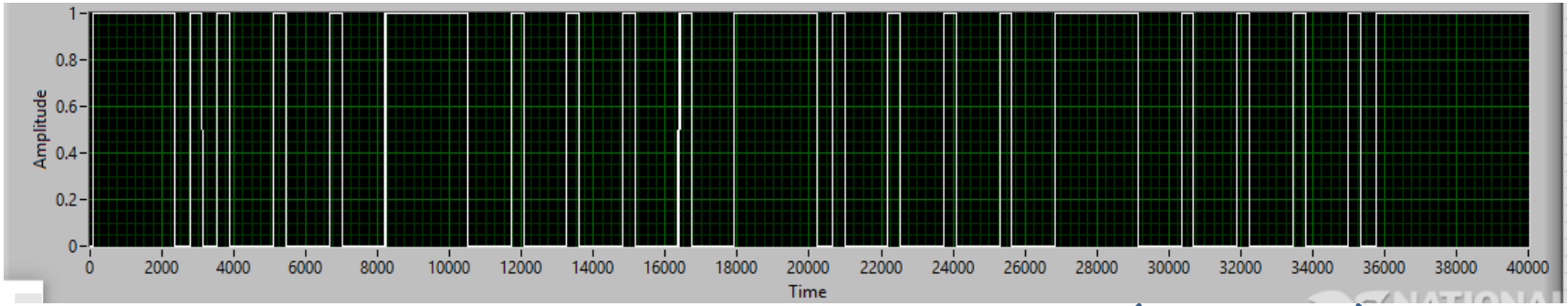


low pass filter output

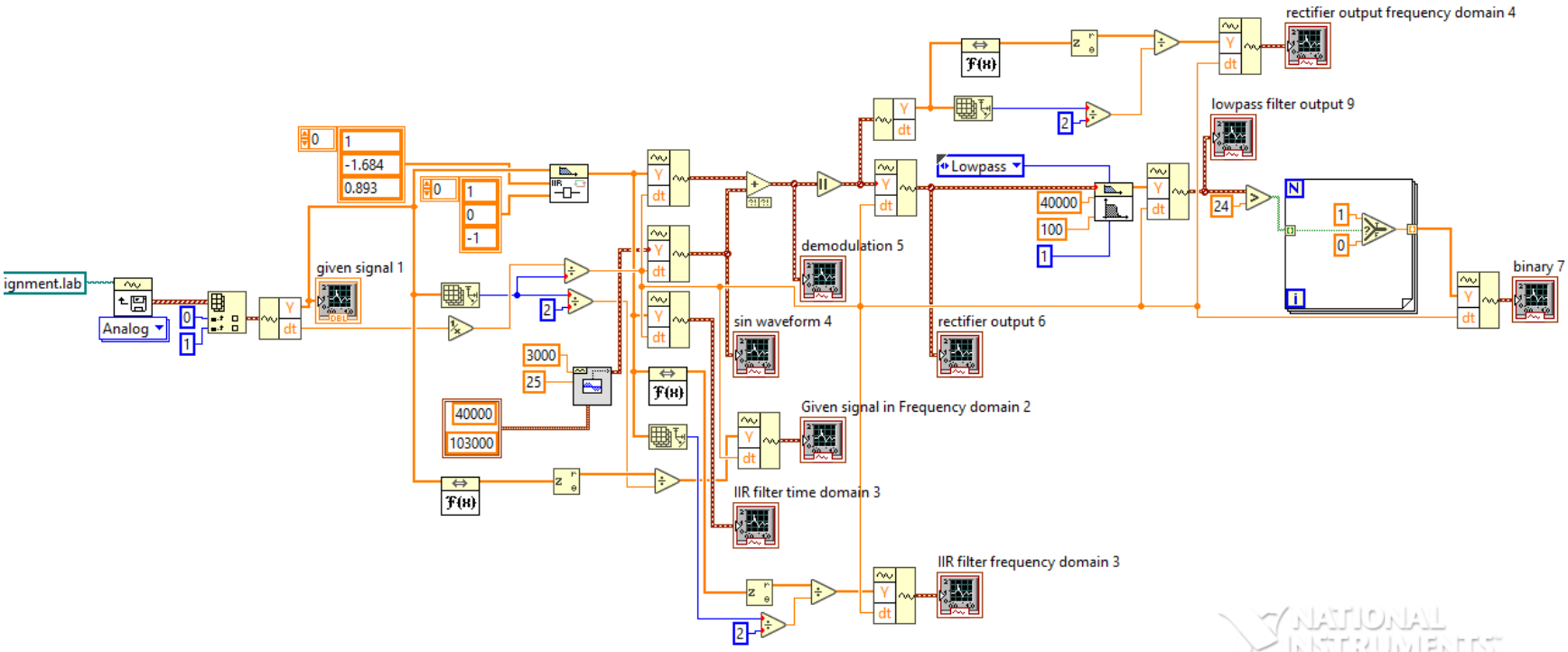


For understanding the signal , the output is converted in binary form





2 0 1 9


rectifier output frequency domain 4
lowpass filter output 9
Lowpass
demodulation 5
given signal 1
sin waveform 4
rectifier output 6
binary 7
Given signal in Frequency domain 2
IIR filter time domain 3
IIR filter frequency domain 3
Analog
-1.684
0.893
40000
100
24
3000
25
103000

Thank you....