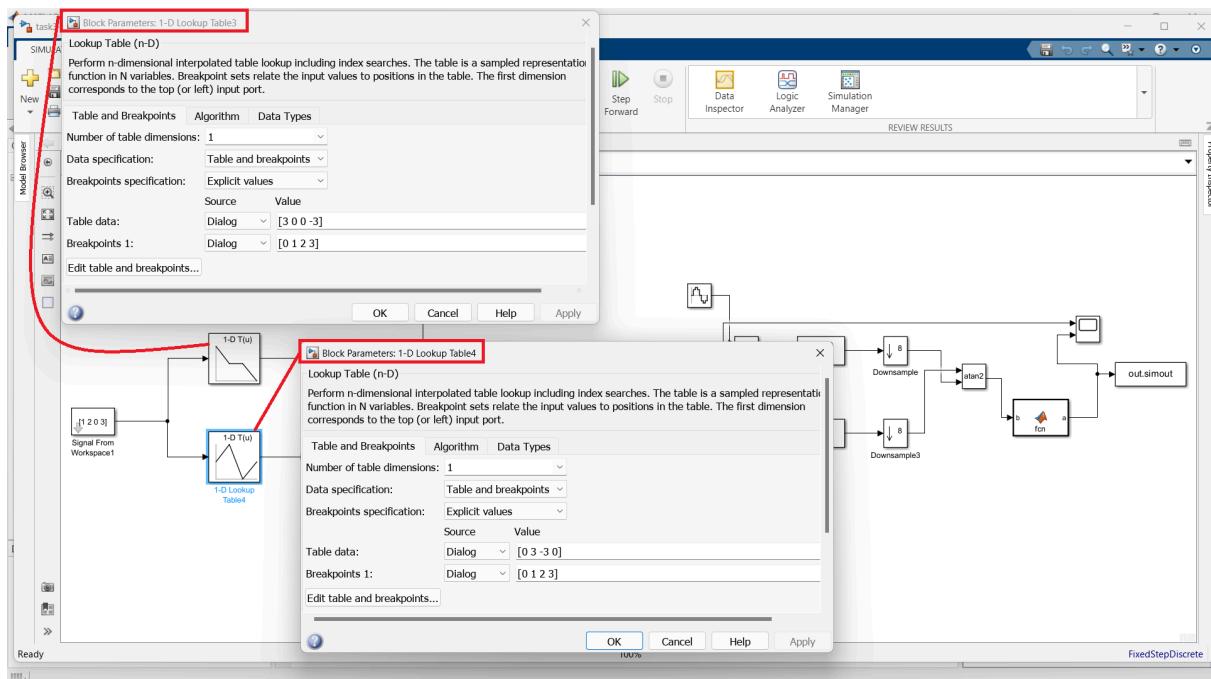
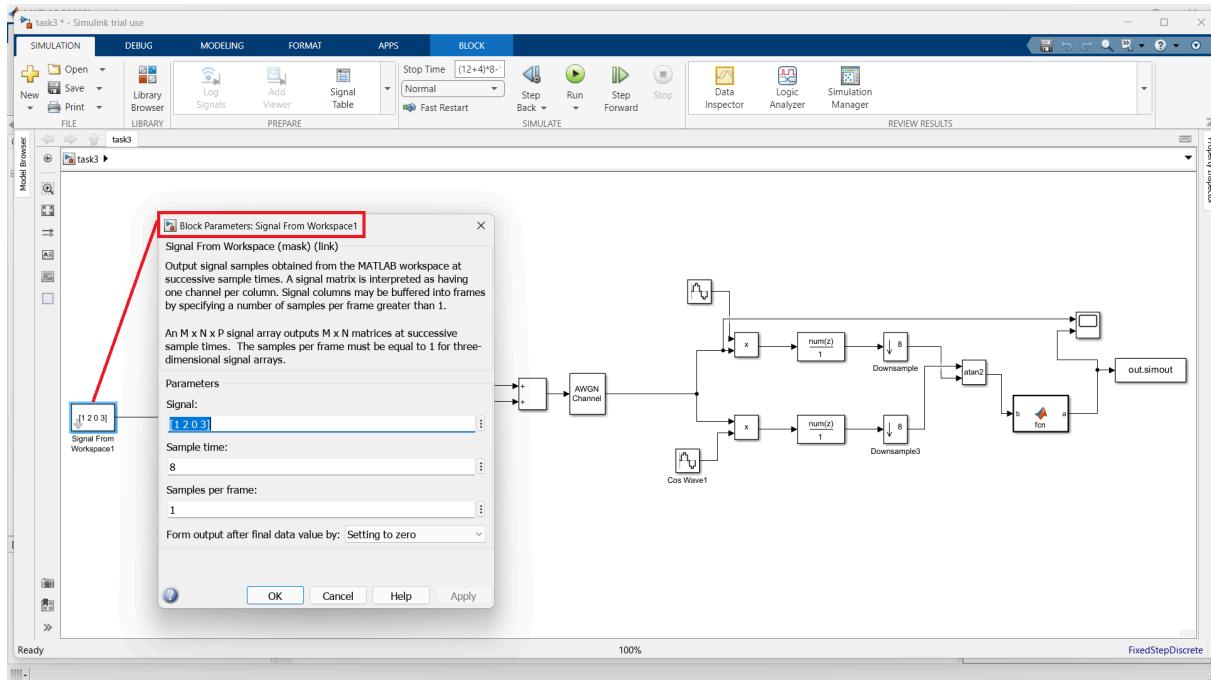


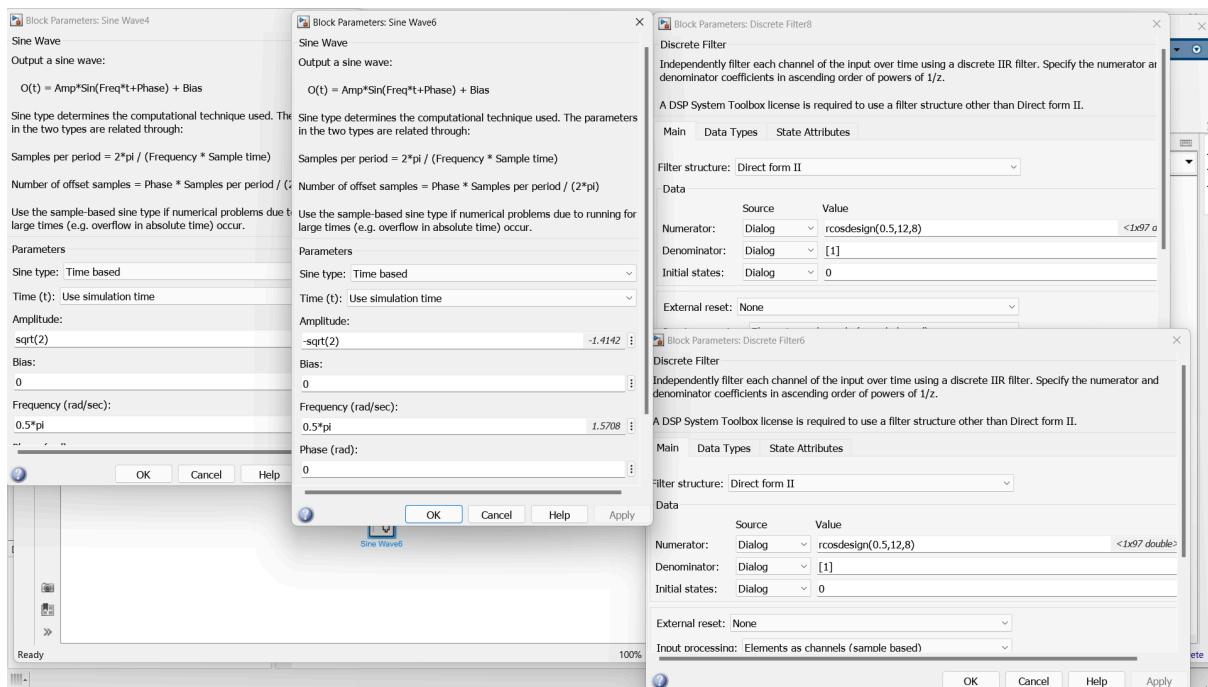
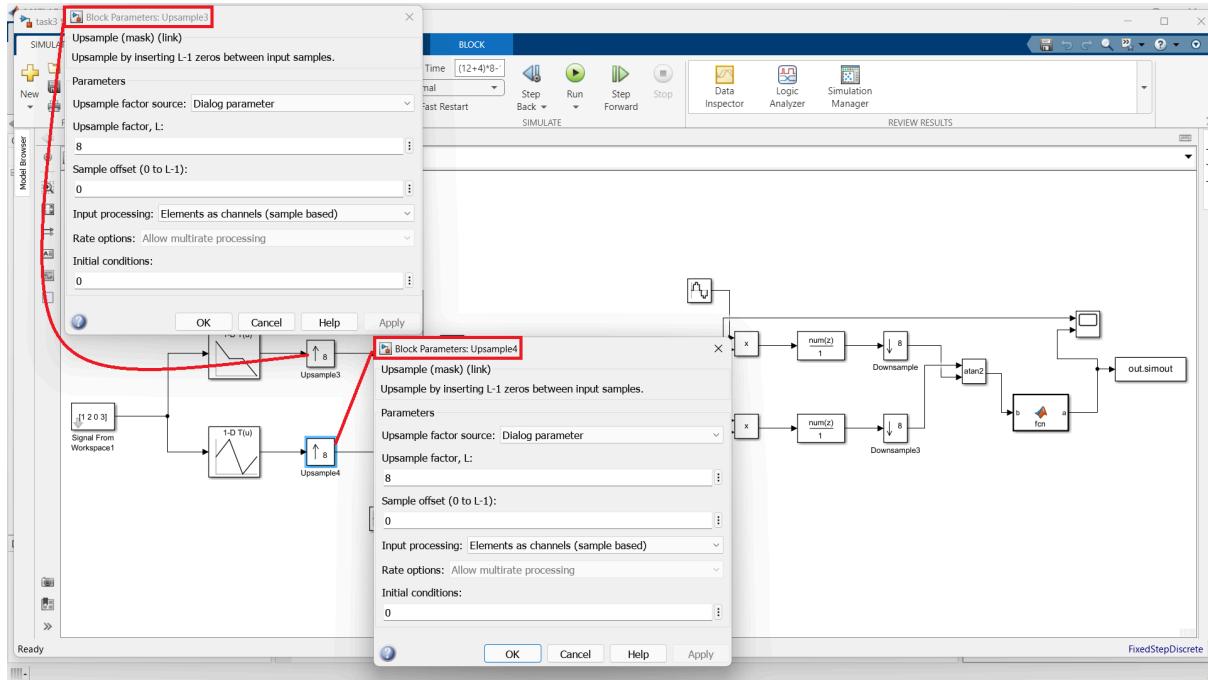
## Task 3: Phase Shift Keying (PSK)

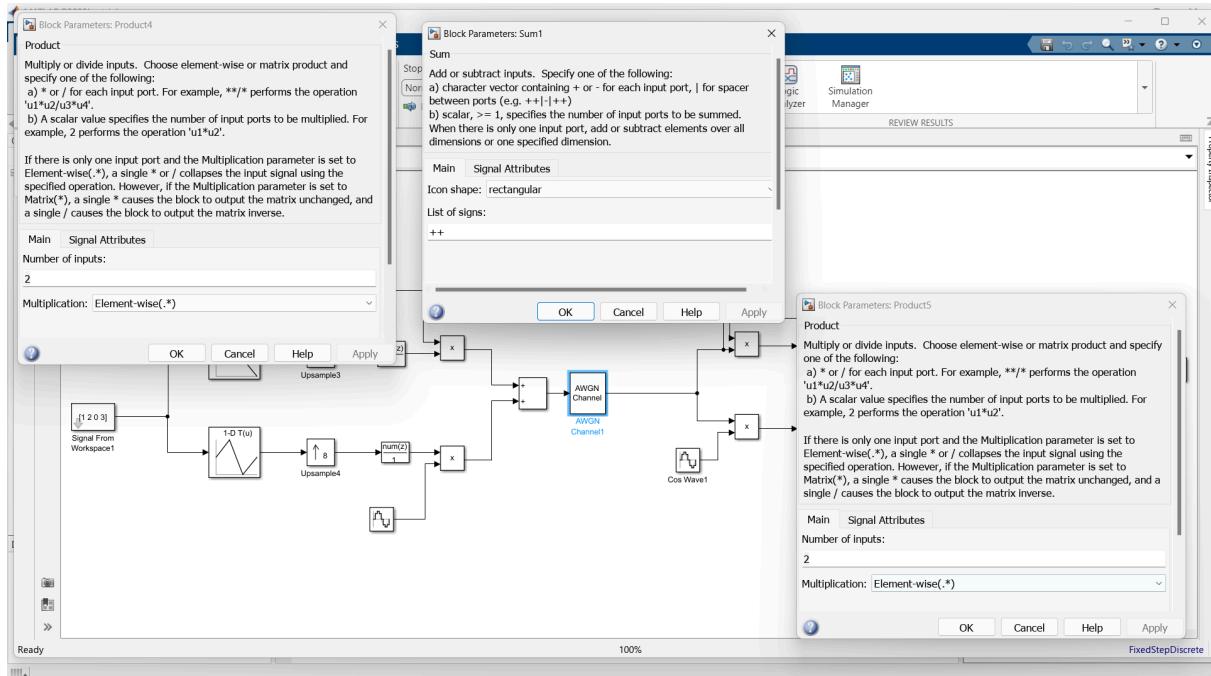
### QPSK system design, Subtask 1 & Subtask 2

#### QPSK system design

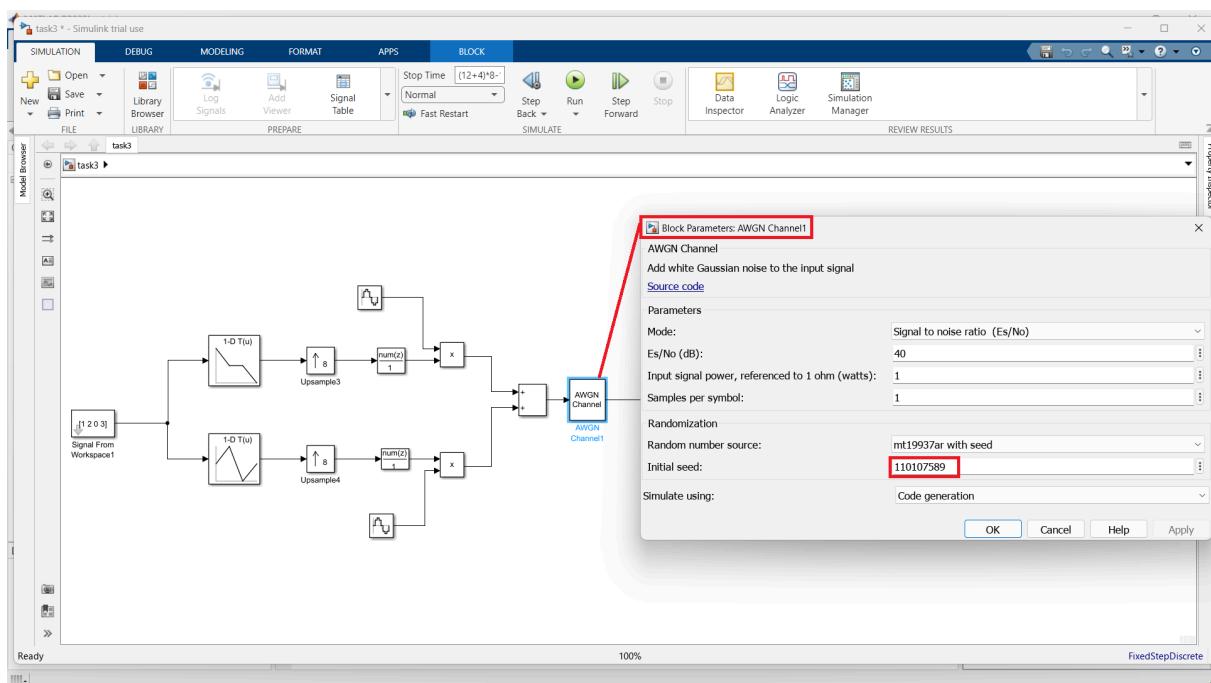
Modulator:



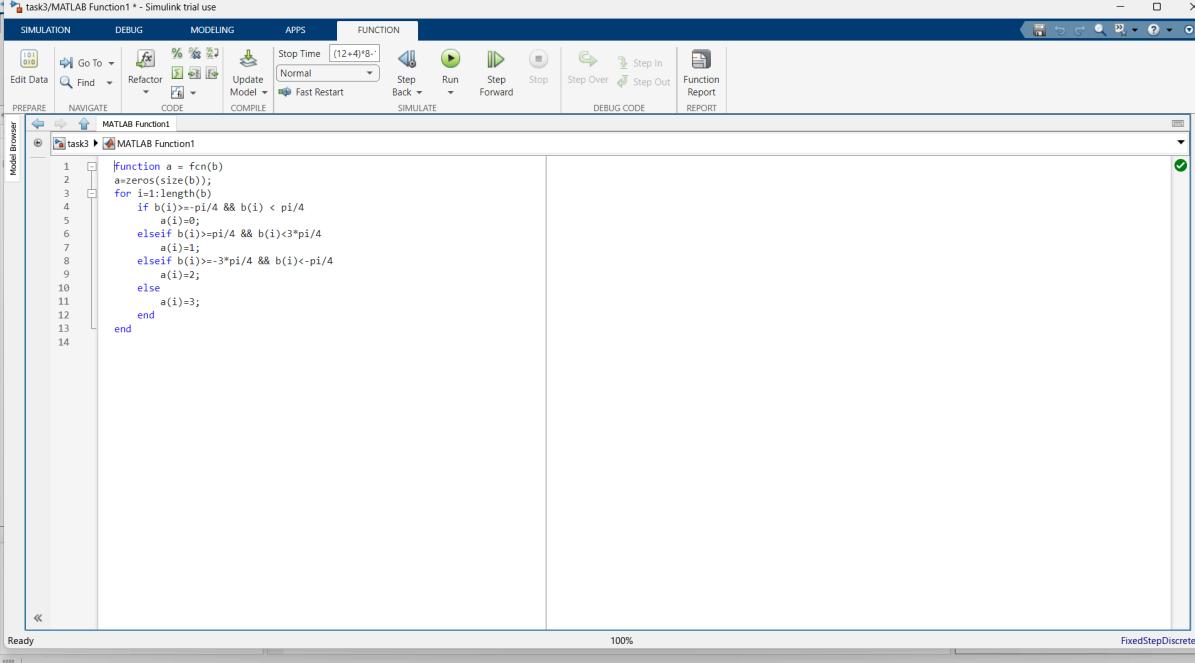




## AWGN Channel:



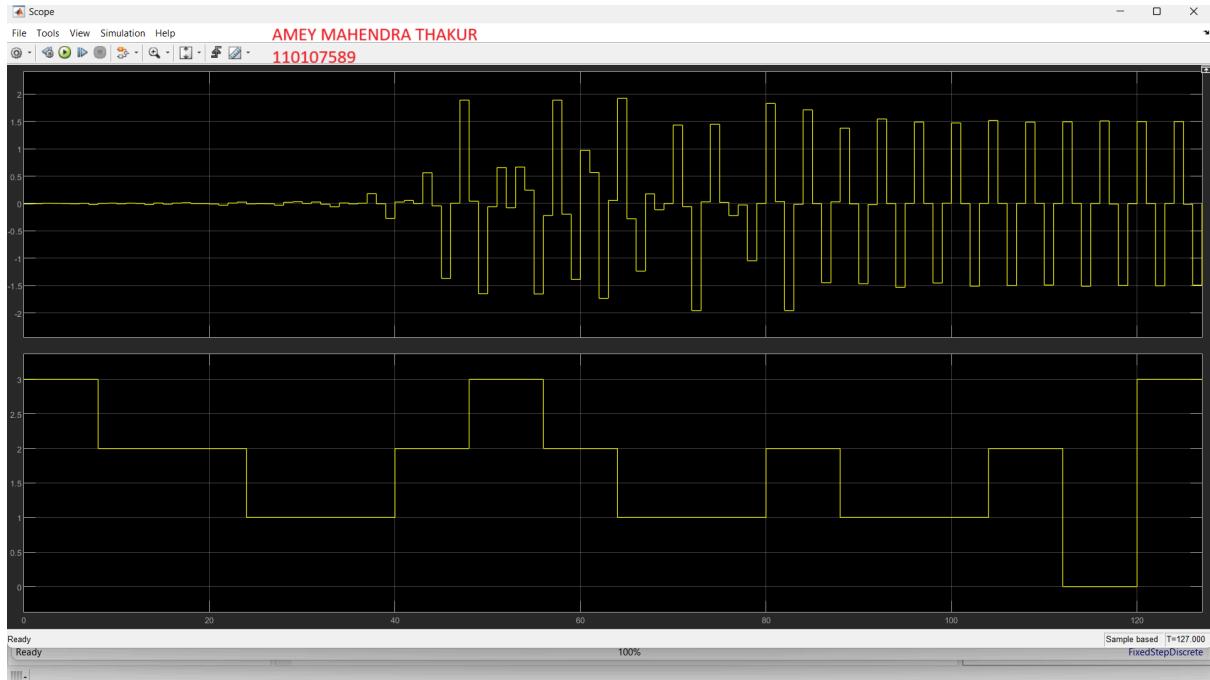
## Demodulator:



The screenshot shows the MATLAB Function Block Editor window. The title bar reads "task3/MATLAB Function1 \* - Simulink trial use". The menu bar includes "SIMULATION", "DEBUG", "MODELING", "APPS", "FUNCTION", "CODE", and "COMPILE". The "FUNCTION" tab is selected. The code area contains the following MATLAB function:

```
function a = fcn(b)
a=zeros(size(b));
for i=1:length(b)
    if b(i)>=pi/4 && b(i) < pi/4
        a(i)=0;
    elseif b(i)>=pi/4 && b(i)<3*pi/4
        a(i)=1;
    elseif b(i)>=-3*pi/4 && b(i)<-pi/4
        a(i)=2;
    else
        a(i)=3;
    end
end
```

## Scope and workspace output:



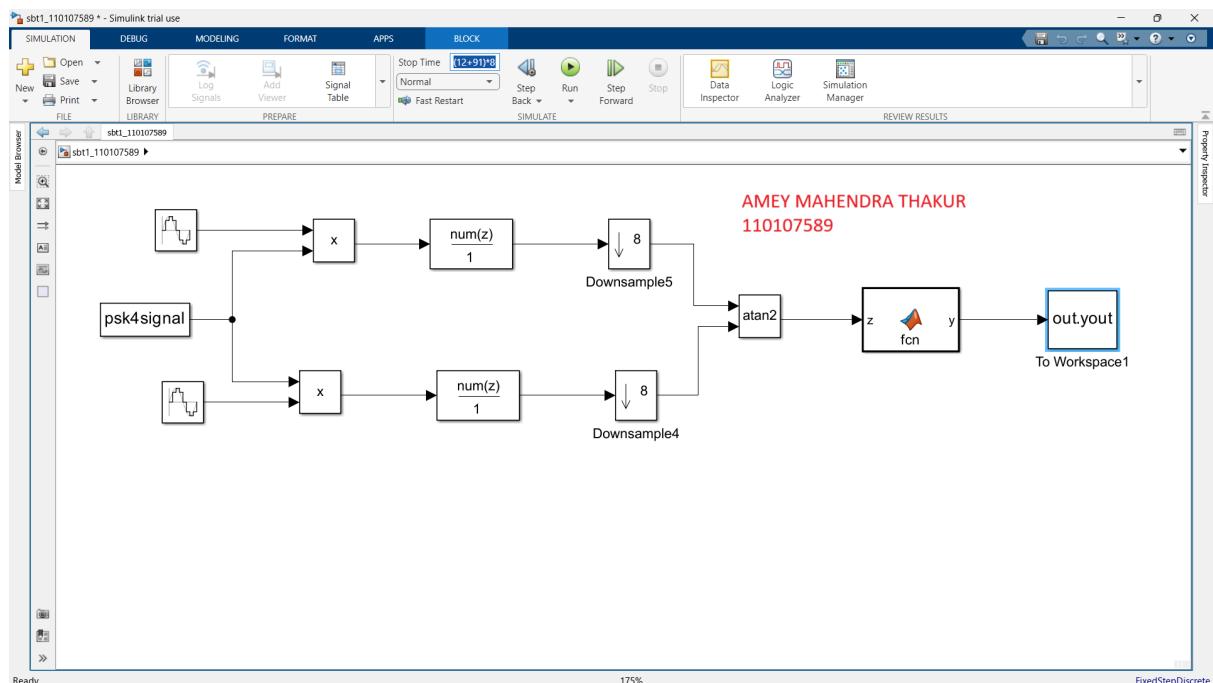
## subtask 1

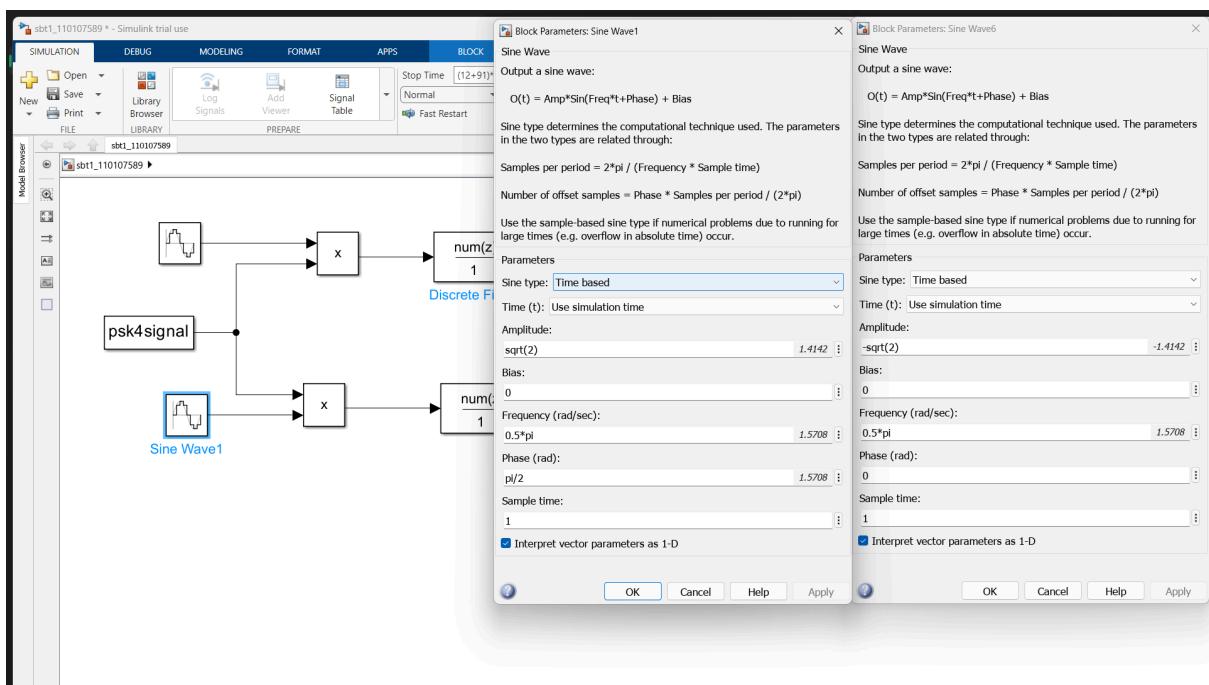
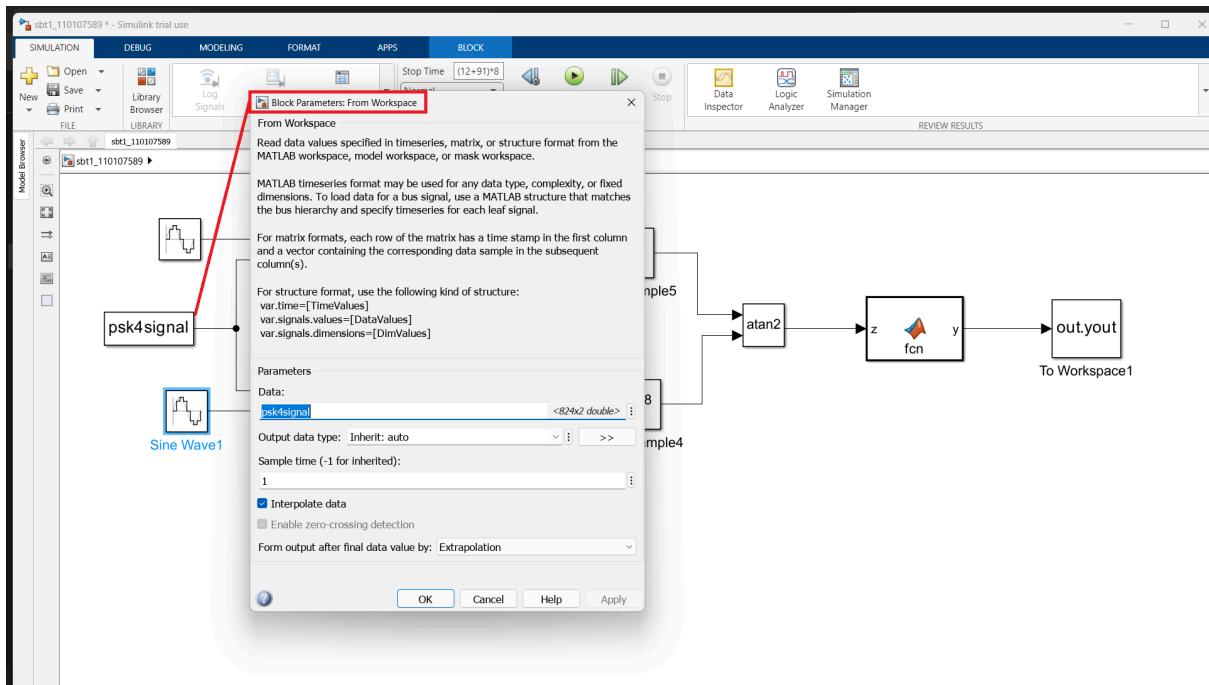
Locate psk4data file in matlab directory.

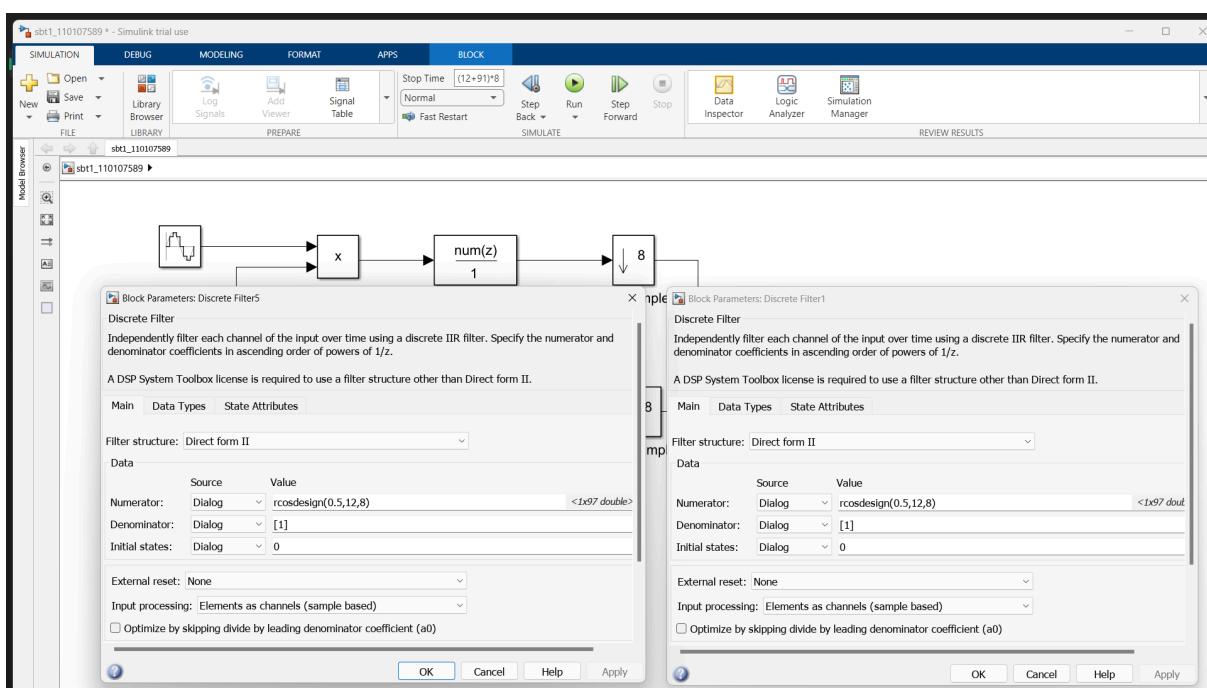
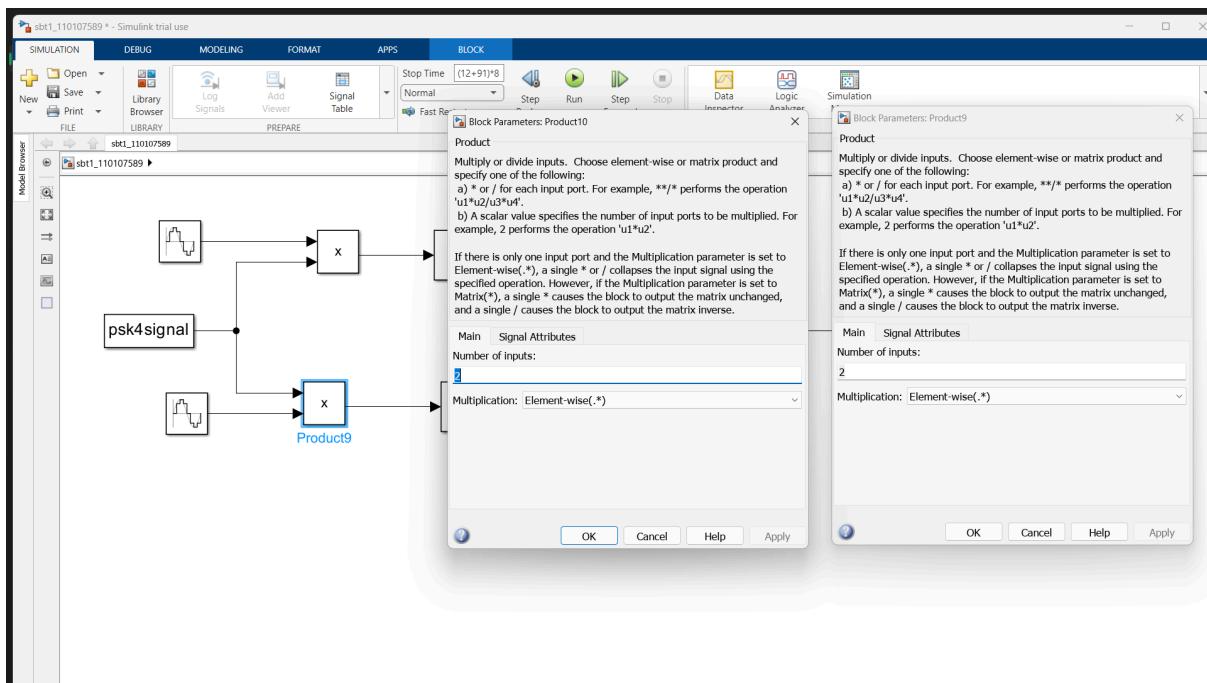
As K value is 91, the stop time is set at  $(12+K)*8-1$

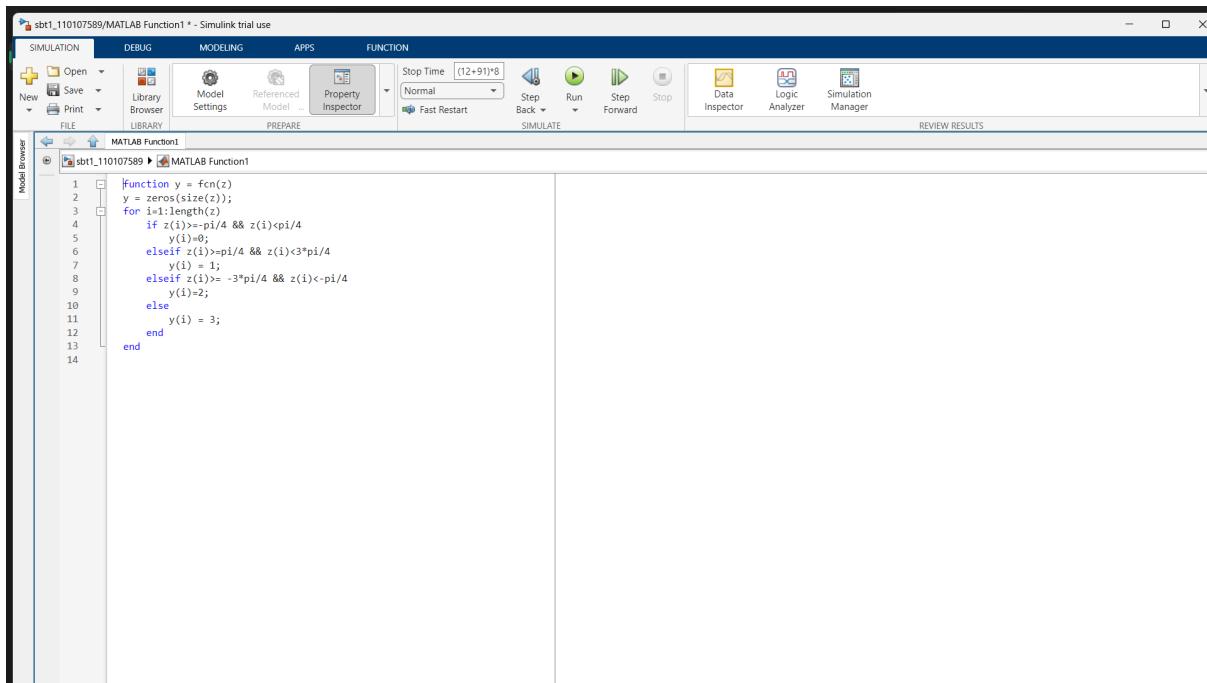
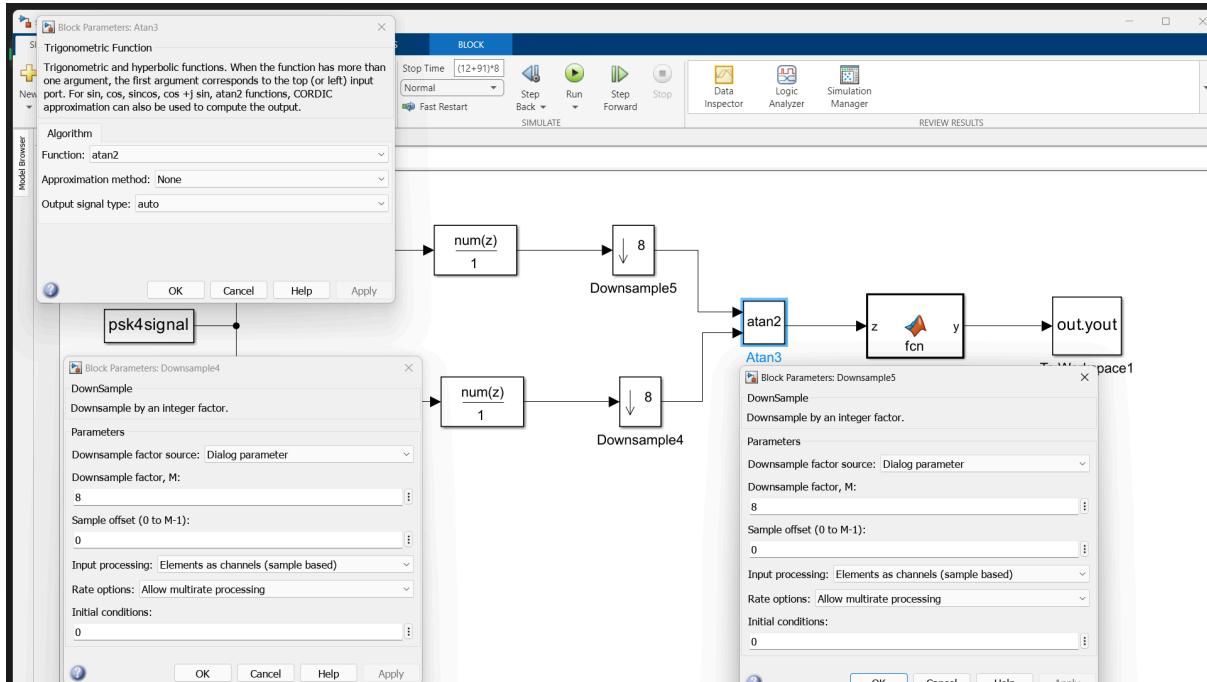
i.e.  $(12+91)*8-1$

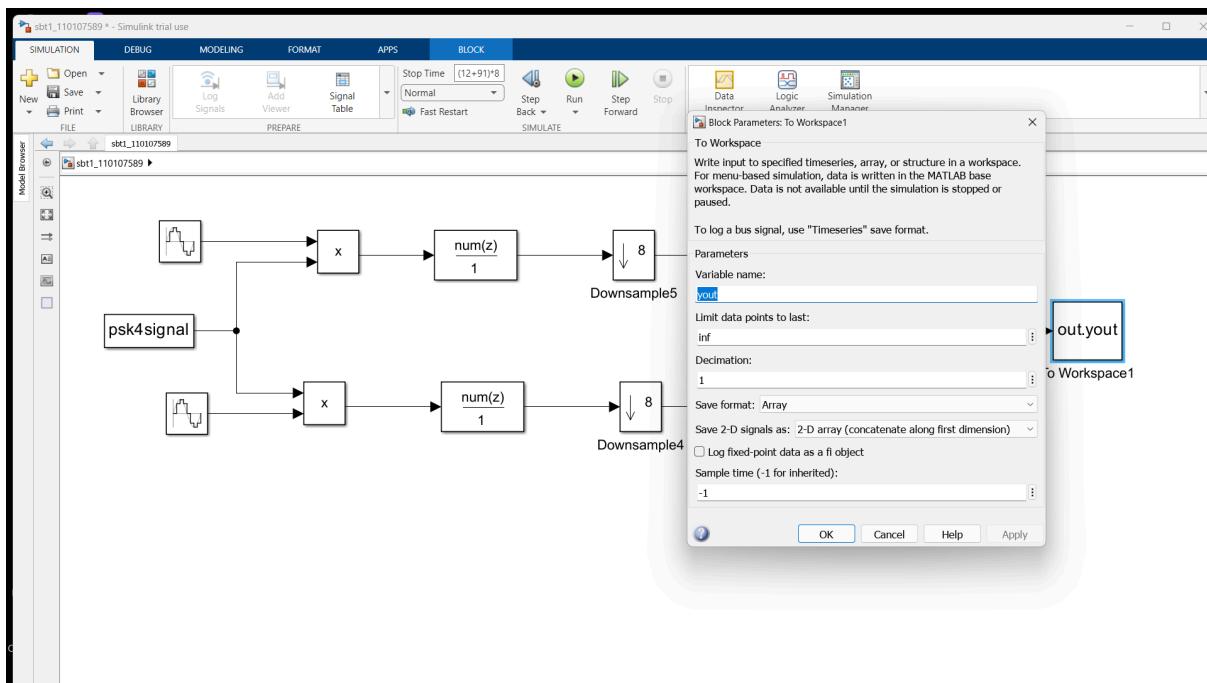
The screenshot shows the MATLAB R2023b interface. In the Command Window, the user has run the command `>> psk4data(110107589)`, which outputs "Message length is 91 symbols". Then, they load the file `psk4signal.mat` using `>> load('psk4signal.mat')`. The workspace browser shows variables: ans (91), ascii\_msg ('Never gonna let ...'), out (1x1 SimulationO\_...), psk4signal (82x2 double), and sym\_msg (91x1 double). The current folder browser shows files like `calgary confirmation.pdf`, `psk4data.p`, `QPSK.pdf`, and `sb1_110107589.stk`.











### ASCII message output:

The size of the message variable is 103\*1 but as instructed only the last K bits are to be considered for further processing. So fetch the last 91 bits and assign it to a variable to further process and the Converting the ASCII text message using the instructed formula.

My secret message is "*Never gonna let you down!*"

### Secret message:

```

MATLAB R2023b - trial use
HOME PLOTS APPS
New New Open Find Files Import Data VARIABLE CODE SIMULINK ENVIRONMENT RESOURCES
FILE
Current Folder D:\IMDATA 06-01-2024 Downloads
Command Window
New to MATLAB? See resources for Getting Started.
>> psk4data(110107589)
Message length is 91 symbols
ans =
91
>> load('psk4signal.mat')
>> sym_msg = out.yout(13:end);
>> ascii_msg = char(bin2dec(num2str(reshape(dec2bin(sym_msg,log2(2)),7,[1]).')));
ascii_msg = char(bin2dec(num2str(reshape(dec2bin(sym_msg,log2(2)),7,[1]).')));
Error: Invalid text character. The text '' contains an unsupported non-ASCII whitespace character.
>> ascii_msg = char(bin2dec(num2str(reshape(dec2bin(sym_msg,log2(2)),7,[1]).')));
ascii_msg =
'Never gonna let you down! '
f>>

```

Name	Value
ans	91
psk4data	1x1 SimulationO...
out	82x2 double
psk4signal	82x2 double
sym_msg	91x1 double

## subtask 2

Locate psk8data file in matlab directory.

As K value is 392, the stop time is set at  $(12+K)*8-1$

i.e.  $(12+392)*8-1$

```

MATLAB R2023b - trial use
HOME PLOTS APPS
FILE Current Folder
Current Folder
Name
calgary confirmation.pdf
psk4data.p
psk4signal.mat
psk8data.p
psk8signal.mat
QPSK.pdf
sb1_110107589.six
sb1_110107589.six.autosave
sb1_110107589.six
sb2_110107589.six
Steven Paul Jobs.png
task3.cpe.mewv4
task3.six
Task 3 - Phase Shift Keying [110107589].pdf

psk8signal.mat (MAT-file)
Name Value
psk8signal 3232x2 double

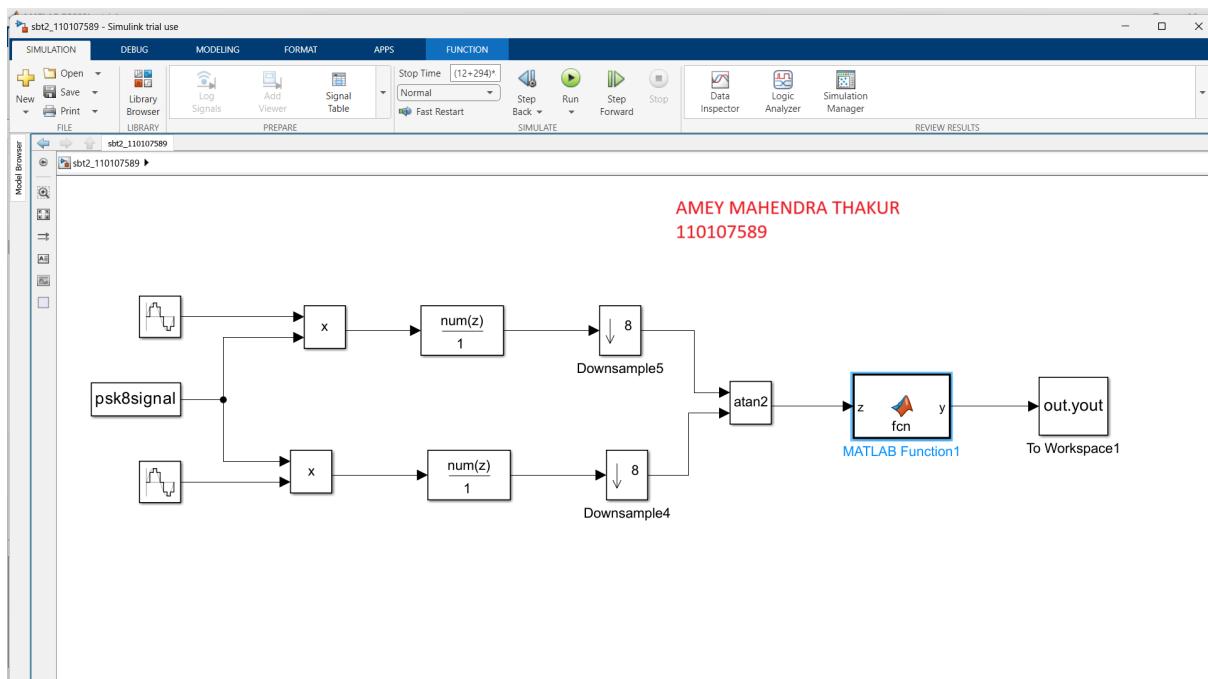
ans =
91
>> load('psk4signal.mat')
>> sym_msg = out.yout(13:end);
>> ascii_msg = char(bin2dec(num2str(reshape(dec2bin(sym_msg,log2(2)).', 7, []).'')));
ascii_msg = char(bin2dec(num2str(reshape(dec2bin(sym_msg,log2(2)).', 7, []).''));
Error: Invalid text character. The text '' contains an unsupported non-ASCII whitespace character.

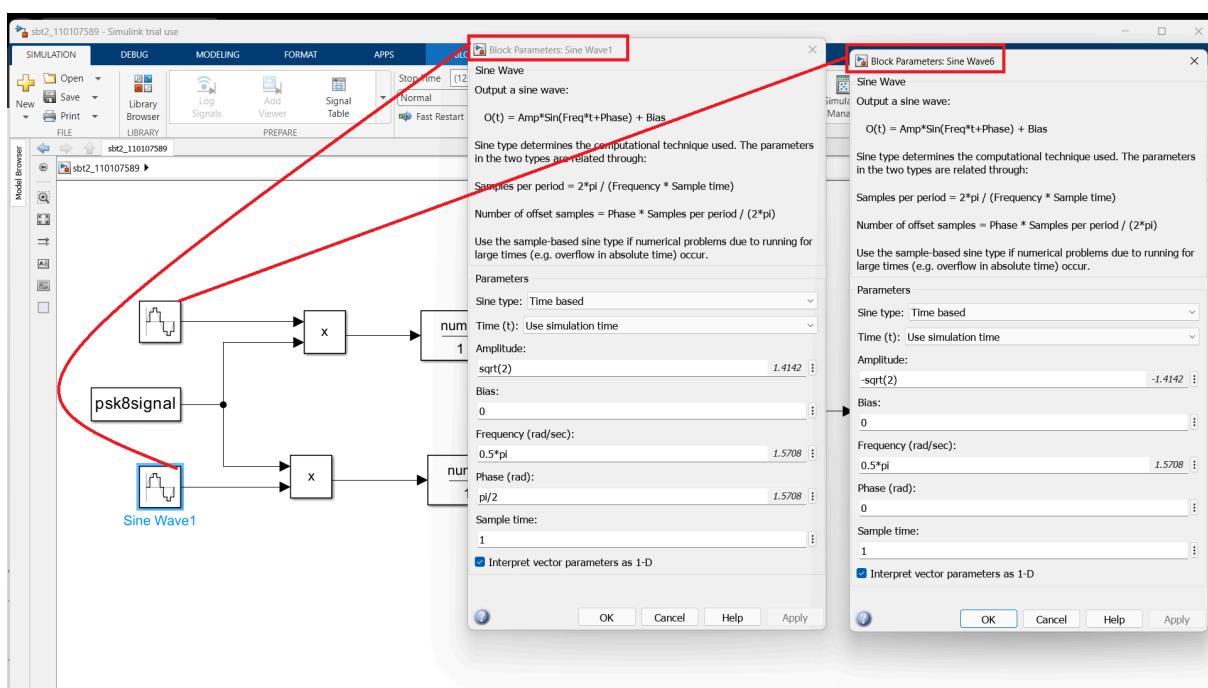
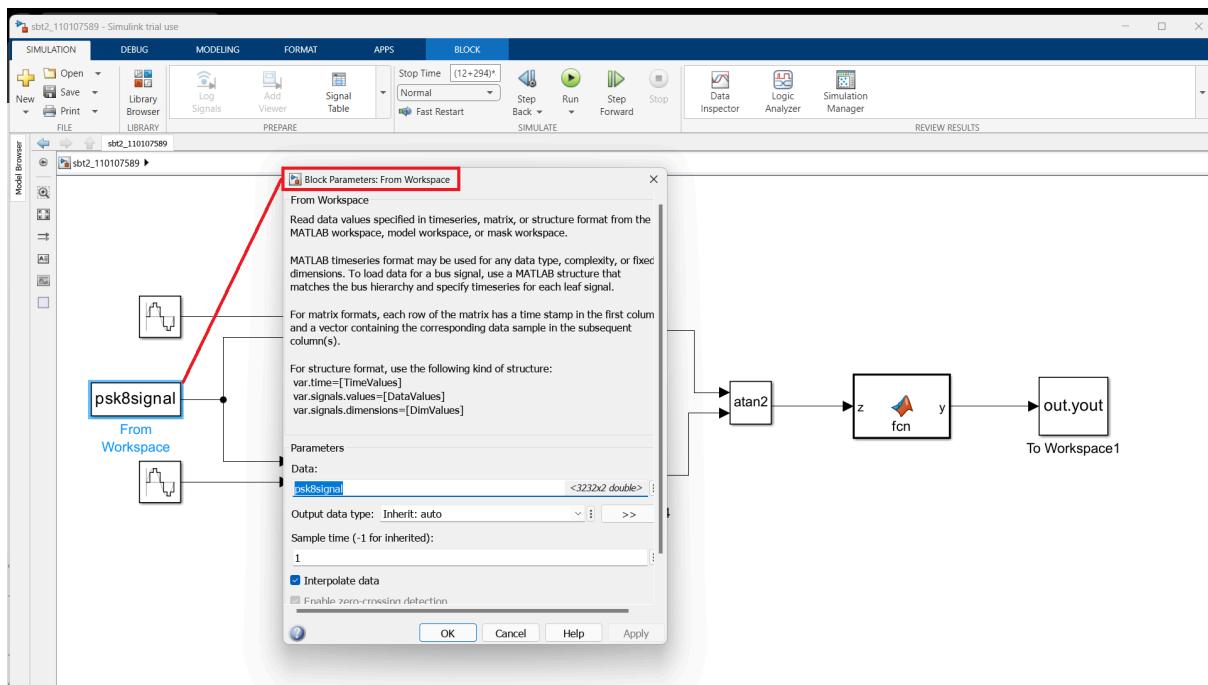
>> ascii_msg = char(bin2dec(num2str(reshape(dec2bin(sym_msg,log2(2)).', 7, []).''));
ascii_msg =
'Never gonna let you down!'

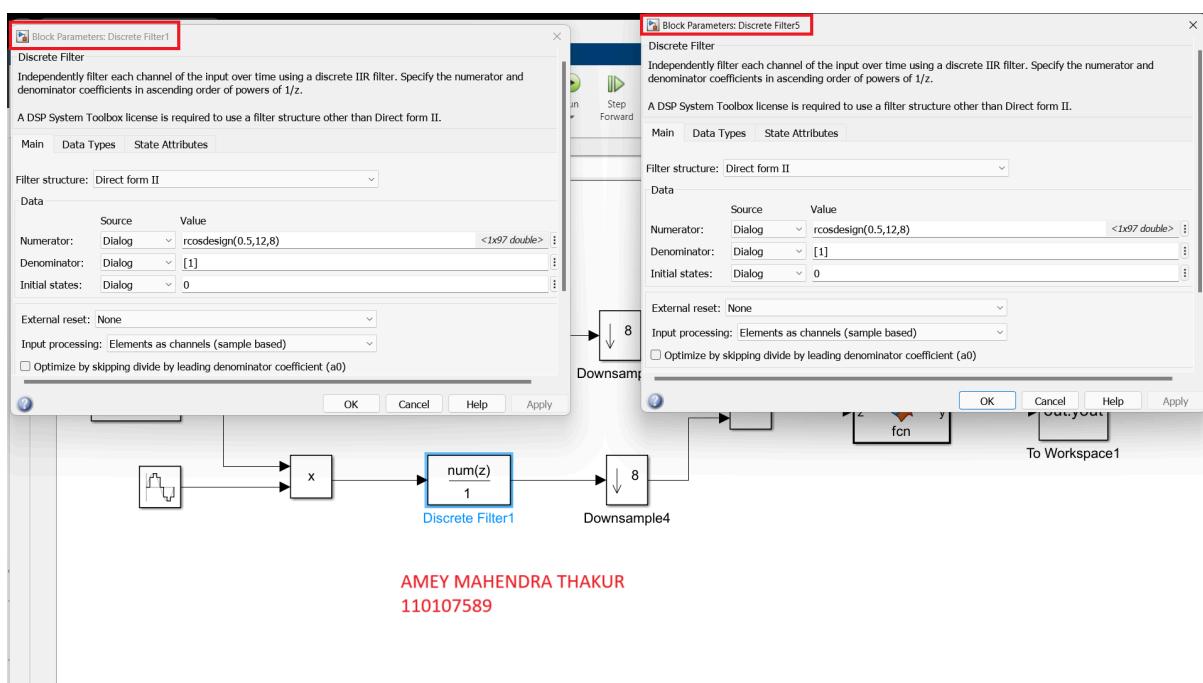
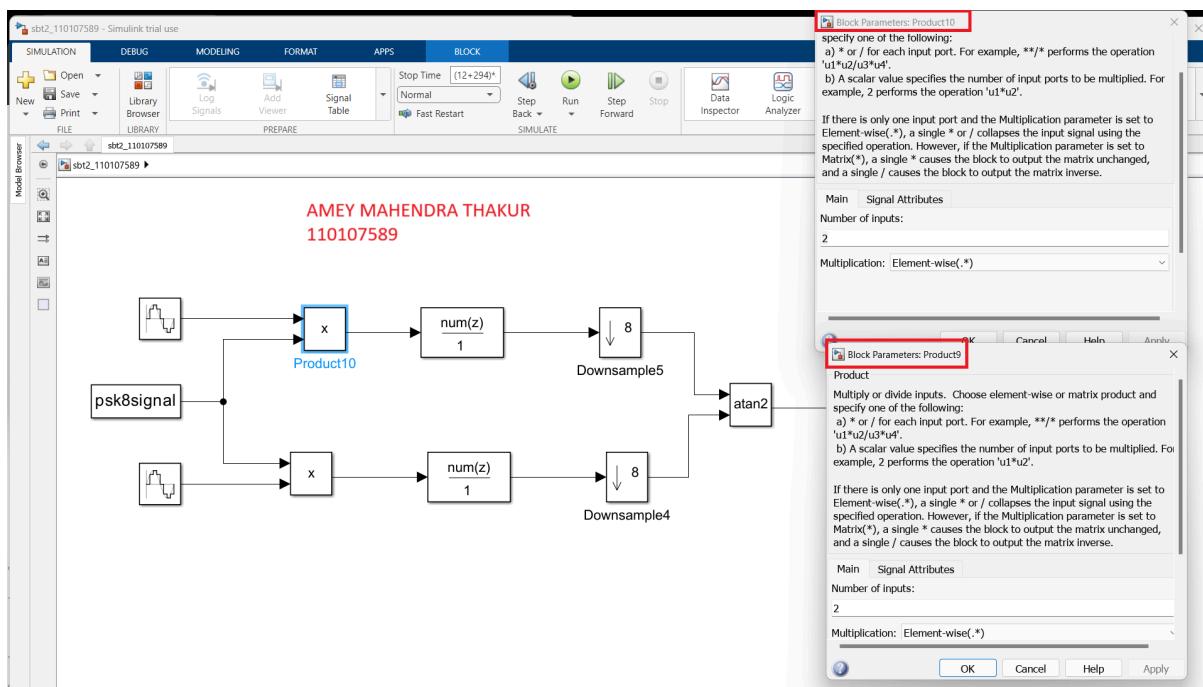
AMEY MAHENDRA THAKUR
110107589
ans =
392
>> load('psk8signal.mat')

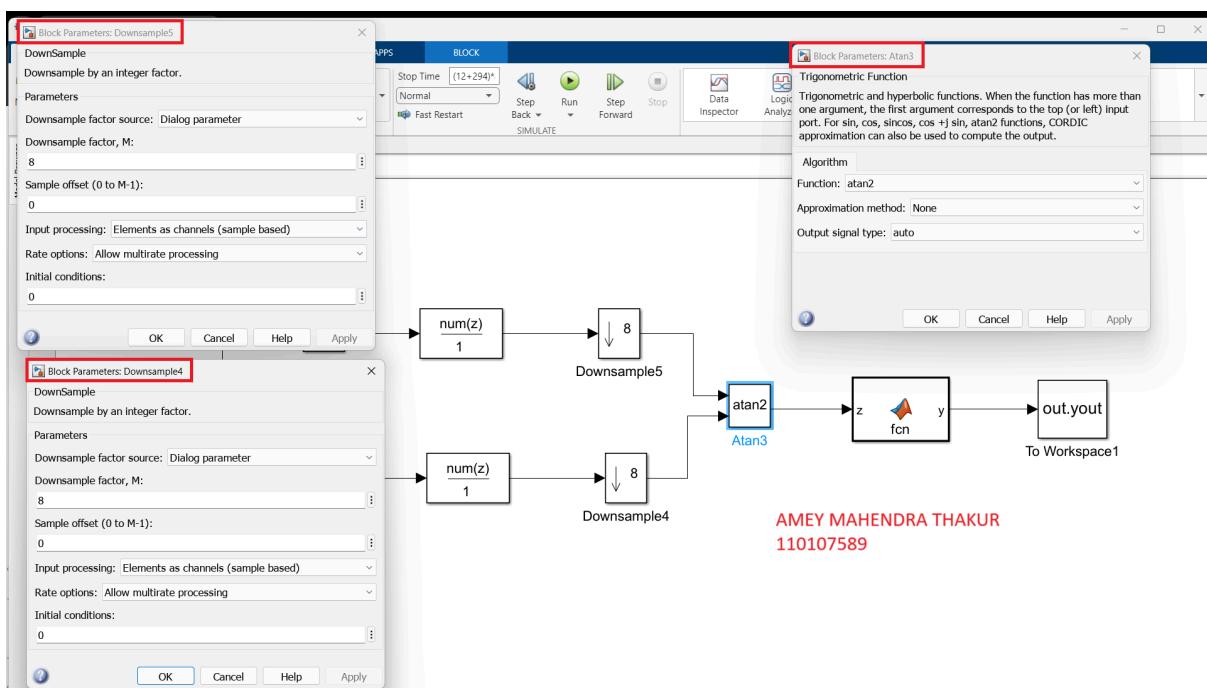
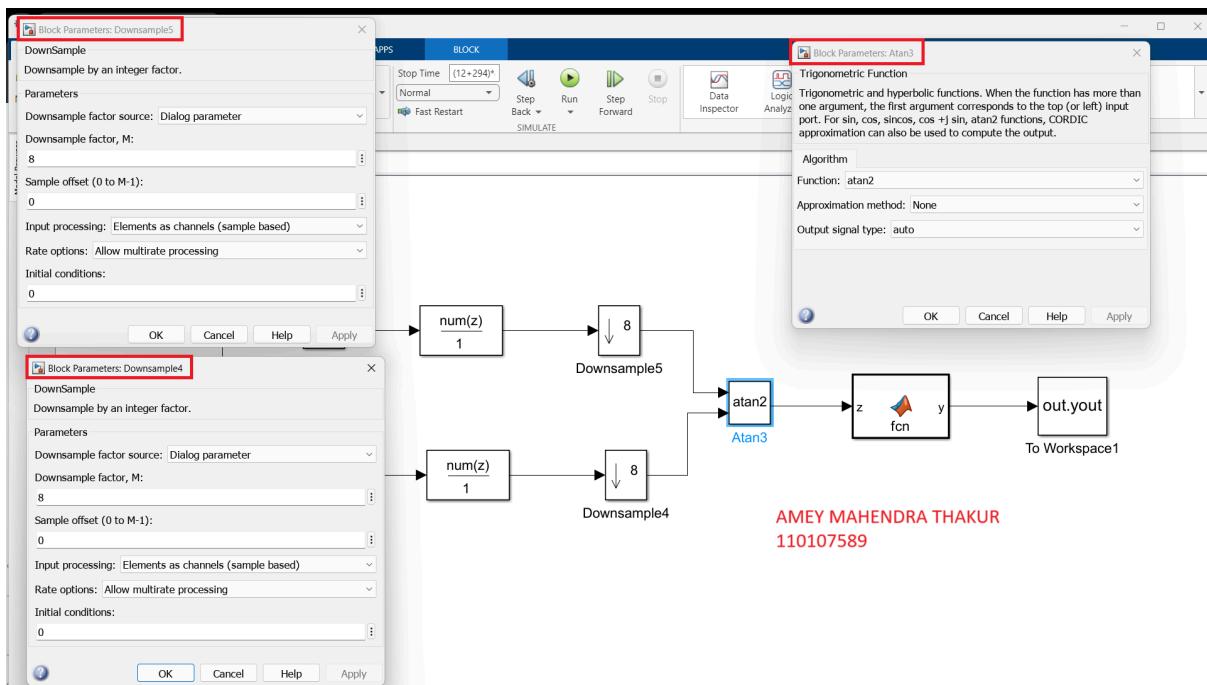
f>>

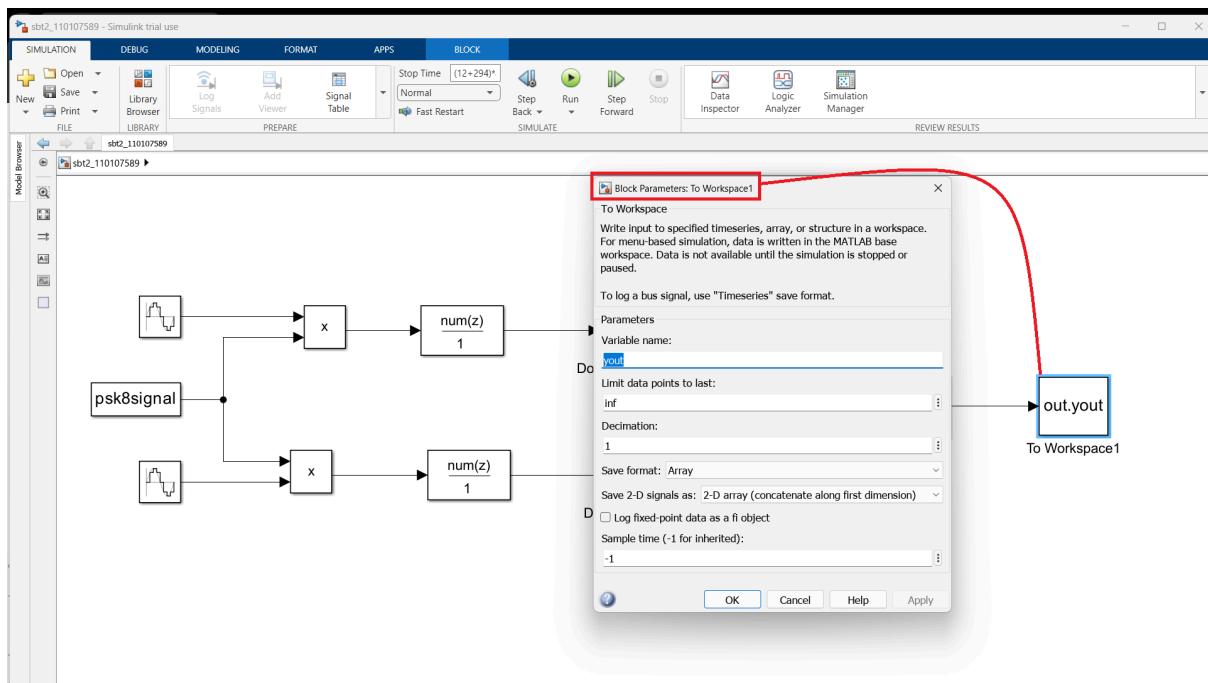
```











```

1 function y = fcn(z)
2 y = zeros(size(z));
3 for i=1:length(z)
4     if z(i)>=(pi/8) & z(i)<(pi/8)
5         y(i)=0;
6     elseif z(i)>(-3*(pi/8)) & z(i)<(-(pi/8))
7         y(i) = 4;
8     elseif z(i)>(-7*(pi/8)) & z(i)<(-5*(pi/8))
9         y(i) = 7;
10    elseif z(i)>= 3*pi/8 & z(i)< 5*(pi/8)
11        y(i)=3;
12    elseif z(i)>= 5*pi/8 & z(i)< 7*(pi/8)
13        y(i)=2;
14    elseif z(i)>= pi/8 & z(i)< 3*(pi/8)
15        y(i)=1;
16    elseif z(i)>= -5*pi/8 & z(i)< -3*(pi/8)
17        y(i)=5;
18    else
19        y(i) = 6;
20    end
21 end

```

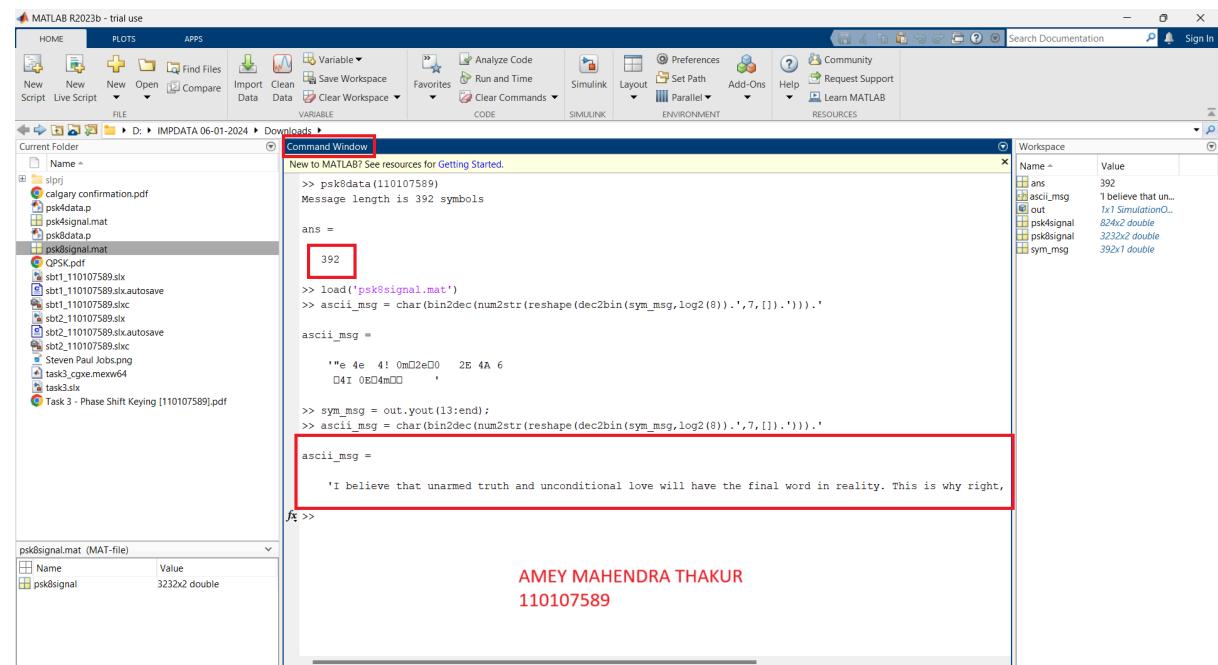
AMEY MAHENDRA THAKUR  
110107589

### ASCII message output:

The size of the message variable is  $404 \times 1$  but as instructed only the last K bits are to be considered for further processing. So fetch the last 392 bits and assign it to a variable to further process and the Converting the ASCII text message using the instructed formula.

My secret message is "*I believe that unarmed truth and unconditional love will have the final word in reality. This is why right, temporarily defeated, is stronger than evil triumphant. -MLK*"

### Secret message:



```

>> psk8data(110107589)
Message length is 392 symbols

ans =
392

>> load('psk8signal.mat')
>> ascii_msg = char(bin2dec(num2str(reshape(dec2bin(sym_msg,log2(8)).',7,[]).')));

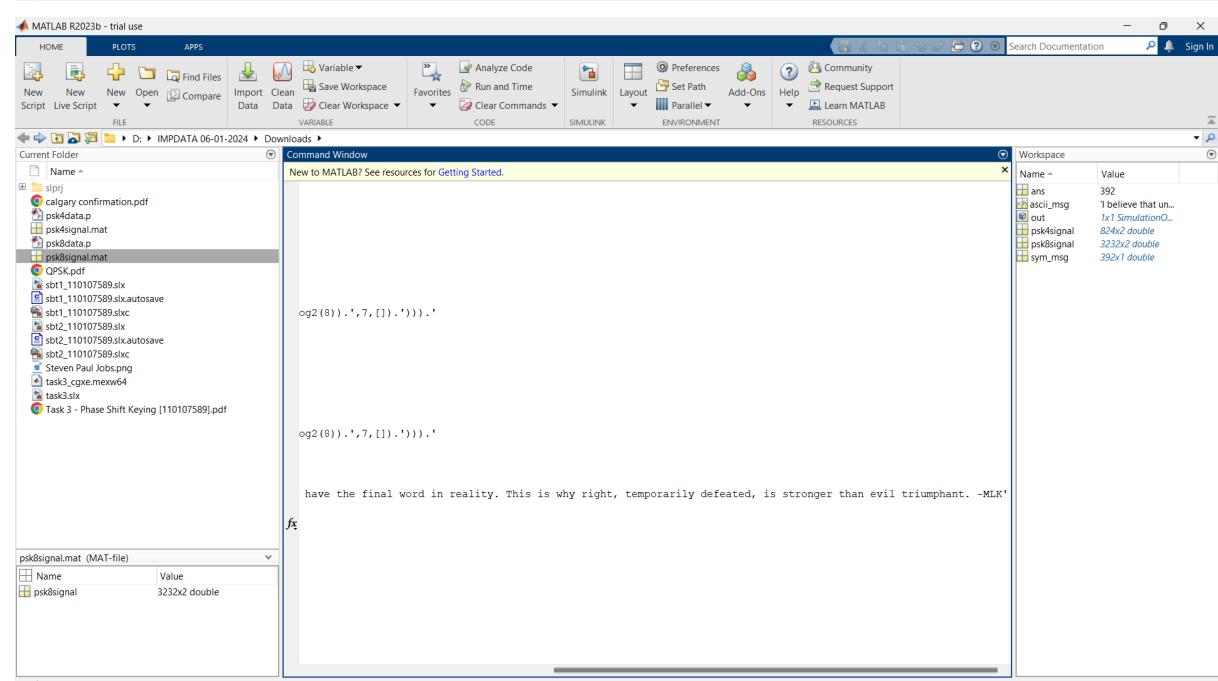
ascii_msg =
''e 4e 4! 0mD2e00 2E 4A 6
04I 0B04m000

>> sym_msg = out.yout(13:end);
>> ascii_msg = char(bin2dec(num2str(reshape(dec2bin(sym_msg,log2(8)).',7,[]).')));

ascii_msg =
'I believe that unarmed truth and unconditional love will have the final word in reality. This is why right,
f'>

```

AMEY MAHENDRA THAKUR  
110107589

```

og2(8).',7,[]).')).'*

og2(8).',7,[]).')).'*

have the final word in reality. This is why right, temporarily defeated, is stronger than evil triumphant. -MLK'
f

```