Lab 2

Name: Harshal Abhyankar

2019A3PS0282P

**Task 1**

Code:

N=2;

B=5+N;

fm=B;

fs = 6\*fm;

t\_start=0;

t\_end=3;

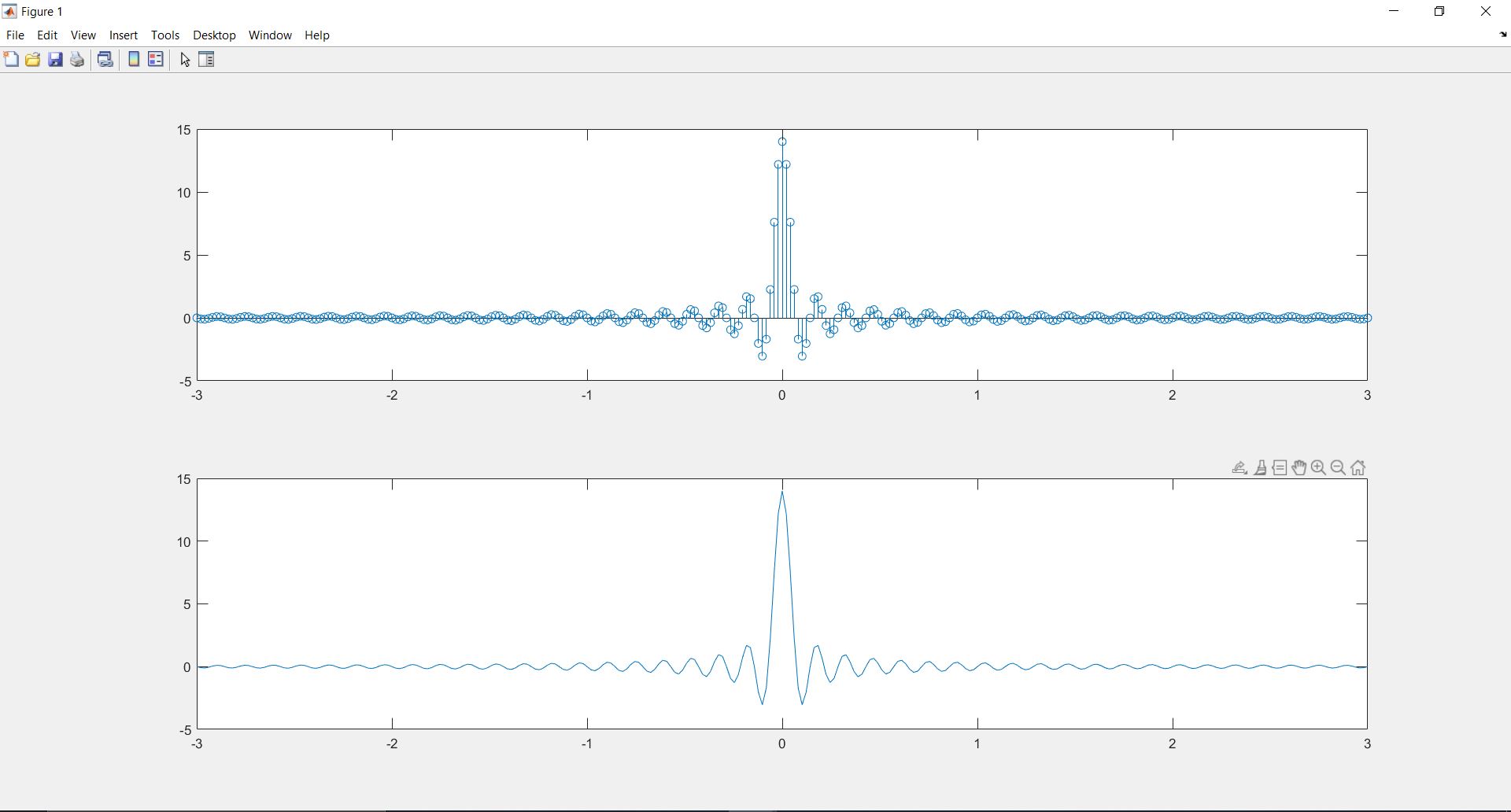
t = [-3:1/fs:3];

mt= 2\*B\*sinc(2\*B\*t);

subplot(2,1,1); stem(t,mt)

subplot(2,1,2); plot(t,mt)

Figure:



**Task 2:**

Code:

roc=280/(10^3);

ac=0.0969/(10^12);

Lo=587.3/(10^9);

Linf=426/(10^9);

b=1.385;

fm=745900;

Cinf=50/(10^12);

Co=0;

ce=1;

go=0;

ge=1;

f=4000; % this has to be changed for each graph

R=sqrt(sqrt((roc^4)+ac\*(f^2)));

L=(Lo+Linf\*((f/fm)^b))/(1+(f/fm)^b);

C=Cinf+Co\*(f^(-ce));

G=go\*f^ge;

w=2\*pi\*f;

gama=sqrt((R+1j\*w\*L)\*(G+1j\*w\*C));

%H=exp(1)^(gama\*d);

%H\_mod=abs(H);

H\_loop=[];

d\_start=10;

d\_end=5000;

for d=d\_start:500:d\_end

H=(exp(1))^(-1\*gama\*d);

H\_mod\_db=10\*log10((abs(H)));

H\_loop=[H\_loop H\_mod\_db];

end

hold all

title('Graph for frequency = 4GHz'); %this has to change with f for each graph

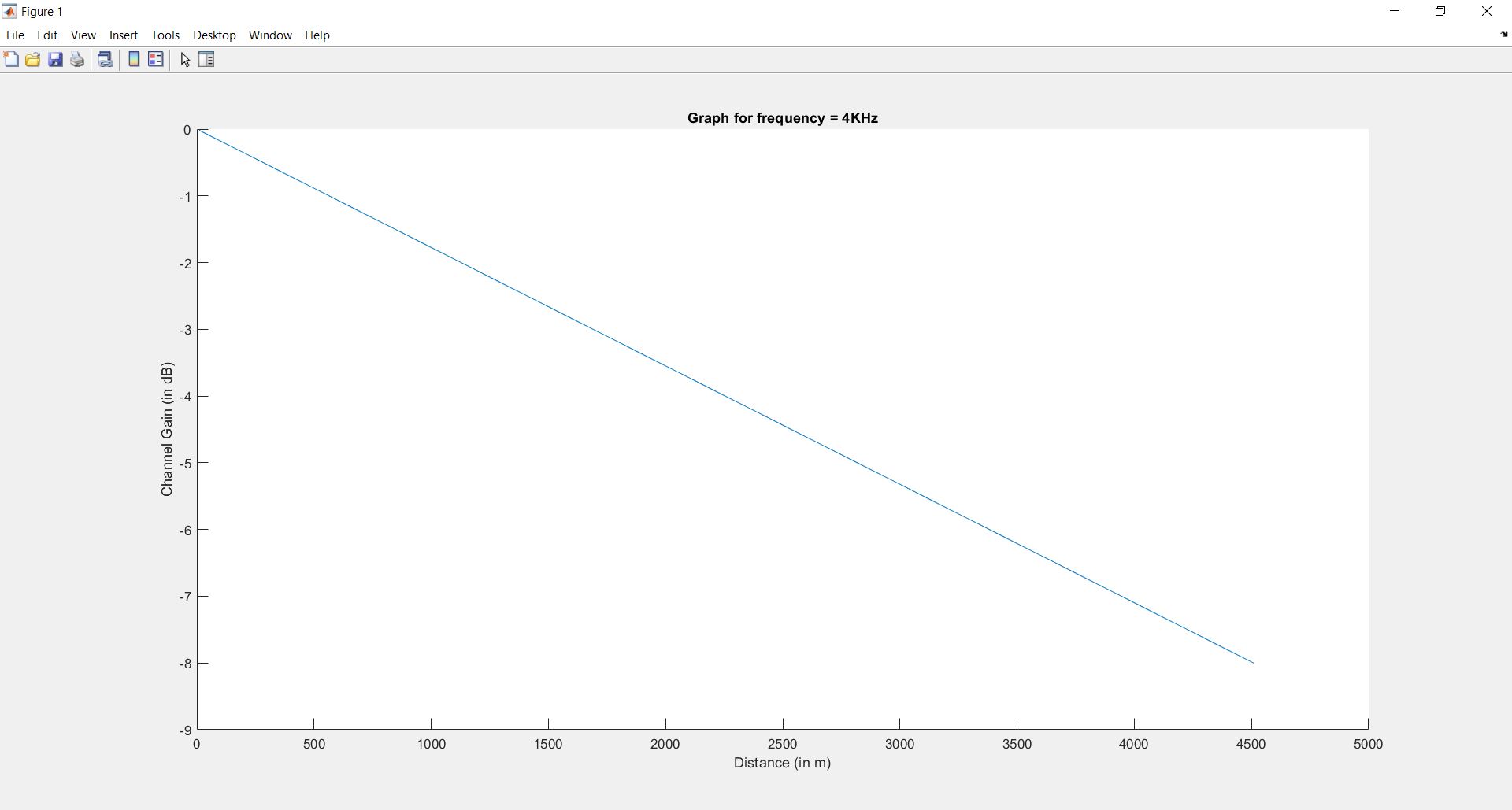
xlabel('Distance (in m)');

ylabel('Channel Gain (in dB)');

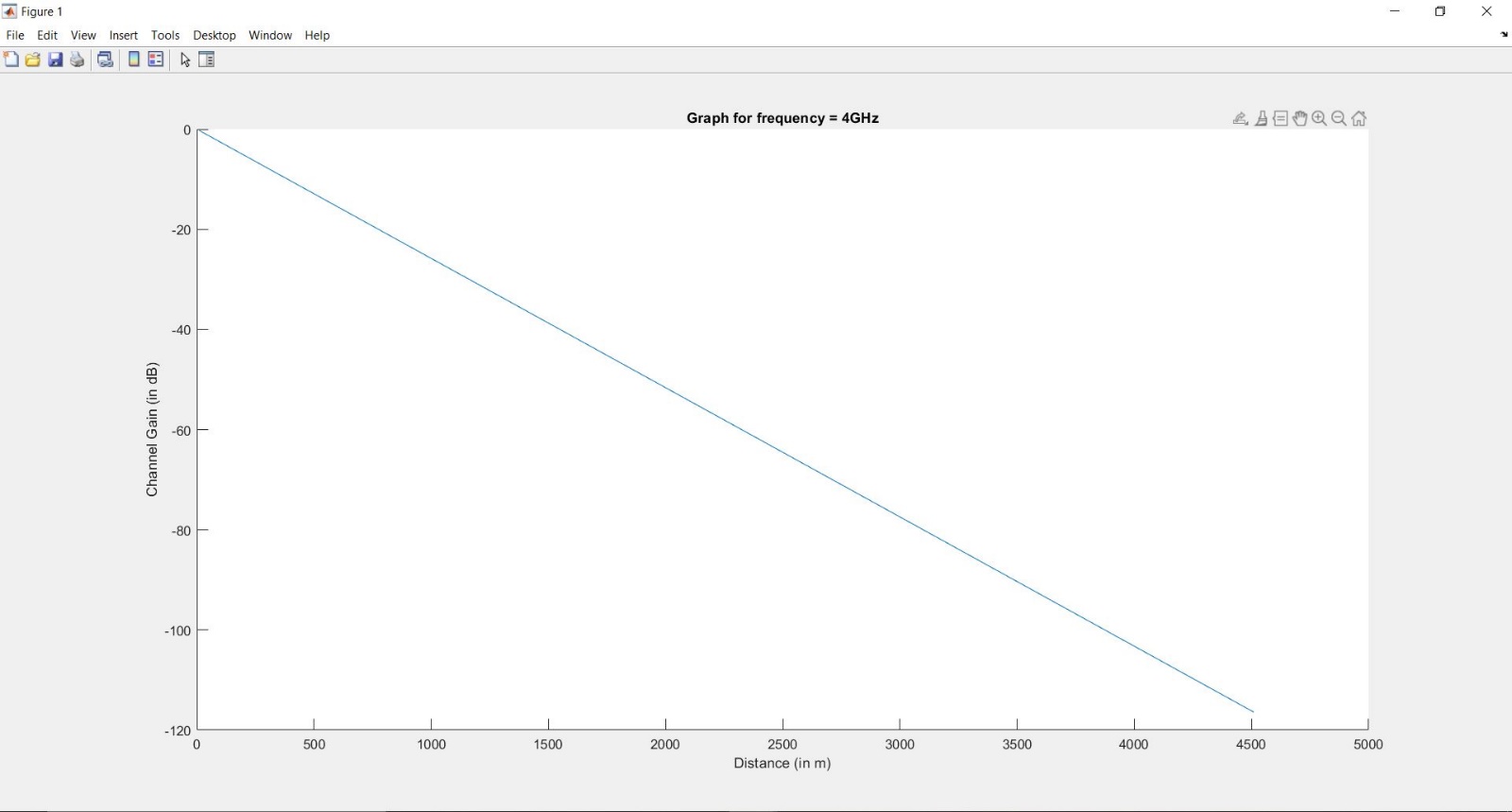
d\_axis=d\_start:500:d\_end;

plot(d\_axis,H\_loop)

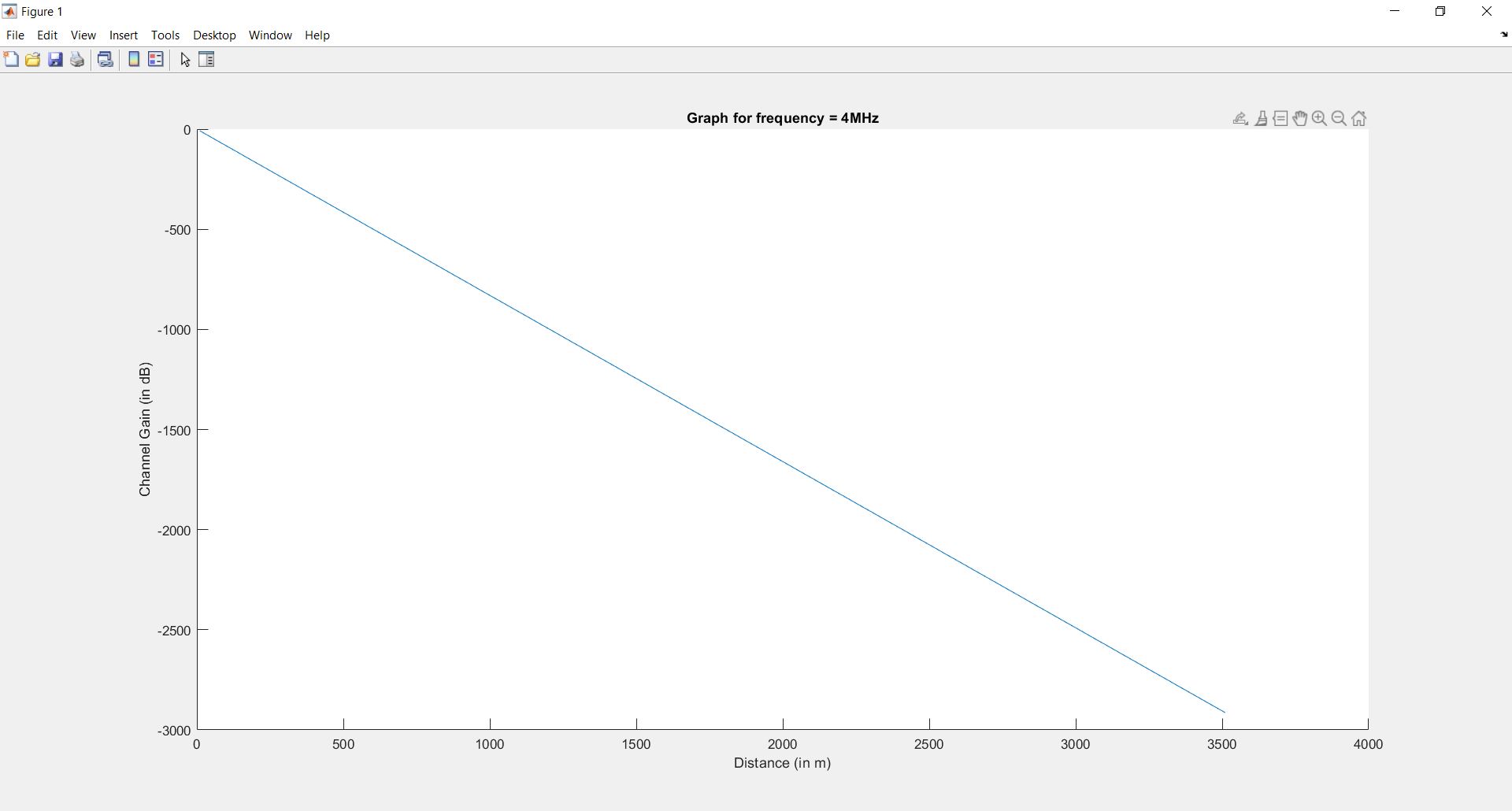
For 4KHz:



For 4Ghz:



For 4MHz:



**Task 3:**

symbls={'H' 'A' 'R' 'S' 'L' 'B' 'Y' 'N' 'K'};

prob=[0.1875 0.3125 0.125 0.0625 0.0625 0.0625 0.0625 0.0625 0.0625];

% H 3/16 A 5/16 R 2/16 S 1/16 L 1/16 B 1/16 Y 1/16 N 1/16 K 1/16

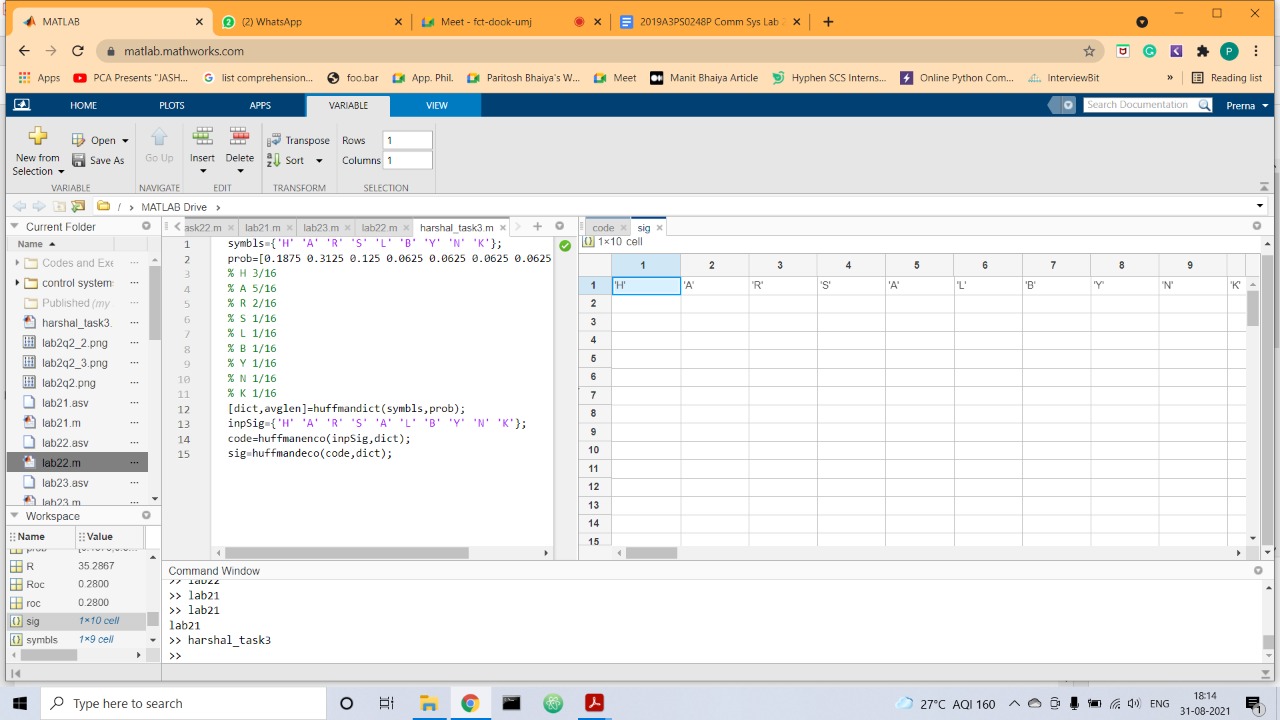
[dict,avglen]=huffmandict(symbls,prob);

inpSig={'H' 'A' 'R' 'S' 'A' 'L' 'B' 'Y' 'N' 'K'};

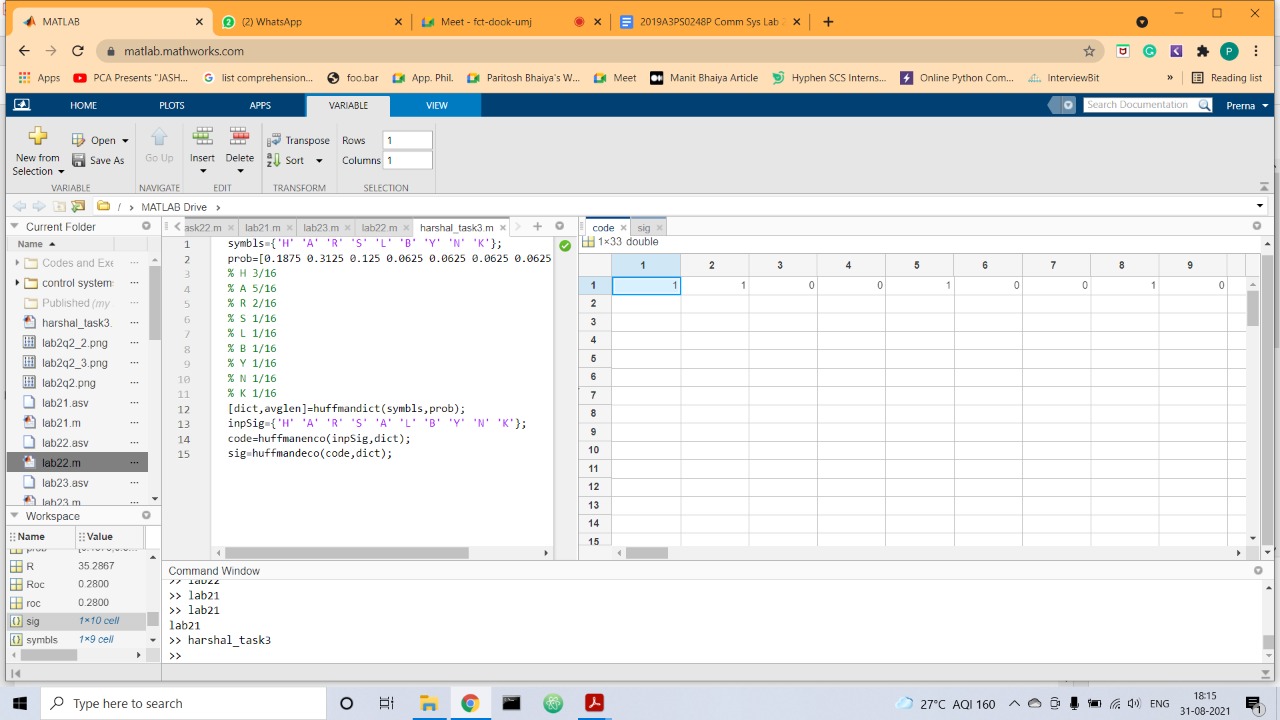
code=huffmanenco(inpSig,dict);

sig=huffmandeco(code,dict);

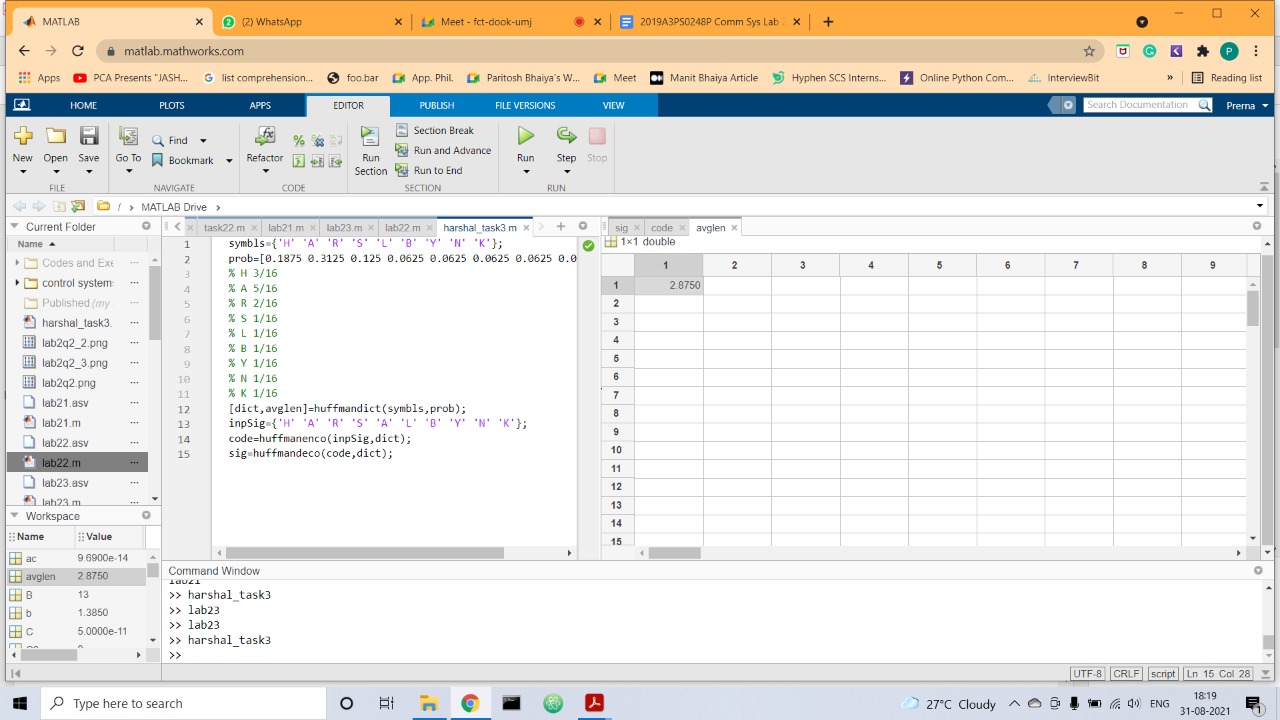
Input:



Coded:



Average length:



**Task 4**

Code:

clear all; close all; clc;  
f1 = 440;  
f2 = 480;  
time = 6;  
sample\_rate = 1000;  
t = linspace(0,6,time\*sample\_rate);  
A = 0.1;  
y = A\*(sin(2 \* pi \* f1 \* t) + sin(2 \* pi \* f2 \* t));  
s = square(t,33);  
s=s+1;  
s=s./2;  
sound\_wave = s.\*y;  
plot(t,sound\_wave)  
sound(sound\_wave,sample\_rate)



