```
clear all; close all; clc;

pas = 1/100;

limita=2;

t=-limita:pas:limita;

t0 = 0; %deplasarea portii

A = 0.5;

x = poarta(-A/2,A/2,1,t-t0);

figure(1);

plot(t,x);

xlabel('t [s]');

ylabel('Amplitudinea [V]');

k=10;

omega = -k*pi/A:1/10:k*pi/A;

X = zeros(1,length(omega));

for i=1:length(omega)

 X(i) = quad(@(t)poarta(-A/2,A/2,1,t-t0).*exp(-1i*omega(i)*t),-10,10);

 re = real(X(i));

 im = imag(X(i));

 if abs(re)<10^-10

 re = 0;

 end

 if abs(im)<10^-10

 im = 0;

 end

 X(i) = re+1i*im;

end

figure(2);

subplot(2,1,1);

plot(omega/(2*pi),abs(X)), title('Parte reala');

xlabel('[Hz]');
```

```matlab
subplot(2,1,2);

plot(omega/(2*pi),angle(X)), title('Parte imaginara');

xlabel('[Hz]');

figure(3);

plot3(omega,real(X),imag(X));

xlabel('Frecventa unghiulara');

ylabel('Partea reala');

zlabel('Partea imaginara');

%%%% esantionare semnale poarta

T=0.05;%perioada de esantionare

N=limita/T;

for n=-N:N

 xd(n+N+1)=poarta(-A/2,A/2,1,n*T);

end

%x reprezeninta varianta discreta a semnalului de tip poarta

%obtinut prin esantionare

X=fft(xd);

n=-N:N;

figure, stem(n*T,xd);

hold on

plot(t,x,'r-');

hold off

legend('Poarta discreta', 'Poarta analogica');

title('Comparatie poarta analogica vs. poarta discreta');

xlabel('t [s]');

ylabel('Amplitudinea [V]');

freq=n/(N*2*T);

figure, plot(freq,2*fftshift(abs(X)/N));

hold on

stem(freq,2*fftshift(abs(X)/N),'r');

xlabel('[Hz]');
```

```matlab
title('Spectru discret al portii discrete');

legend('TFTD', 'TFD');

hold off
```

```matlab
clear all; close all; clc;

pas = 1/100;

limita=0.5;

t=-limita:pas:limita;

t0 = 0; %deplasarea portii

A = 1;

f=10;%frecventa semnalului sinusoidal

x = sin(2*pi*f*t);

figure(1);

plot(t,x);

xlabel('t [s]');

ylabel('Amplitudinea [V]');

k=10;

omega = -k*pi/A:1/10:k*pi/A;

X = zeros(1,length(omega));

for i=1:length(omega)

 X(i) = quad(@(t)sin(2*pi*f*t).*exp(-1i*omega(i)*t),-10,10);

 re = real(X(i));

 im = imag(X(i));

 if abs(re)<10^-10

 re = 0;

 end

 if abs(im)<10^-10

 im = 0;

 end

 X(i) = re+1i*im;

end
```

```matlab
figure(2);

subplot(2,1,1);

plot(omega/(2*pi),abs(X)), title('Parte reala');

xlabel('[Hz]');

subplot(2,1,2);

plot(omega/(2*pi),angle(X)), title('Parte imaginara');

xlabel('[Hz]');

figure(3);

plot3(omega,real(X),imag(X));

xlabel('Frecventa unghiulara');

ylabel('Partea reala');

zlabel('Partea imaginara');

%%% esantionare semnale poarta

T=0.01;%perioada de esantionare

N=limita/T;

for n=-N:N

 xd(n+N+1)=sin(2*pi*f*n*T);

end

%x reprezeninta varianta discreta a semnalului de tip poarta

%obtinut prin esantionare

X=fft(xd);

n=-N:N;

figure, stem(n*T,xd);

hold on

plot(t,x,'r-');

hold off

legend('Semnal sin discret', 'Semnal sin analogic');

title('Comparatie analogic vs. discret');

xlabel('t [s]');

ylabel('Amplitudinea [V]');

freq=n/(N*2*T);
```

```matlab
figure, plot(freq,2*fftshift(abs(X)/N));

hold on

stem(freq,2*fftshift(abs(X)/N),'r');

xlabel('[Hz]');

title('Spectru discret al semnalului sin discret');

legend('TFTD', 'TFD');

hold off
```

```matlab
syms k a z w

trans = symsum( a^k * z^(-k),k,0,inf)

% trans = symsum( 1 * z^(-k),k,0,inf)

% trans = symsum( -1 * z^(-k),k,-inf,0)

% trans = symsum( k * z^(-k),k,0,inf)

% trans = symsum( (-1*a)^k * z^(-k),k,-inf,0)

% trans = symsum( cos(w*k) * z^(-k),k,0,inf)

% trans = symsum( sin(w*k) * z^(-k),k,0,inf)

% trans = symsum( a^k*cos(w*k) * z^(-k),k,0,inf)

% trans = symsum( a^k*sin(w*k) * z^(-k),k,0,inf)

pretty(trans)
```

```matlab
clear all

close all

clc

fs=8000;%frecventa de esantionare

ts=1/fs;%perioada de esantionare

t=1:ts:2;

f=input('Introduceti o tasta: ','s')

[f1,f2]=frecvente(f)


x1=sin(2*pi*f1*t);

x2=sin(2*pi*f2*t);
```

```matlab
y=x1+x2;%semnalul audio al tastei apasate ca suma de doua semnale
    %sinusoidale la frecventele f1 si f2 corespunzatoare tastei
soundsc(y,fs)
plot(t,y);
title('DTMF');
xlabel('Timp');
ylabel('Amplitudine');
grid;
```