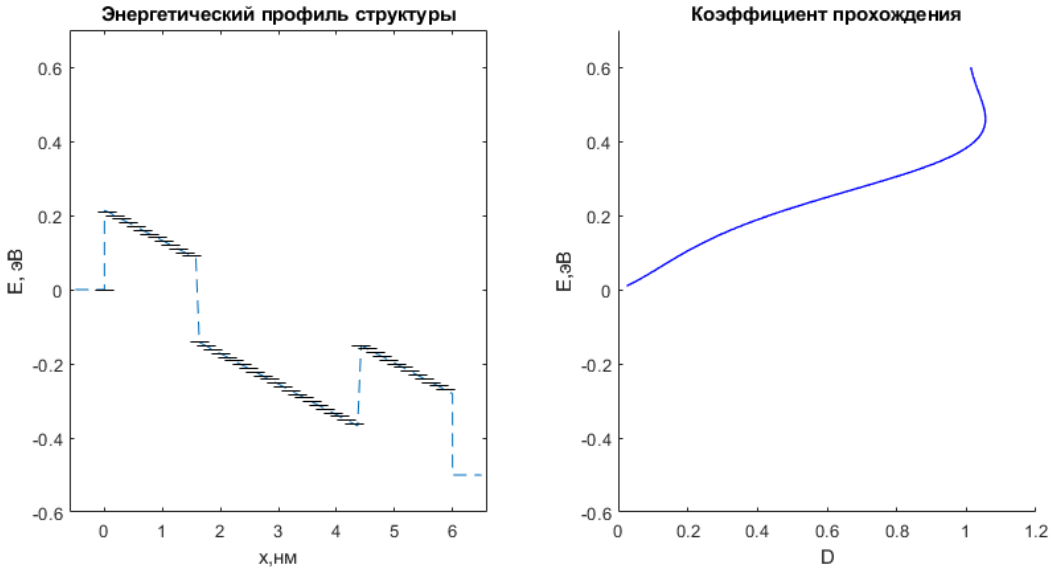
```
%preparing workspace
clc
clear
% close all

%constants
k=1.38e-23;
hbar=1.0546e-34;
m0=9.1e-31;
e=1.6e-19;

X=0.3;
%initial paramets
a=2.8e-9;                  %size of chanel, nm ????????????
b=1.6e-9;                  %size of barrier, nm ????????????
U0=X*0.74;             %height of barrier,  eV
m1=0.067*m0;             %eff. mass in GaAs, kg
m2=(0.067+0.083*X)*m0;  %eff. mass in AlGaAs(x), kg
V=0.5;

g=@(E,m,U)sqrt(2*m*(E-U))/hbar;
T=@(m1,m2,g1,g2,z)[0.5*(1+g1/g2*m2/m1)*exp(-1i*(g2-g1)*z),   0.5*(1-g1/g2*m2/
m1)*exp(-1i*(g2+g1)*z);
                   0.5*(1-g1/g2*m2/m1)*exp( 1i*(g2+g1)*z),   0.5*(1+g1/g2*m2/
m1)*exp( 1i*(g2-g1)*z)];
N=100;
x=linspace(0,2*b+a,N);
m=zeros(1,N);
U=zeros(1,N);

for i=1:N
    if(x(i)>=0&&x(i)<b)
        m(i)=m2;
        U(i)=U0-V*i/N;
    elseif (x(i)>=b&&x(i)<b+a)
        m(i)=m1;
        U(i)=-V*i/N;
    elseif(x(i)>=b+a)
        m(i)=m2;
        U(i)=U0-V*i/N;
    end
end

U=(U-V/N/2)*e;

T0=@(E)T(m2,m1,g(E,m2,U(N)),g(E,m1,-V*e),x(N));
for i=N-1:-1:1
    T0=@(E)T0(E)*T(m(i),m(i+1),g(E,m(i),U(i)),g(E,m(i+1),U(i+1)),x(i));
end
T0=@(E)T0(E)*T(m1,m2,g(E,m1,0),g(E,m2,U(1)),x(1)-x(2));
Tline=@(E)reshape(T0(E),1,[]);
Umax=2*e*X;
```

```
En=linspace(0.01*e, Umax,100);
D=zeros(1,100);
for i=1:100
    T1=Tline(En(i));
    D(i)=abs(g(En,m1,-V*e))/abs(g(En,m1,0))*m(1)/m(5)*abs((T1(4)*T1(1)-
T1(2)*T1(3))/T1(4))^2;
end

figure('Units','normalized','OuterPosition',[0.1 0.1 0.5 0.5])

subplot(1,2,2)
hold on
plot(D,En/e,'b','LineWidth',1);
Emax=En(islocalmax(D));
ylim([-V-.1, Umax/e+0.1])
% xlim([0 1])
ylabel('E,##')
xlabel('D')
title('########### ###########')

subplot(1,2,1)
x=[-0.5 0 x*1e9 x(end)*1e9 x(end)*1e9+0.5];
y=[0 0 U/e -V -V];
plot(x,y,'_--','MarkerSize',10,'MarkerEdgeColor','black','MarkerFaceColor',
[0.95 0.95 0.95],'MarkerIndices',2:2:N)
ylim([-V-.1, Umax/e+0.1])
xlim([x(1)-0.1 x(end)+0.1])
title('############### ######## #########')
xlabel('x,##')
ylabel('E, ##')
```



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