```
clear;
clc;

E = 100000; %MPa
nu = 0.3;
B = 20; %mm
a0 = 40; %mm
h = 1.0; %mm
I = 1/12*B*h^3;
L = 200; %mm
deltaL = 20 ; %mm
Gc0 = 100e-3; %MPa.mm or 10^-3 J/mm^2
nstep = 10000;
deltau = 0.01; %mm
u_ith = 0;
u_hist = zeros(1,nstep);
a_hist = zeros(1,nstep);
P_hist = zeros(1,nstep);
a = a0;

for i=1:nstep
u_ith = u_ith + deltau;
%calculate G with current opening displacement u
G = 9*E*I*u_ith^2/(4*B*a^4);

loc_checker = floor((a-a0)/deltaL);
if mod(loc_checker,2) == 0
   Gc = Gc0;
else Gc = 2*Gc0;
end

if G >= Gc
%disp('crack entends')
%calculate new crack length
a = (9*E*I*u_ith^2/(4*B*Gc))^0.25;
P_hist(i) = (1/sqrt(u_ith))*((4*Gc^3*E*I*B^3)/9)^0.25;
else
    %disp('crack not entend')
    %elastic loading
    P_hist(i) = 3*E*I*u_ith/(2*a^3);
end
u_hist(i) = u_ith;
a_hist(i) = a;
% if a <= a0
%
% else
%
% end
end

figure(1)
plot(u_hist,a_hist);
figure(2)
plot(u_hist,P_hist);
```