APPENDIX A1
MATLAB CODE FOR THE CASE II.1

```matlab
clear
clc
tic
profit_for_m1 = -ones(101,101);
profit_for_m2 = -ones(101,101);
for j1 = 0:100;
for j2 = 0:100;

for i=1:1:101;
    a = [0:1:100];
    n2(i,:) = [a];
end
n1 = n2';
m1 = j1.*ones(101,101)/100;
m2 = j2.*ones(101,101)/100;
%% Each firm's profit calculation
if  j1==j2 | j1==1| j2==0;
    C = zeros(101,101);
    pf1 = zeros(101,101);
    pf2 = zeros(101,101);

else
pf1     =       ((2.*(m1.^2).*m2+m2.*(1+8.*m2-2.*n1)-
m1.*(8.*m2+2.*(m2.^2)+(n1.^2)+((-1+n2).^2))).^2)./(72.*m1.*(m1-m2).*m2);
pf2     =       ((m2+2.*(m1.^2).*m2-2.*m2.*(2.*m2+n1)+m1.*(-2.*(-
2+m2).*m2+(1+n1-n2).*(-1+n1+n2))).^2)./(72.*m1.*(m1-m2).*m2)
p1      =       -(-7.*m1+4.*m2-32.*m1.*m2+8.*(m1.^2).*m2+32.*(m2.^2)-
8.*m1.*(m2.^2)-8.*m2.*n1-8.*m1.*(n1.^2)+8.*m1.*n2-4.*m1.*(n2.^2))./(24.*m1);
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p2        =        -(m1-4.*m2-16.*m1.*m2-
8.*(m1.^2).*m2+16.*(m2.^2)+8.*m1.*(m2.^2)+8.*m2.*n1-4.*m1.*(n1.^2)-
8.*m1.*n2-8.*m1.*(n2.^2))./(24.*m1);
k1        =        (m1+1)./2-(n1-1/2)./(2.*(m1-1))+(p1-p2)./(2.*(m1-1))-1;
k2        =        -(m2./2-(1./2-n2)./(-2.*m2)+(p1-p2)./(-2.*m2));
k3        =        ((m1+m2)./2-(n1-n2)./(2.*(m1-m2))+(p1-p2)./(2.*(m1-m2)))-
((m1+1)./2-(n1-1./2)./(2.*(m1-1))+(p1-p2)./(2.*(m1-1)));
k4        =        (m2./2-(1./2-n2)./(-2.*m2)+(p1-p2)./(-2.*m2))-((m1+m2)./2-(n1-
n2)./(2.*(m1-m2))+(p1-p2)./(2.*(m1-m2)));
   if  k1>0 & k2<0 & k3<0 & k4<0 & p1>0 & p2>0;
     C = ones(101,101);
   else C = zeros(101,101);
   end
end
pf1s = pf1.*C-1.*(1-C);
pf2s = pf2.*C-1.*(1-C);


%%Nash Equilibrium of n1, n2 finding
for i = 1:101;
   maxn1(i,:) = max(max(pf1s),0);
   maxn2(:,i) = max(max(pf2s'),0)';
end
checkn1 = (pf1s == maxn1);
checkn2 = (pf2s == maxn2);
equi_for_n = checkn1 .* checkn2;


%%Record profit for m1, m2 that is the N.E. from n1, n2

if sum(sum(equi_for_n))>0
[r,c] = find(equi_for_n>0,1, 'first');
profit_for_m1(j1,j2) = pf1s(r,c);
profit_for_m2(j1,j2) = pf2s(r,c);
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end
end
end

%% Nash Equilibrium for m1, m2 finding
for i = 1:101;
    maxm1(i,:) = max(max(profit_for_m
    maxm2(:,i) = max(max(profit_for_m2'),0)';
end

checkm1 = (profit_for_m1 == maxm1);
checkm2 = (profit_for_m2 == maxm2);
equi_for_m = checkm1 .* checkm2;
NEpl_for_m1 = equi_for_m.*profit_for_m1;
NEpl_for_m2 = equi_for_m.*profit_for_m2;

%% To check whether there is any N.E. or not
[NEr,NEc] = find(equi_for_m>0)
toc
```