```matlab
%{
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Subject: Assignment2 Q8
%}

function Prob8()
clear all % Clear stored variables
clc % Clear the screen
close all % Close all previously created plots

% Given values of K1 and K2 in case a
K11 = 0.1071;
K21 = 0.01493;

% Given initial concentrations of components
NoCO21 = 0.33333333333;
NoO21 = 0.33333333333;
NoN21 = 0.33333333333;
NoCO1 = 0;
NoNO1 = 0;

% Given values of K1 and K2 in case a
K12 = 0.1071;
K22 = 0.01493;

% Given initial concentrations of components
NoCO22 = 2;
NoO22 = 0.33333333333;
NoN22 = 0.33333333333;
NoCO2 = 0;
NoNO2 = 0;
E = [0.5; 0.5];

%Calling functioneval1 for case a
fun1 = @(E) eval1 (E, K11, K21, NoCO21, NoO21, NoN21, NoCO1, NoNO1);
fun1(E);
%Calling functioneval1 for case b
fun2 = @(E) eval1(E, K12, K22, NoCO22, NoO22, NoN22, NoCO2, NoNO2);
fun2(E);
options = optimoptions('fsolve','Display','iter');
[Ea] = fsolve(fun1, E, options);
[Eb] = fsolve(fun2, E, options);


disp('For case a the extent of reaction is (E1 and E2)')
Ea
disp('For case b the extent of reaction is (E1 and E2)')
Eb
end
```

```matlab
function func = eval1(E, K1, K2, NoCO2, NoO2, NoN2, NoCO, NoNO)

%Defining the functions which will be returned when called
func(1) = ((((NoCO + 2*E(1))^2)*(NoO2 - E(2) + E(1)))/(((NoCO2 -
 2*E(1))^2)*(NoCO2 + NoCO + NoO2 + NoN2 + NoNO + E(1))))-K1;
func(2) = (((NoNO + 2*E(2))^2)/((NoO2 + E(1) - E(2))*(NoN2 - E(2))))-
K2;

end
```

Iteration	Func-count	f(x)	Norm of step	First-order optimality	Trust-region radius
0	3	324.692		973	1
1	6	143.763	0.536168	365	1
2	9	45.7472	1	69.4	1
3	12	11.7483	1	11.5	1
4	15	3.02318	1	0.722	1
5	18	0.668911	1	0.0928	1
6	21	0.618679	2.5	0.536	2.5
7	22	0.618679	6.25	0.536	6.25
8	23	0.618679	1.5625	0.536	1.56
9	26	0.599584	0.390625	0.104	0.391
10	27	0.599584	0.390625	0.104	0.391
11	30	0.598522	0.0976563	0.109	0.0977
12	33	0.598135	0.0976563	0.0643	0.0977
13	34	0.598135	0.0976563	0.0643	0.0977
14	37	0.597965	0.0244141	0.0578	0.0244
15	40	0.597797	0.0244141	0.0258	0.0244
16	41	0.597797	0.0244141	0.0258	0.0244
17	44	0.597779	0.00610352	0.0193	0.0061
18	47	0.597764	0.00610352	0.0125	0.0061

19	50	0.597763	0.00610352	0.00936	0.0061
20	53	0.597758	0.00610352	0.00678	0.0061
21	54	0.597758	0.00610352	0.00678	0.0061
22	57	0.597757	0.00152588	0.0047	0.00153
23	60	0.597756	0.00152588	0.00321	0.00153
24	63	0.597755	0.00152588	0.00187	0.00153
25	66	0.597755	0.00152588	0.000959	0.00153
26	69	0.597755	0.00152588	0.000392	0.00153
27	70	0.597755	0.00152588	0.000392	0.00153
28	73	0.597755	0.00038147	0.000195	0.000381
29	74	0.597755	0.00038147	0.000195	0.000381
30	77	0.597755	9.53674e-05	0.00014	9.54e-05
31	80	0.597755	9.53674e-05	0.000105	9.54e-05
32	81	0.597755	9.53674e-05	0.000105	9.54e-05
33	84	0.597755	2.38419e-05	7.12e-05	2.38e-05
34	87	0.597755	2.38419e-05	4.94e-05	2.38e-05
35	90	0.597755	2.38419e-05	3.55e-05	2.38e-05
36	93	0.597755	2.38419e-05	2.66e-05	2.38e-05
37	96	0.597755	2.38419e-05	2.08e-05	2.38e-05
38	97	0.597755	2.38419e-05	2.08e-05	2.38e-05
39	100	0.597755	5.96046e-06	1.43e-05	5.96e-06
40	103	0.597755	5.96046e-06	8.33e-06	5.96e-06
41	106	0.597755	5.96046e-06	4.46e-06	5.96e-06
42	109	0.597755	5.96046e-06	1.98e-06	5.96e-06
43	110	0.597755	5.96046e-06	1.98e-06	5.96e-06
44	113	0.597755	1.49012e-06	1.05e-06	1.49e-06
45	114	0.597755	1.49012e-06	1.05e-06	1.49e-06

```
    46          117        0.597755    3.72529e-07      7.37e-07
  3.73e-07
```

No solution found.

fsolve stopped because the problem appears regular as measured by the
 gradient,
but the vector of function values is not near zero as measured by the
default value of the function tolerance.

Iteration	Func-count	f(x)	Norm of step	First-order optimality	Trust-region radius
0	3	324.538		973	1
1	6	0.882078	1	1.73	1
2	9	0.0052727	0.497895	0.114	2.5
3	10	0.0052727	0.135749	0.114	2.5
4	13	0.000770041	0.0339372	0.0281	0.0339
5	14	0.000770041	0.0848431	0.0281	0.0848
6	17	0.000162829	0.0212108	0.00541	0.0212
7	18	0.000162829	0.0312042	0.00541	0.053
8	21	7.64897e-05	0.00780104	0.00573	0.0078
9	24	1.04821e-05	0.0127548	0.00405	0.0195
10	27	2.60839e-08	0.00262437	0.000182	0.0195
11	30	2.34452e-13	0.000145191	5.43e-07	0.0195

Equation solved.

fsolve completed because the vector of function values is near zero
as measured by the default value of the function tolerance, and
the problem appears regular as measured by the gradient.

For case a the extent of reaction is (E1 and E2)

Ea =

```
    1.4991
    0.1141

For case b the extent of reaction is (E1 and E2)

Eb =

    0.4050
    0.0284
```

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