

```

1  #Assgn 6, Q1
2  clear
3  output_precision(16)
4  # System Parameters
5  a1=0.1;a2=0.1;b1=8*power(10,-7);b2=8*power(10,-7);c1=power(10,-6);c2=power(10,-7);
6  f=@(n1,n2) [n1*(a1-b1*n1-c1*n2); n2*(a2-b2*n2 -c2*n1)];
7
8  #m=no. of equations; N= no. of time intervals; a,b =start and end points resp.
9  #init=array of initial conditions.
10 m=2;N=10*2^7;a=0;b=10;init=[power(10,5),power(10,5)];
11 n1(1)=init(1);n2(1)=init(2); #n1 and n2 are the arrays storing values at different t
12 #h=time step size,t=current instant of time, T is the iterator which stores the time
    values
13 h=(b-a)/N;t=a;T(1)=a;
14 for j=1:1:m
15     w(j)=init(j);
16 endfor
17 for i=1:1:N
18     for j=1:1:m
19         k1(j)=h*f(w(1),w(2))(j);
20     endfor
21     for j=1:1:m
22         k2(j)=h*f((w(1)+0.5*k1(1)), (w(2)+0.5*k1(2)))(j);
23     endfor
24     for j=1:1:m
25         k3(j)=h*f((w(1)+0.5*k2(1)), w(2)+0.5*k2(2))(j);
26     endfor
27     for j=1:1:m
28         k4(j)=h*f((w(1)+k3(1)), w(2)+k3(2))(j);
29     endfor
30     for j=1:1:m
31         w(j)=w(j)+(k1(j)+2*k2(j)+2*k3(j)+k4(j))/6;
32     endfor
33     t=a+i*h;
34     T(end+1)=t;
35     n1(end+1)=w(1);
36     n2(end+1)=w(2);
37 endfor
38
39 plot(T,n1, '-b',T,n2, '-r')
40 xlabel("T (in years)","FontSize",20)
41 ylabel("N1(t)/N2(t)","FontSize",20)
42 title("Plot of N1(t) and N2(t) with time","FontSize",25)
43 set(gca,'fontsize',20)
44 legend('N1(t)', 'N2(t)')
45 n1(end)
46 n2(end)
47
48

```