

```
clear all
global lh bita pi mh picap la lb lf ma mb mf alpha tildpi pibrave barpi arrowpi
lh=317;
bita=0.24;
pi=0.18;
mh=0.00004;%0.004,0.04, 0.4
lf=14950;%1/14,12
picap =0.05;%0 .25,0.01
mf=0.189;%0.71420,.071428,1,0.0789,0.189
la=73;
lb=20;
ma=0.19;
mb=0.25;
tildpi=0.12;
alpha=0.16;
pibrave=0.11;
barpi=0.07;
arrowpi=0.04;
R0 = (bita^2*pi*pibrave*la*lb*lf+
alpha^2*barpi*tildpi*lb*lh*lf+alpha^2*picap*arrowpi*la*lh*lf)/(mf^2*lh*la*lb);
tspan=[0 300];
x0=[300,50,30,20,15 8,1500,500]; % period orbit
[t,x] = ode45('CLTWof1',tspan,x0);
figure(11)
subplot(4,2,1), plot(t,x(:,1));
hold on;
subplot(4,2,2), plot(t,x(:,2));
hold on;
subplot(4,2,3), plot(t,x(:,3));
hold on;
subplot(4,2,4), plot(t,x(:,4));
hold on;
subplot(4,2,5), plot(t,x(:,5));
hold on;
subplot(4,2,6), plot(t,x(:,6));
hold on;
subplot(4,2,7), plot(t,x(:,7));
hold on;
subplot(4,2,8), plot(t,x(:,8));
hold on;
```

```
function yp= CLTWOf1 (t,y)
global lh bita pi mh picap la lb lf ma mb mf alpha tildpi pibrave barpi arrowpi
yp (1,:)= lh-bita.*pi.*y(8).*y(1)/(y(1)+y(2))- mh.*y(1);
yp (2,:)= bita.*pi.*y (8).*y(1)./(y(1)+y(2))- mh.*y(2);
yp (3,:)= la-alpha.*tildpi.*y(8).*y(3)/(y(3)+y(4))- ma.*y(3);
yp (4,:)= alpha.*tildpi.*y(8).*y(3)./(y(3)+y(4))- ma.*y(4);
yp (5,:)= lb-alpha.*picap.*y(8).*y(5)./(y(5)+y(6))- mb.*y(5);
yp (6,:)= alpha.*picap.*y(8).*y(5)./(y(5)+y(6))- mb.*y(6);
yp (7,:)= lf-bita.*pibrave.*y(7).*y(2)./(y(1)+y(2))-alpha.*barpi.*y(7).*y(4)./(y(3)+y(4))-alpha.*arrowpi.*y(7).*y (6)./(y(5)+y(6))- mf.*y(7);
yp (8,:)= bita.*pibrave.*y(7).*y(2)./(y(1)+y(2))+alpha.*barpi.*y(7).*y(4)./(y(3)+y(4)) +alpha.*arrowpi.*y(7).*y (6)./(y(5)+y(6))- mf.*y(8);
```

```
clear all
global lh bita pi mh picap la lb lf ma mb mf alpha tildpi pibrave barpi arrowpi
lh=317;
bita=0.18;
pi=0.16;
mh=0.071; %0.071,0.004,0.00004
lf=14950;%1/14,12
picap =0.02;%0 .25,0.01
mf=0.789;%0.71420,.071428,1,0.0789,0.18
la=73;
lb=20;
ma=0.07;
mb=0.09;
tildpi=0.13;
alpha=0.15;
pibrave=0.19;
barpi=0.18;
arrowpi=0.21;
R0 = (bita^2*pi*pibrave*la*lb*lf+
alpha^2*barpi*tildpi*lb*lh*lf+alpha^2*picap*arrowpi*la*lh*lf)/(mf^2*lh*la*lb);
tspan=[0 300];
x0=[300,70,30,50 20,10,1500,500];% period orbit
[t,x] = ode45('CLTWof1',tspan,x0);
subplot(4,2,1), plot(t,x(:,1));
hold on;
subplot(4,2,2), plot(t,x(:,2));
hold on
subplot(4,2,3), plot(t,x(:,3));
hold on
subplot(4,2,4), plot(t,x(:,4));
hold on;
subplot(4,2,5), plot(t,x(:,5));
hold on;
subplot(4,2,6), plot(t,x(:,6));
hold on;
subplot(4,2,7), plot(t,x(:,7));
hold on;
subplot(4,2,8), plot(t,x(:,8));
hold on;
```

```
function yp= CLTWOf1 (t,y)
global lh bita pi mh picap la lb lf ma mb mf alpha tildpi pibrave barpi arrowpi
yp (1,:)= lh-bit.*pi.*y(8).*(y(1)/(y(1)+y(2))- mh.*y(1);
yp (2,:)= bita.*pi.*y (8).*(y(1)/(y(1)+y(2))- mh.*y(2);
yp (3,:)= la-alpha.*tildpi.*y(8).*(y(3)/(y(3)+y(4))- ma.*y(3);
yp (4,:)= alpha.*tildpi.*y(8)*y(3)/(y(3)+y(4))- ma.*y(4);
yp (5,:)= lb-alpha.*picap.*y(8).*(y(5)/(y(5)+y(6))- mb.*y(5);
yp (6,:)= alpha.*picap.*y(8).*(y(5)/(y(5)+y(6))- mb.*y(6);
yp (7,:)= lf-bit.*pibrave.*y(7).*(y(2)/(y(1)+y(2))-alpha.*barpi.*y(7).*(y(4)/(y(3)+y(4))-alpha.*arrowpi.*y(7).*(y (6)/(y(5)+y(6))- mf.*y(7);
yp (8,:)= bita.*pibrave.*y(7).*(y(2)/(y(1)+y(2))+alpha.*barpi.*y(7).*(y(4)/(y(3)+y(4)))+alpha.*arrowpi.*y(7).*(y (6)/(y(5)+y(6))- mf.*y(8);
```