
exam02 - q03 - lyapunov equation

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```
clc
clear
close all
%warning('off','all')
%warning

A = [0 1; -3 -4];

Q1 = [1 0; 0 1];
Q2 = [0 1; 1 0];
Q3 = [1 0; 0 0];
Q4 = [0 1; 0 0];
Q5 = [0 0; 1 0];
Q6 = [0 0; 0 1];

Q7 = [0 1; 1 1];
Q8 = [1 0; 1 1];
Q9 = [1 1; 0 1];
Q10 = [1 1; 1 0];

Q11 = [0 0; 1 1];
Q12 = [1 1; 0 0];
Q13 = [1 0; 0 1];
Q14 = [0 1; 1 0];

Q1
P = lyap(A,Q1)
m11 = P(1,1)
m22 = P(1,1)*P(2,2) - P(1,2)*P(2,1)

Q2
P = lyap(A,Q2)
m11 = P(1,1)
m22 = P(1,1)*P(2,2) - P(1,2)*P(2,1)

Q3
lyap(A,Q3)
m11 = P(1,1)
m22 = P(1,1)*P(2,2) - P(1,2)*P(2,1)

Q4
P = lyap(A,Q4)
m11 = P(1,1)
m22 = P(1,1)*P(2,2) - P(1,2)*P(2,1)

disp(Q5)
P = lyap(A,Q5)
```

```
m11 = P(1,1)
m22 = P(1,1)*P(2,2) - P(1,2)*P(2,1)
```

```
disp(Q6)
P = lyap(A,Q6)
m11 = P(1,1)
m22 = P(1,1)*P(2,2) - P(1,2)*P(2,1)
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```
disp(Q7)
P = lyap(A,Q7)
m11 = P(1,1)
m22 = P(1,1)*P(2,2) - P(1,2)*P(2,1)
```

```
disp(Q8)
P = lyap(A,Q8)
m11 = P(1,1)
m22 = P(1,1)*P(2,2) - P(1,2)*P(2,1)
```

```
disp(Q9)
P = lyap(A,Q9)
m11 = P(1,1)
m22 = P(1,1)*P(2,2) - P(1,2)*P(2,1)
```

```
disp(Q10)
P = lyap(A,Q10)
m11 = P(1,1)
m22 = P(1,1)*P(2,2) - P(1,2)*P(2,1)
```

```
disp(Q11)
P = lyap(A,Q11)
m11 = P(1,1)
m22 = P(1,1)*P(2,2) - P(1,2)*P(2,1)
```

```
disp(Q12)
P = lyap(A,Q12)
m11 = P(1,1)
m22 = P(1,1)*P(2,2) - P(1,2)*P(2,1)
```

```
disp(Q13)
P = lyap(A,Q13)
m11 = P(1,1)
m22 = P(1,1)*P(2,2) - P(1,2)*P(2,1)
```

```
disp(Q14)
P = lyap(A,Q14)
m11 = P(1,1)
m22 = P(1,1)*P(2,2) - P(1,2)*P(2,1)
```

```
Q1 =
```

```
    1    0
    0    1
```

$P =$

$$\begin{array}{cc} 0.8333 & -0.5000 \\ -0.5000 & 0.5000 \end{array}$$

$m11 =$

$$0.8333$$

$m22 =$

$$0.1667$$

$Q2 =$

$$\begin{array}{cc} 0 & 1 \\ 1 & 0 \end{array}$$

$P =$

$$\begin{array}{cc} 0.3333 & 0 \\ 0 & 0 \end{array}$$

$m11 =$

$$0.3333$$

$m22 =$

$$0$$

$Q3 =$

$$\begin{array}{cc} 1 & 0 \\ 0 & 0 \end{array}$$

$ans =$

$$\begin{array}{cc} 0.7917 & -0.5000 \\ -0.5000 & 0.3750 \end{array}$$

$m11 =$

$$0.3333$$

$m_{22} =$

0

$Q_4 =$

$\begin{array}{cc} 0 & 1 \\ 0 & 0 \end{array}$

$P =$

$\begin{array}{cc} 0.1667 & 0.1250 \\ -0.1250 & 0.0000 \end{array}$

$m_{11} =$

0.1667

$m_{22} =$

$\begin{array}{cc} 0.0156 & \\ 0 & 0 \\ 1 & 0 \end{array}$

$P =$

$\begin{array}{cc} 0.1667 & -0.1250 \\ 0.1250 & 0 \end{array}$

$m_{11} =$

0.1667

$m_{22} =$

$\begin{array}{cc} 0.0156 & \\ 0 & 0 \\ 0 & 1 \end{array}$

$P =$

$\begin{array}{cc} 0.0417 & 0 \end{array}$

$$\begin{matrix} 0 & 0.1250 \end{matrix}$$

$$m11 =$$

$$0.0417$$

$$m22 =$$

$$0.0052$$

$$\begin{matrix} 0 & 1 \\ 1 & 1 \end{matrix}$$

$$P =$$

$$\begin{matrix} 0.3750 & -0.0000 \\ -0.0000 & 0.1250 \end{matrix}$$

$$m11 =$$

$$0.3750$$

$$m22 =$$

$$0.0469$$

$$\begin{matrix} 1 & 0 \\ 1 & 1 \end{matrix}$$

$$P =$$

$$\begin{matrix} 1.0000 & -0.6250 \\ -0.3750 & 0.5000 \end{matrix}$$

$$m11 =$$

$$1$$

$$m22 =$$

$$0.2656$$

$$\begin{matrix} 1 & 1 \\ 0 & 1 \end{matrix}$$

$P =$

$$\begin{array}{cc} 1.0000 & -0.3750 \\ -0.6250 & 0.5000 \end{array}$$

$m11 =$

$$1$$

$m22 =$

$$0.2656$$
$$\begin{array}{cc} 1 & 1 \\ 1 & 0 \end{array}$$

$P =$

$$\begin{array}{cc} 1.1250 & -0.5000 \\ -0.5000 & 0.3750 \end{array}$$

$m11 =$

$$1.1250$$

$m22 =$

$$0.1719$$
$$\begin{array}{cc} 0 & 0 \\ 1 & 1 \end{array}$$

$P =$

$$\begin{array}{cc} 0.2083 & -0.1250 \\ 0.1250 & 0.1250 \end{array}$$

$m11 =$

$$0.2083$$

$m22 =$

$$0.0417$$
$$\begin{array}{cc} 1 & 1 \end{array}$$

$$\begin{matrix} 0 & 0 \end{matrix}$$

$$P =$$

$$\begin{matrix} 0.9583 & -0.3750 \\ -0.6250 & 0.3750 \end{matrix}$$

$$m11 =$$

$$0.9583$$

$$m22 =$$

$$0.1250$$

$$\begin{matrix} 1 & 0 \\ 0 & 1 \end{matrix}$$

$$P =$$

$$\begin{matrix} 0.8333 & -0.5000 \\ -0.5000 & 0.5000 \end{matrix}$$

$$m11 =$$

$$0.8333$$

$$m22 =$$

$$0.1667$$

$$\begin{matrix} 0 & 1 \\ 1 & 0 \end{matrix}$$

$$P =$$

$$\begin{matrix} 0.3333 & 0 \\ 0 & 0 \end{matrix}$$

$$m11 =$$

$$0.3333$$

$$m22 =$$

0

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