1.Solution:

Matlab code:

function [m,a]=LU(a,n)

m = zeros(n,n); % initial the n\*n matrix m zeros

for i = 1:n; m(i,i) = 1; end % let the diagonal elements be 1

for j = 1 : n-1

if abs(a(j,j))<eps;

error('zero pivot encountered'); % when the zero pivot happens,end the process

end

for i = j+1 : n

mult = a(i,j)/a(j,j);

m(i,j) = mult;

for k = j:n

a(i,k) = a(i,k) - mult\*a(j,k);

end

end

end

disp(' L='); disp(m);

disp(' U='); disp(a);

disp(' LU='); disp(m\*a);

Matlab command:

>> a=[17 24 1 8 15;23 5 7 14 16;4 6 13 20 22;10 12 19 21 3;11 18 25 2 9]

a =

17 24 1 8 15

23 5 7 14 16

4 6 13 20 22

10 12 19 21 3

11 18 25 2 9

>> [L,U]=LU(a,5)

L=

1.0000 0 0 0 0

1.3529 1.0000 0 0 0

0.2353 -0.0128 1.0000 0 0

0.5882 0.0771 1.4003 1.0000 0

0.6471 -0.0899 1.9366 4.0578 1.0000

U=

17.0000 24.0000 1.0000 8.0000 15.0000

0 -27.4706 5.6471 3.1765 -4.2941

0 0 12.8373 18.1585 18.4154

0 0 0 -9.3786 -31.2802

0 0 0 0 90.1734

**i=1:**

>> b1=[1 2 3 4 8]'

b1 =

1

2

3

4

8

>> inv(U)\*inv(L)\*b1

ans =

0.0230

0.0172

0.2887

-0.0981

0.0461

**i=2:**

>> b2=[2 3 4 3 6]'

b2 =

2

3

4

3

6

>> inv(U)\*inv(L)\*b2

ans =

0.0259

0.0028

0.1887

-0.0587

0.1182

**i=3:**

>> b3=[3 4 5 6 8]'

b3 =

3

4

5

6

8

>> inv(U)\*inv(L)\*b3

ans =

0.0470

0.0451

0.2467

0.0066

0.0547

2.Solution:

Matlab code:

function [l,d]=cholesky(A)

dim=size(A);

n=dim(1);

for i=1:n

for j=1:n

if A(i,j)~=A(j,i)

error('The input matrix should be a Symteric Matrix!,see IDIT.m')

end

end

end

l=eye(n);

d=zeros(n);

g=zeros(n);

d(1,1)=A(1,1);

for i=2:n

for j=1:i-1

%calculate g(i,j)

temp=0;

for k=1:j-1

temp=temp+g(i,k)\*l(j,k);

end

g(i,j)=A(i,j)-temp;

%calculate l(i,j)

l(i,j)=g(i,j)/d(j,j);

end %loop of j

%calculate d(i,i)

temp=0;

for k=1:i-1

temp=temp+g(i,k)\*l(i,k);

end

d(i,i)=A(i,i)-temp;

end %loop of i

end

Matlab command:

>> A=[34 47 5 18 26;47 10 13 26 34;5 13 26 39 47;18 26 39 42 5;26 34 47 5 18]

A =

34 47 5 18 26

47 10 13 26 34

5 13 26 39 47

18 26 39 42 5

26 34 47 5 18

>> [l,d]=cholesky(A)

l =

1.0000 0 0 0 0

1.3824 1.0000 0 0 0

0.1471 -0.1108 1.0000 0 0

0.5294 -0.0203 1.4063 1.0000 0

0.7647 0.0353 1.6563 3.6814 1.0000

d =

34.0000 0 0 0 0

0 -54.9706 0 0 0

0 0 25.9390 0 0

0 0 0 -18.8021 0

0 0 0 0 181.8560

3.Solution:

Matlab command:

>> a1=1/2.\*[3 2;1 4]

a1 =

1.5000 1.0000

0.5000 2.0000

>> a2=1/2.\*[1.000 1.000;1.001 0.999]

a2 =

0.5000 0.5000

0.5005 0.4995

>> cond(a1)

ans =

2.6180

>> cond(a2)

ans =

2.0000e+03

>> b=1/2.\*[1;1]

b =

0.5000

0.5000

>> b1=1/2.\*[0.99;1.01]

b1 =

0.4950

0.5050

>> inv(a1)\*b

ans =

0.2000

0.2000

>> inv(a1)\*b1

ans =

0.1940

0.2040

>> inv(a2)\*b

ans =

0.5000

0.5000

>> inv(a2)\*b1

ans =

10.4950

-9.5050

Because the condition number of A2 is large, a small change in b can cause a large change in the solution x, and the numerical stability is poor. the condition number of A1 is small, there is a slight change in b, and the change of x is also very small, and the numerical stability is good.