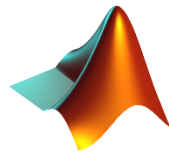


MAT 2002

MATLAB



Lab Assessment – 1

L29+L30

FALL SEMESTER 2020–21

by

SHARADINDU ADHIKARI

19BCE2105

Question 1

Problem:

Input a matrix A, verify Cayley Hamilton Theorem and hence find the inverse of A. (Check whether inverse exists or not.)

Code in MATLAB Editor:

```
A=input('Enter matrix A: ');
cf=poly(A);
n=length(cf);
CH=cf(1)*A^(n-1);
if det(A)==0
    disp('Inverse does not exist')
else
    disp('Inverse exists')
end
for i=2:n
    CH=CH+cf(i)*A^(n-i);
end
disp('R.H.S. of C-H Theorem: ')
disp(round(CH))

INV=cf(1)*A^(n-2);
for i=2:n-1
    INV=INV+cf(i)*A^(n-i-1);
end
INV=INV/(-cf(n));
disp('Inverse of matrix A: ')
disp(INV)
```

Input & Output in Command Window:

```
>> Q1
Enter matrix A: [1 2 1; 3 1 3; 4 2 3]
Inverse exists
R.H.S. of C-H Theorem:
     0     0     0
     0     0     0
     0     0     0

Inverse of matrix A:
    -0.6000    -0.8000     1.0000
     0.6000    -0.2000    -0.0000
     0.4000     1.2000    -1.0000

>> Q1
Enter matrix A: [6 1 1; 0 0 3; 0 0 4]
Inverse does not exist
```

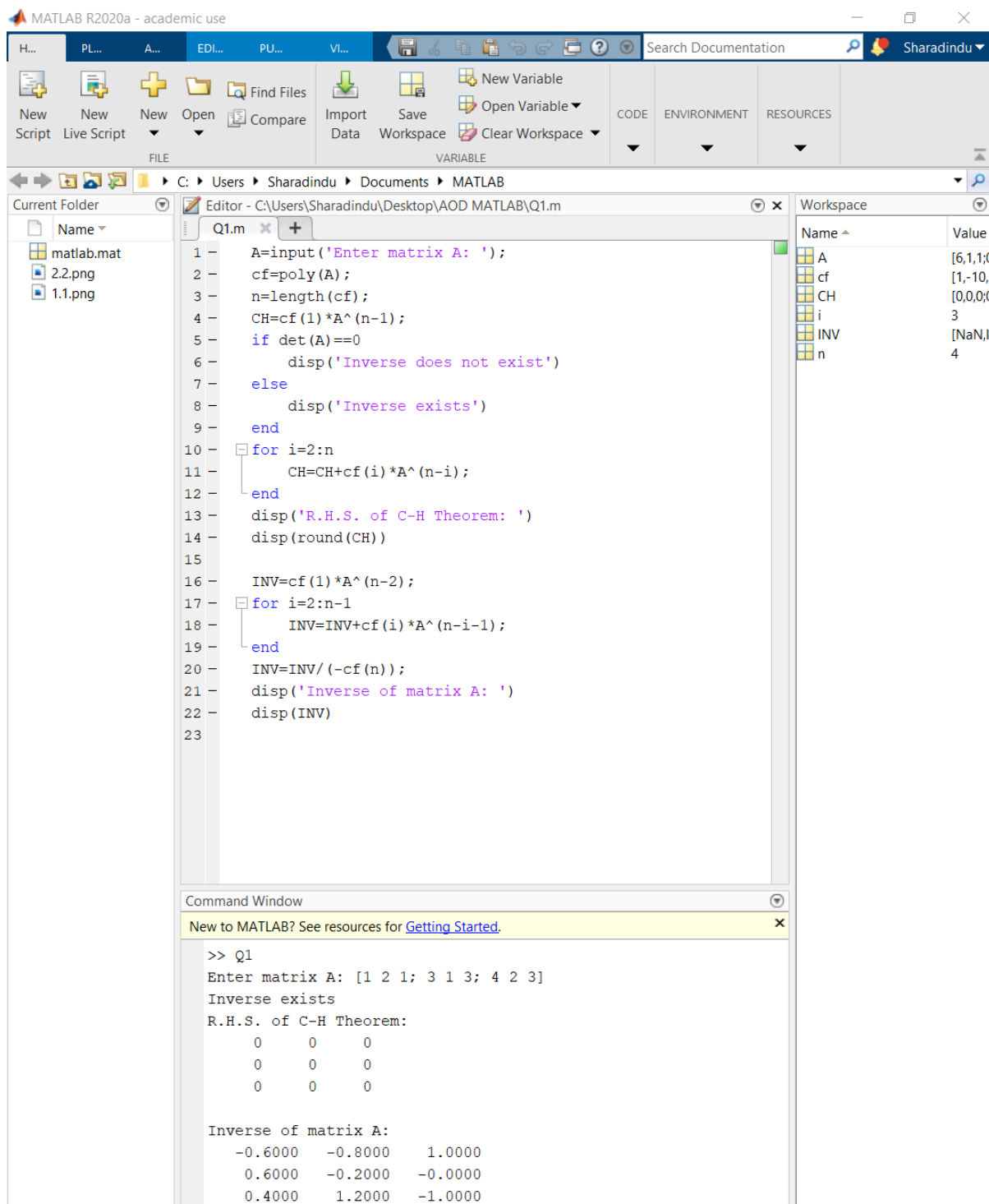
R.H.S. of C-H Theorem:

0	0	0
0	0	0
0	0	0

Inverse of matrix A:

NaN	Inf	-Inf
NaN	-Inf	Inf
NaN	NaN	NaN

Screenshot:



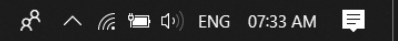
```
>> Q1
Enter matrix A: [6 1 1; 0 0 3; 0 0 4]
Inverse does not exist
R.H.S. of C-H Theorem:
    0    0    0
    0    0    0
    0    0    0
```

```
Inverse of matrix A:
NaN    Inf   -Inf
NaN   -Inf    Inf
NaN    NaN    NaN
```

fx >>

Details ^

< >



Question 2

Problem:

Diagonalize a matrix A by similarity transformation and hence find A^n ($n=9$).

Code in MATLAB Editor:

```
A=input('Enter the matrix for diagonalization: ');
[P D]=eig(A);
disp('Given Matrix A: ')
disp(A)
disp('Modal Matrix P: ')
disp(P)
disp('Inverse of Matrix P: ')
PI=inv(P);
disp(PI)
D=det(P);
Drt=round(P,0);
if (Drt==0)
disp('Non Digonalizable');
end
disp('Diagonal Matrix (D=P^(-1)*A*P): ')
DM=round(inv(P)*A*P, 2);
disp(DM)
B= A^(9);
disp('Matrix A^9:');
disp(B)
```

Input & Output in Command Window:

```
>> Q2
Enter the matrix for diagonalization: [2 0 1; -2 3 4; -5 5 6]
Given Matrix A:
     2     0     1
    -2     3     4
    -5     5     6

Modal Matrix P:
   -0.1259   -0.7743   -0.2512
   -0.5491   -0.5559   -0.8346
   -0.8262   -0.3024    0.4902

Inverse of Matrix P:
    0.8712   -0.7560   -0.8407
   -1.5912    0.4470   -0.0545
    0.4868   -0.9985    0.5894

Diagonal Matrix (D=P^(-1)*A*P):
    8.5600         0         0
         0    2.3900         0
         0         0    0.0500
```

Matrix A^9 :

-27085898	23505200	26141341
-118097242	102478323	113967444
-177717105	154211905	171500266

Screenshot:

The screenshot displays the MATLAB R2020a - academic use interface. The main window shows a script titled 'Q2.m' in the Editor, which performs matrix diagonalization. The script includes comments and displays intermediate results. The Command Window shows the execution of the script, with the user input 'Q2' and the resulting matrices A, P, P inverse, and the diagonal matrix D.

Script Code (Q2.m):

```
1 A=input('Enter the matrix for diagonalization: ');
2 [P D]=eig(A);
3 disp('Given Matrix A: ')
4 disp(A)
5 disp('Modal Matrix P: ')
6 disp(P)
7 disp('Inverse of Matrix P: ')
8 PI=inv(P);
9 disp(PI)
10 D=det(P);
11 Drt=round(P,0);
12 if (Drt==0)
13 disp('Non Digonalizable');
14 end
15 disp('Diagonal Matrix (D=P^(-1)*A*P): ')
16 DM=round(inv(P)*A*P, 2);
17 disp(DM)
18 B= A^9;
19 disp('Matrix A^9:');
20 disp(B)
21
```

Workspace:

Name	Value
A	[2,0,1;-2,3,4;-5,5,6]
B	[-27085898, 23505200, 26141341; -118097242, 102478323, 113967444; -177717105, 154211905, 171500266]
D	-0.602
DM	[8.5600, 0, 0; 0, 2.3900, 0; 0, 0, 0.0500]
Drt	[0,-1,0; 0,-1,0; 0,-1,0]
P	[-0.1259, -0.7743, -0.2512; -0.5491, -0.5559, -0.8346; -0.8262, -0.3024, 0.4902]
PI	[0.8712, -0.7560, -0.8407; -1.5912, 0.4470, -0.0545; 0.4868, -0.9985, 0.5894]

Command Window:

```
>> Q2
Enter the matrix for diagonalization: [2 0 1; -2 3 4; -5 5 6]
Given Matrix A:
     2     0     1
    -2     3     4
    -5     5     6

Modal Matrix P:
   -0.1259   -0.7743   -0.2512
   -0.5491   -0.5559   -0.8346
   -0.8262   -0.3024    0.4902

Inverse of Matrix P:
    0.8712   -0.7560   -0.8407
   -1.5912    0.4470   -0.0545
    0.4868   -0.9985    0.5894

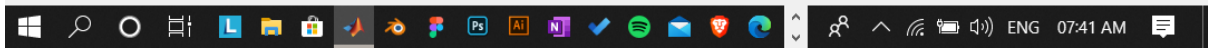
Diagonal Matrix (D=P^(-1)*A*P):
    8.5600         0         0
         0    2.3900         0
         0         0    0.0500
```

Matrix A^9:

-27085898	23505200	26141341
-118097242	102478323	113967444
-177717105	154211905	171500266

fx >> |

Details ^



Question 3

Problem:

Diagonalize a symmetric matrix A by finding an orthogonal matrix P and hence find A^n ($n=8$).

Code in MATLAB Editor:

```
A=input('Enter a matrix for diagonalization: ')
[P D]=eig(A);
if A'==A
    disp('Orthogonal transformation is possible.')
else
    disp('Orthogonal transformation is not possible.')
end
disp('Modal matrix P: ')
disp(P)
NormP=normc(P);
D=NormP'*A*NormP;
disp('Diagonalized matrix: ')
disp(round(D))
disp('A^8 = ')
disp(round(NormP*D^8*NormP'))
```

Input & Output in Command Window:

```
>> Q3
Enter a matrix for diagonalization: [1 2 3; 2 4 6; 3 6 9]

A =

     1     2     3
     2     4     6
     3     6     9

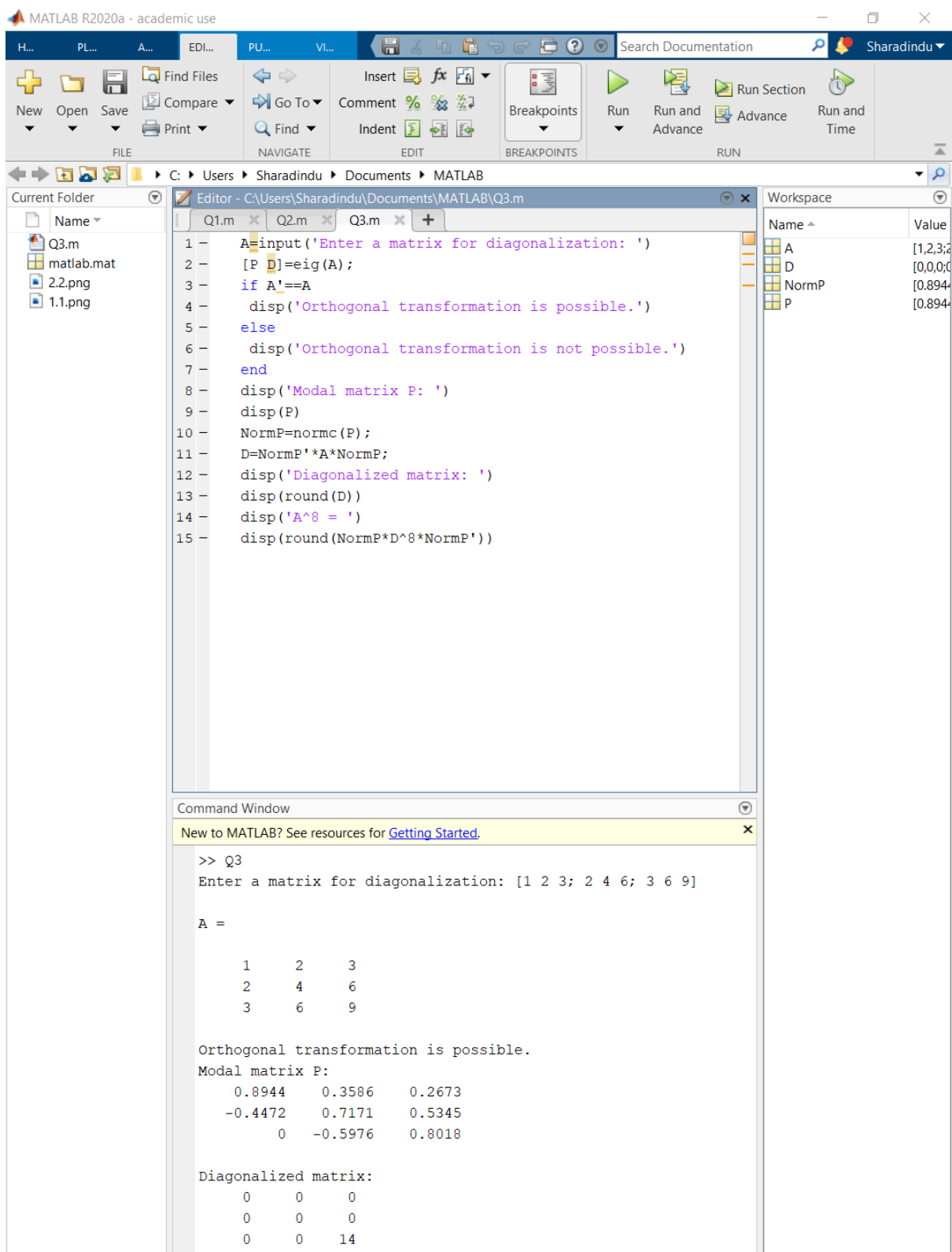
Orthogonal transformation is possible.
Modal matrix P:
    0.8944    0.3586    0.2673
   -0.4472    0.7171    0.5345
         0   -0.5976    0.8018

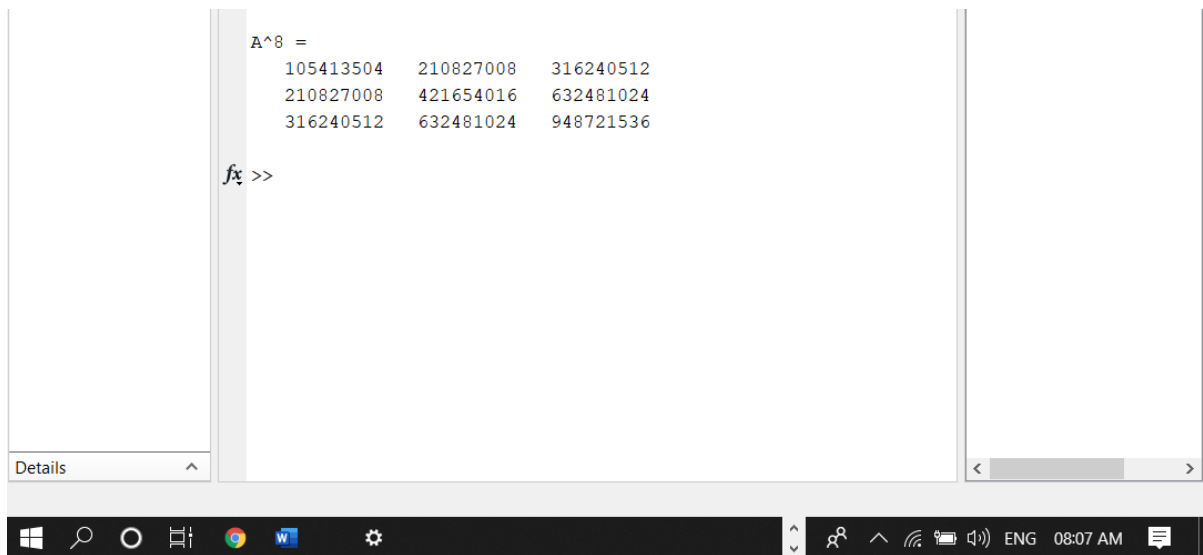
Diagonalized matrix:
     0     0     0
     0     0     0
     0     0    14
```


$A^8 =$

105413504	210827008	316240512
210827008	421654016	632481024
316240512	632481024	948721536

Screenshot:





End