Bharatiya Vidya Bhavan's
Sardar Patel Institute of Technology
Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous College Affiliated to University of Mumbai)

Computer Engineering Department & Information Technology Engineering Department

Academic Year: 2021-2022

Class: S.Y.B.Tech **Sem.:** 4 **Course:** Linear Algebra

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Experiment Aim:	To Find Rank of a Matrix using SciLab and Manually		

Introduction to SciLab

Scilab is a programming language associated with a rich collection of numerical algorithms covering many aspects of scientific computing problems. From the software point of view, Scilab is an interpreted language. This generally allows to get faster development processes, because the user directly accesses to a high level language, with a rich set of features provided by the library. The Scilab language is meant to be extended so that user-defined data types can be defined with possibly overloaded operations

Capablities of SciLab

- Linear algebra, sparse matrices,
- Polynomials and rational functions,
- Interpolation, approximation,
- Linear, quadratic and non linear optimization,
- Ordinary Differential Equation solver and Differential Algebraic Equations solver,
- Classic and robust control, Linear Matrix Inequality optimization,
- Differentiable and non-differentiable optimization,
- Signal processing,
- Statistics

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How to Install SciLab:

- Visit the site http://www.scilab.org/download to download the latest version of SciLab software
- There are three different platforms supported by SciLab (Windows, Linux, Mac Os)

Some Basic Commands to write in console:

```
-->s="Hello World!"
 s   =
 Hello World!
-->disp(s)
 Hello World!
```

```
-->x=1
 x   =
    1.
-->x = x * 2
 x   =
    2.
```

+	addition
-	substraction
*	multiplication
/	right division i.e. $x/y = xy^{-1}$
\	left division i.e. $x\backslash y = x^{-1}y$
^	power i.e. x^y
**	power (same as ^)
'	transpose conjugate

```
-->A = [1 , 2 , 3 ; 4 , 5 , 6]
 A   =
    1.    2.    3.
    4.    5.    6.
```

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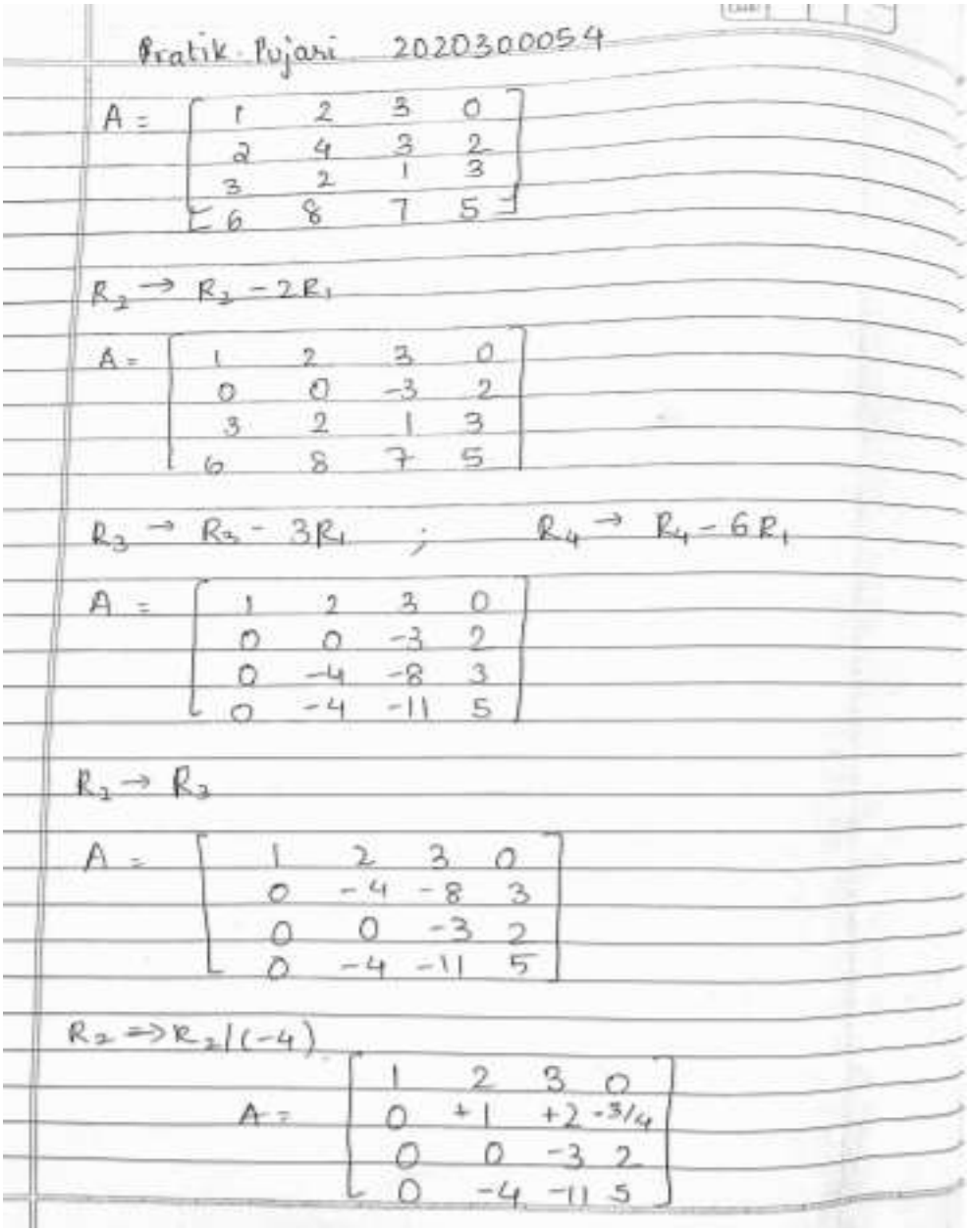
Question 1: Find the Rank of the Given Matrix A in the below Question?



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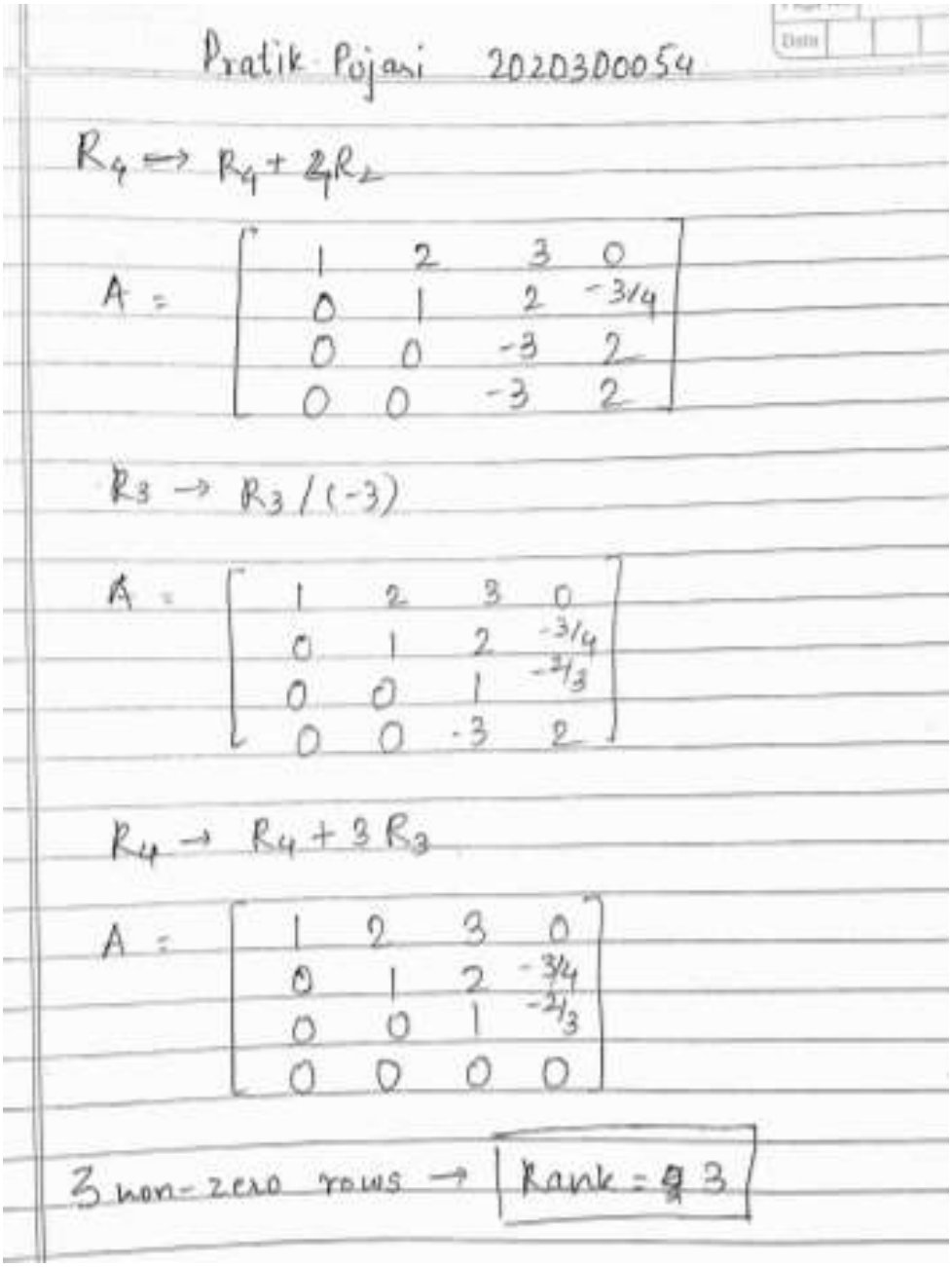

Therefore by using elementary row operations we get Rank =4 for the given matrix

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Using the SciLab Software to find the Rank of the Matrix

- Declaring the Matrix A

```
//Declaring the matrix
A=[1,2,3,0; 2,4,3,2; 3,2,1,3; 6,8,7,5]

//Displaying the matrix
printf('The matrix A is :')
disp(A)
```

```
The matrix A is :
   1.    2.    3.    0.
   2.    4.    3.    2.
   3.    2.    1.    3.
   6.    8.    7.    5.
```

- Performing the Elementary Row Operations

```
//Declaring the matrix
A=[1,2,3,0; 2,4,3,2; 3,2,1,3; 6,8,7,5]

//Displaying the matrix
disp('The matrix A is :')
disp(A)

//First Operation
A(2,:)=A(2,:)-2*A(1,:)

disp('R2-> R2-2*R1')
disp(A)
```

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```
14 //Second Operation
15 A(3,:)=A(3,:)-3*A(1,:)
16
17 disp('R3-> R3-3*R1')
18 disp(A)
19
20 //Third Operation
21 A(4,:)=A(4,:)-6*A(1,:)
22
23 disp('R4-> R4-4*R1')
24 disp(A)
25
26 //Fourth Operation
27 C=A(2,:)
28 A(2,:)=A(3,:)
29 A(3,:)=C
30
31 disp('R2->R3')
32 disp(A)
33
34 //Fifth operation
35 A(2,:)=A(2,:)/(-4)
36
37 disp('R2-> R2/(-4)')
38 disp(A)
```

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```
40 //Sixth Operation
41 A(4,:)=A(4,:)+4*A(2,:)
42
43 disp('R4-> R4+4*R2')
44 disp(A)
45
46 //Seventh Operation
47 A(3,:)=A(3,:)/(-3)
48
49 disp('R3-> R3/(-3)')
50 disp(A)
51
52 //Eighth Operation
53 A(4,:)=A(4,:)+3*A(3,:)
54
55 disp('R4-> R4+3*R3')
56 disp(A)
57
```

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- Final Result

```
The matrix A is :

  1.   2.   3.   0.
  2.   4.   3.   2.
  3.   2.   1.   3.
  6.   8.   7.   5.

R2-> R2-2*R1

  1.   2.   3.   0.
  0.   0.  -3.   2.
  3.   2.   1.   3.
  6.   8.   7.   5.

R3-> R3-3*R1

  1.   2.   3.   0.
  0.   0.  -3.   2.
  0.  -4.  -8.   3.
  6.   8.   7.   5.

R4-> R4-4*R1

  1.   2.   3.    0.
  0.   0.  -3.    2.
  0.  -4.  -8.    3.
  0.  -4.  -11.   5.
```

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```
R2->R3

  1.    2.    3.    0.
  0.   -4.   -8.    3.
  0.    0.   -3.    2.
  0.   -4.   -11.   5.

R2-> R2/(-4)

  1.    2.    3.    0.
  0.    1.    2.   -0.75
  0.    0.   -3.    2.
  0.   -4.   -11.   5.

R4-> R4+4*R2

  1.    2.    3.    0.
  0.    1.    2.   -0.75
  0.    0.   -3.    2.
  0.    0.   -3.    2.

R3-> R3/(-3)

  1.    2.    3.    0.
  0.    1.    2.   -0.75
  0.    0.    1.   -0.6666667
  0.    0.   -3.    2.

R4-> R4+3*R3

  1.    2.    3.    0.
  0.    1.    2.   -0.75
  0.    0.    1.   -0.6666667
  0.    0.    0.    0.
```

Conclusion: Learnt to use SciLab basics and to find Rank of an given matrix using both Maths as well as Software

Therefore Rank=4.Same as Above