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# SANKHYA VIGNAN

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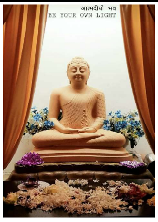
# EDITORIAL



We are extremely happy to bring before you this issue (NSV 18, Dec. 2022 No. 4) we express our sincere thanks to all our contrbutors, evaluators, readers and well wishers for their continous and consistent support without which we would not have acheved our goal.

**This issue contans five research articles, one bography and other items lke SV News letter and Readers Forum as usual. You will find details in the content.**

We are very higihly obliged to our following referees who have helped us for evaluaton of articles / papers submiitted for this issue. (Their names are givien one by one in the order of their appearance in the journal.)

| | |
|---|---|
| **(1) M. Joseph Paramasvam** | **(2) A. C. Brahmbhatt** |
| **(3) J. R. Purohit** | **(4) A. Thilak Moses** |
| **(5) Hiten S. Parekh** | **(6) Shailesh Teredesai** |

You can visit our website **www.sankhyavignan.org** and give your feedback and suggestions.

We express our sincere thanks to our **Research Team** for this work. In particular we thank **Shree Dinesh Darji for DTP work and Shree Ashish Bhatt for website.**

All our contributors will get digital copy and official certificates.

We express our best wishes for the **New Year 2023.** Our best wishes are for your good health, progress and prosperity.

AHMEDABAD **EDITORIAL BOARD**

Date : 31/12/2022

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# SANKHYA VIGNAN

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SANKHYA VIGNAN is a peer reviewed refereed Bi-Annually journal that published empirical, conceptual and review papers of exceptional quality that contribute to Statistics Theory and enriched Applications of Statistical Techniques in various fields. The objective ofthe Journal is to disseminate knowledge, which ensures good practice of professional management and its focal point is on research and reflections relevant to academicians and practitioners in the field of Applied Statistics.

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(4) To give each published issue for evaluation by two external Refrees other than editors, obtain evaluation reports and journal evaluation score out of 10 points.

(5) To declare average Journal Evaluation Scaore on the basis of the scores given by these two Refrees for each published issue.

(6) To keep all records in perfect order.

(7) Invite and accept suggestions made by the Refrees for Peer Review.

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- The coherence of its analysis.
- The ability to communicate to readers (grammar and style)
- All research paper are reviewed by at least two suitable qualified experts.
- All publication decisions are made by the journals' Editor on the basis of the review provided.
- Normal turn-around time for evaluation of manuscripts is 21 days from the date of recipient.

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2. The research must be original in nature and is neither published nor under consideration for publication anywhere else.
3. The review process may take 2-3 days and the status would be known within 24 hours of submissions of the article. It is mandatory to mention a valid email and mobile number. We acknowledge the receipt of your article and subscription fee be email.
4. The abstract s hould not be more than 200-2502 words and it should adequately describe the work and highlight its signifcance. Avoid the use of abbreviation and reference in the abstract. The abstract should be folowed by relevant keywords.
5. The main paper (Manuscripts) should not exceed more than 3,000 to 4,000 words (inclduing graphs & charts.)
6. Article should be typed in 12 point - Times New Roman Font English with a one and half space and single column with 1 Margin on a Standard A4 size paper. The page numbers should be at the center of every page. All headings & sub headings must be in bold letters.
7. Table should be numbered consecutively, the title of the table should be placed above the table. The source should be indicated at the bottom.
8. All the tables, charts, graphs, diagrams should be in black and not in colors.
9. Footnotes, italics and quotation marks should be kept to the minimum.
10. References should be mentioned in APA Referencing Formate.

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*RESEARCH ARTICLE*

# SOLVING THE NUMERICAL METHODS BY USING PYTHON

**P. M. MARIAPPAN***

## ABSTRACT

In this paper we will introduce the study of solving Linear Equation. Gauss-elimination and Gauss-Jordan elimination by using python. This paper aims that easily and quickly calculate the linear problems by using python code. Gauss-elimination and Gauss-Jordan elimination are linking the application problem such that electrical networks, traffic flow and commodity marked. By studying this theorem, they know the important characteristics of matrices, concept of vector spaces and properties of special categories of matrices. And also they can know how to use characteristics of matrix to solve a liner system of equations or study properties of a linear transformation.

## KEYWORDS

Linear equation, Gauss-Elimination, Gauss-Jordan Elimination, Python code, Electrical network.

## I. INTRODUCTION

We now come to one of the most important use of matrices, that is, using matrices to solve system of linear equations. We showed informally, how to represent the information contained in a system of linear equations by a matrix called the augmented matrix. This matrix will then be used in solving the linear system of equations. Our approach to solving linear systems is called the Gauss-elimination method. Since, this method is so fundamental to linear algebra, the student should

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(Recd. Jan. 22 / Rvd. Nov. 22 )

be alert. A shorter term for system of linear equation is just linear systems model many application in engineering, economics, statistics and many other areas. Electrical networks, traffic flow and commodity markets may serve as specific example of applications.

## II. METHODS AND MATERIAL

### A. Fundamental Theorem for Linear System

Let's suppose this system of liner equations

$$a_{11}x_1 + a_{12}x_2 + \ldots + a_{1n}x_n = b_1$$

$$a_{21}x_1 + a_{22}x_2 + \ldots + a_{2n}x_n = b_2$$

$$a_{n1}x_1 + a_{n2}x_2 + \ldots + a_{nn}x_n = b_n$$

**The Matrix Form of the System**

***Ax = b***

$$A = \begin{bmatrix} a_{11} & a_{12} & \ldots & a_{1n} \\ a_{21} & a_{22} & \ldots & a_{2n} \\ \ldots & \ldots & \ldots & \ldots \\ a_{n1} & a_{n2} & \ldots & a_{nn} \end{bmatrix}, \quad x = \begin{bmatrix} x_1 \\ x_2 \\ \ldots \\ x_n \end{bmatrix}, \quad b = \begin{bmatrix} b_1 \\ b_2 \\ \ldots \\ b_n \end{bmatrix}$$

Stage 1 : Elimination

$$A = \begin{bmatrix} a_{11} & a_{12} & a_{13} & a_{14} \\ a_{21} & a_{22} & a_{23} & a_{24} \\ a_{31} & a_{32} & a_{33} & a_{34} \\ a_{41} & a_{42} & a_{43} & a_{44} \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} b_1 \\ b_2 \\ b_3 \\ b_4 \end{bmatrix}$$

$$\begin{bmatrix} a_{11} & a_{12} & a_{13} & a_{14} \\ 0 & a_{22} & a_{23} & a_{24} \\ 0 & a_{32} & a_{33} & a_{34} \\ 0 & a_{42} & a_{43} & a_{44} \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} b_1 \\ b_2 \\ b_3 \\ b_4 \end{bmatrix}$$

$$\begin{bmatrix} a_{11} & a_{12} & a_{13} & a_{14} \\ 0 & a_{22} & a_{23} & a_{24} \\ 0 & 0 & a_{33} & a_{34} \\ 0 & 0 & a_{43} & a_{44} \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} b_1 \\ b_2 \\ b_3 \\ b_4 \end{bmatrix}$$

$$\begin{bmatrix} a_{11} & a_{12} & a_{13} & a_{14} \\ 0 & a_{22} & a_{23} & a_{24} \\ 0 & 0 & a_{33} & a_{34} \\ 0 & 0 & 0 & a_{44} \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} b_1 \\ b_2 \\ b_3 \\ b_4 \end{bmatrix}$$

Stage 2 : Back Substitution

$$a_{11}x_1 + a_{12}x_2 + a_{13}x_3 + a_{14}x_4 = b_1$$

$$a_{22}x_2 + a_{23}x_3 + a_{24}x_4 = b_2$$

$$a_{33}x_3 + a_{34}x_4 = b_3$$

$$a_{44}x_4 = b_4$$

$$x_4 = \frac{b_4}{a_{44}}$$

$$x_3 = \frac{(b_4 - a_{34}x_4)}{a_{33}}$$

$$x_2 = \frac{(b_2 - a_{23}x_3 - a_{24}x_4)}{a_{22}}$$

$$x_1 = \frac{(b_1 - a_{12}x_2 - a_{13}x_3 - a_{14}x_4)}{a_{11}}$$

**B.Determination of the Inverse by the Gauss-Jordan Method**

$$\begin{bmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ \dots & \dots & \dots & \dots \\ a_{n1} & a_{n2} & \dots & a_{nn} \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ \dots \\ x_n \end{bmatrix} = \begin{bmatrix} b_1 \\ b_2 \\ \dots \\ b_n \end{bmatrix}$$

$$\begin{bmatrix} a_{11} & a_{12} & a_{13} & a_{14} \\ a_{21} & a_{22} & a_{23} & a_{24} \\ a_{31} & a_{32} & a_{33} & a_{34} \\ a_{41} & a_{42} & a_{43} & a_{44} \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} b_1 \\ b_2 \\ b_3 \\ b_4 \end{bmatrix}$$

$$\begin{bmatrix} 1 & a_{12} & a_{13} & a_{14} \\ 0 & a_{22} & a_{23} & a_{24} \\ 0 & a_{32} & a_{33} & a_{34} \\ 0 & a_{42} & a_{43} & a_{44} \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} b_1 \\ b_2 \\ b_3 \\ b_4 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 0 & a_{13} & a_{14} \\ 0 & 1 & a_{23} & a_{24} \\ 0 & 0 & a_{33} & a_{34} \\ 0 & 0 & a_{43} & a_{44} \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} b_1 \\ b_2 \\ b_3 \\ b_4 \end{bmatrix}$$

General Formulas

Step 1. Transformation of the pivot row

$$a^*_{k,j} = \frac{a_{k,j}}{a_{k,k}}, b^*_k = \frac{b_k}{a_{k,k}} k = 1, 2..., n, j = k, ..., n$$

Step 2: Transformation of non-pivot rows

$$a^*_{i,j} = a_{i,j} - a_{k,j} a^*_{k,j}, \qquad b^*_i = b_i - a_{i,k} b^*_k$$

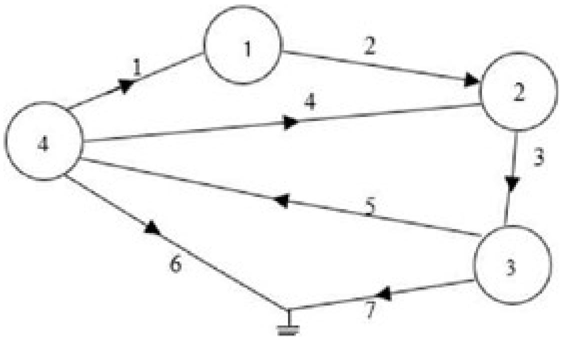
Where $k = 1, 2, ..., n, i = 1, ..., n,$

$i \neq k, j = k, ..., n$

1. If $a_{i,k} = 0$, *skip row i.*

2. *Apply partial pivoting at each elimination.*

## III. RESULTS AND DISCUSSION




Electrical Networks presents an electrical network having seven branches and four nodes. One of the nodes is reference node. All the nodes are numbered except the reference node. We also numbered except the reference node. We also number and direct the branches.

We can now use 1.1 to form the nodal incidence matrices, we will need a computation table to relate the nodes.

Table 1.

| No : of no de | Bra nc h 1 | Bra nch 2 | Bran ch 3 | Bra nch 4 | Bra nch 5 | Bra nch 6 | Bra nc h 7 |
|---|---|---|---|---|---|---|---|
| No de | 1 | 1 | 0 | 1 | 0 | 0 | 0 |
| 1 | | | | | | | |
| No de 2 | 0 | -1 | 1 | -1 | 0 | 0 | 0 |
| No de 3 | 0 | 0 | 1 | 0 | 1 | 0 | 1 |
| No de 4 | -1 | 0 | 0 | 1 | -1 | 1 | 0 |

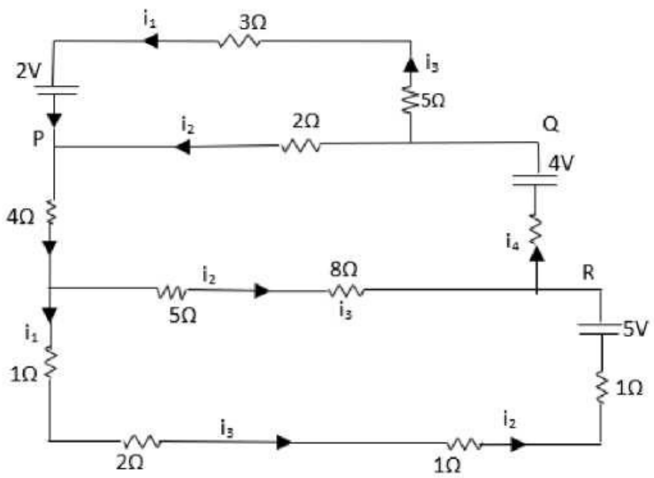
Computation table for Electrical Network in

The Nodal incidence matrix is now a 4 x 7 matrix given by

$$A = \begin{bmatrix} 1 & 1 & 0 & 1 & 0 & 0 & 0 \\ 0 & -1 & 1 & -1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 1 \\ -1 & 0 & 0 & 1 & 1 & 1 & 0 \end{bmatrix}$$

To construct the electrical network from the nodal incidence matrix above, we will follow the reverse operation of the step above,

From the nodal incidence matrix, we will construct table-1 to show use clearly now the nodes and branches are related.




**Network and relating the current**

*Node P:* $3i_1 - si_2 + 5i_3 = 2$

*Node Q:* $4i_1 - 5i_2 + 8i_3 + i_4 = 4$

*Node R:* $4i_1 - 5i_2 + 8i_3 + i_4 = 4$

*Upper Loop:* $i_1 - i_2 + 2i_3 + i_4 = 5$

***Lower loop*** $2i_1 - 7i_2 + 6i_3 + 5i_4 = 7$

(A) Solve the following linear system by using Gauss-elimination.

$$3x_1 - 2x_2 + 5x_3 = 2$$

$$4x_1 - 5x_2 + 8x_3 + x_4 = 4$$

$$x_1 - x_2 + 2x_3 + x_4 = 5$$

$$2x_1 - 7x_2 + 6x_3 + 5x_4 = 7$$

$$\begin{bmatrix} a_{11} & a_{12} & a_{13} & a_{14} \\ 0 & a_{22} & a_{23} & a_{24} \\ 0 & a_{32} & a_{33} & a_{34} \\ 0 & a_{42} & a_{43} & a_{44} \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} b_1 \\ b_2 \\ b_3 \\ b_4 \end{bmatrix}$$

$$\begin{array}{c} 0 \\ 1 \\ 2 \\ 3 \end{array} \left[\begin{array}{cccc|c} 0 & 1 & 2 & 3 & b \\ 3 & -2 & 5 & 0 & 2 \\ 4 & 5 & 8 & 1 & 4 \\ 1 & 1 & 2 & 1 & 5 \\ 2 & 7 & 6 & 5 & 7 \end{array}\right]$$

$$\frac{a(0,0)}{a(1,0)} = \frac{3}{4} = 0.75 \ \text{x} \ row \ [1]$$

$$\frac{a(0,0)}{a(2,0)} = \frac{3}{1} = 3 \ \text{x} \ row \ [2]$$

$$\frac{a(0,0)}{a(3,0)} \ \frac{3}{1} = 1.5 \ \text{x} \ row \ [3]$$

$$\begin{array}{c} 0 \\ 1 \\ 2 \\ 3 \end{array} \left|\begin{array}{cccc|c} 0 & 1 & 2 & 3 & b \\ 3 & -2 & 5 & 0 & 2 \\ 3 & 3.75 & 6 & 0.75 & 3 \\ 3 & 3 & 6 & 3 & 15 \\ 3 & 10.5 & 9 & 7.5 & 10.5 \end{array}\right.$$

$$\frac{a(1,1)}{a(2,1)}\ \frac{-5.75}{-5}=1.15 \ \text{x} \ \textit{row [2]}$$

$$\frac{a(1,1)}{a(3,1)}\ \frac{-5.75}{-12.5}=0.46 \ \text{x} \ \textit{row [3]}$$

$$\begin{array}{c|cccc|c}
 & 0 & 1 & 2 & 3 & b \\
0 & 3 & -2 & 5 & 0 & 2 \\
1 & 3 & -5.75 & -1 & -0.75 & -1 \\
2 & 0 & -5 & -1 & -3 & -13 \\
3 & 0 & -12.5 & -4 & -7.5 & -8.5
\end{array}$$

$$\frac{a(1,1)}{a(2,1)}\ \frac{-5.75}{-5}=1.15 \ \text{x} \ \textit{row [2]}$$

$$\frac{a(1,1)}{a(3,1)}\ \frac{-5.75}{-12.5}=0.46 \ \text{x} \ \textit{row [3]}$$

$$\begin{array}{c|cccc|c}
 & 0 & 1 & 2 & 3 & b \\
0 & 3 & -2 & 5 & 0 & 2 \\
1 & 0 & -5.75 & -1 & -0.75 & -1 \\
2 & 0 & -5.75 & -1.15 & -3.45 & -14.95 \\
3 & 0 & -5.7.5 & -1.84 & -3.45 & -3.91
\end{array}$$

$$\begin{array}{c|cccc|c}
 & 0 & 1 & 2 & 3 & b \\
0 & 3 & -2 & 5 & 0 & 2 \\
1 & 0 & -5.75 & -1 & -0.75 & -1 \\
2 & 0 & 0 & 0.15 & 2.7 & 13.95 \\
3 & 0 & 0 & 0.84 & 2.7 & 2.91
\end{array}$$

$$\frac{a(2,2)}{a(3,2)}\ \frac{0.15}{0.84}=0.178571 \ \text{x} \ \textit{row [3]}$$

$$
\begin{array}{c|cccc|c}
 & 0 & 1 & 2 & 3 & b \\
0 & 3 & -2 & 5 & 0 & 2 \\
1 & 0 & -5.75 & -1 & -0.75 & -1 \\
2 & 0 & 0 & 0.15 & 2.7 & -13.95 \\
3 & 0 & 0 & 0.15 & 0.482143 & 0.519643
\end{array}
$$

$$
\begin{array}{c|cccc|c}
 & 0 & 1 & 2 & 3 & b \\
0 & 3 & -2 & 5 & 0 & 2 \\
1 & 0 & -5.75 & -1 & -0.75 & -1 \\
2 & 0 & 0 & 0.15 & 2.7 & 13.95 \\
3 & 0 & 0 & 0.15 & 2.217857 & 13.430357
\end{array}
$$

$$x[3] = \frac{b(3)}{a(3,3)} = \frac{13.430357}{2.217857} = 6.055556$$

$$x[2] = \frac{\left(b[2] - b[2,3] * x[3]\right)}{a(2,2)} = \frac{[13.95 - 2.7x6.055556]}{0.15} = -16$$

$$x[1] = \frac{\left(b[1] - b[1,3] * x[3] - a[1,2] * x[2]\right)}{a(1,1)} = \frac{[-1 - (-0.75) \times 6.05556 - (-x) \times (-16)]}{(-5.75)} = 2.166667$$

$$x[0] = 28.777778$$

The Solution is $\begin{bmatrix} x_0 \\ x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 28.77778 \\ 2.166667 \\ -16 \\ 6.055556 \end{bmatrix}$

(B) Solving the linear equation of Gauss-elimination by using Python code

Code

```
  2,7,6,5]]),float]
b=a rray( [2,4,5,7], float)
n=len(b)
x=zeros(n,float)
#Elimination
for k in range(n-l):
for I in range(k+l,n):
if a[i,k]==0 :
factor=a [k,k]/a [i, k]
for j in range (k,n):
a[i.j]=a[k,j]-a[i.j]*factor
b [i]=b[k]-b[ ]* factor
print (a)
print(b)
#Back-substitution
X[n-1]=b(n-l]/a[n-1,n-1|
for i range (n-2,-1,-1):
```

The solution of the system is [28.777777778,. 166668, -16, 6.0555556]

(C) Solve the following linear system by using Gauss-Jordan elimination.

$$a = \begin{bmatrix} 0 & 2 & 0 & 1 \\ 2 & 2 & 3 & 2 \\ 4 & -3 & 0 & 1 \\ 6 & 1 & -6 & -5 \end{bmatrix}, \quad b = \begin{bmatrix} 0 \\ -2 \\ -7 \\ 6 \end{bmatrix}$$

$$\begin{array}{c|cccc|c} & 0 & 1 & 2 & 3 & b \\ 0 & 0 & 2 & 0 & 1 & 0 \\ 1 & 2 & 2 & 3 & 2 & -2 \\ 2 & 4 & -3 & 0 & 1 & -7 \\ 3 & 6 & 1 & -6 & -5 & 6 \end{array}$$

$$\begin{array}{c|cccc|c} & 0 & 1 & 2 & 3 & b \\ 0 & 2 & 2 & 3 & 2 & -1 \\ 1 & 0 & 2 & 0 & 1 & 0 \\ 2 & 4 & -3 & 0 & 1 & -7 \\ 3 & 6 & 1 & -6 & -5 & 6 \end{array}$$

*Row* [0] = *Row* [0]/2

$$\begin{array}{c|cccc|c} & 0 & 1 & 2 & 3 & b \\ 0 & 1 & 1 & 1.5 & 1 & -1 \\ 1 & 0 & 2 & 0 & 1 & 0 \\ 2 & 4 & -3 & 0 & 1 & -7 \\ 3 & 6 & 1 & -6 & -5 & 6 \end{array}$$

*Row* [2] = *Row* [2] – 4 * *Row* [0]
*Row* [3] = *Row* [3] – 6 * *Row* [0]

$$\begin{array}{c|cccc|c} & 0 & 1 & 2 & 3 & b \\ 0 & 1 & 1 & 1.5 & 1 & -1 \\ 1 & 0 & 2 & 0 & 1 & 0 \\ 2 & 0 & -7 & -6 & -3 & -3 \\ 3 & 0 & -5 & -15 & -11 & 12 \end{array}$$

$Row\ [1] = Row\ [1]/2$

$$\begin{array}{c|cccc|c} & 0 & 1 & 2 & 3 & b \\ 0 & 1 & 1 & 1.5 & 1 & -1 \\ 1 & 0 & 1 & 0 & 1 & 0 \\ 2 & 0 & -7 & -6 & -3 & -3 \\ 3 & 0 & -5 & -15 & -11 & 12 \end{array}$$

$Row\ [0] = Row\ [0] - 1 * Row\ [1]$
$Row\ [2] = Row\ [2] - (-7) * Row\ [1]$
$Row\ [3] = Row\ [3] - (-5) * Row\ [1]$

$$\begin{array}{c|cccc|c} & 0 & 1 & 2 & 3 & b \\ 0 & 1 & 0 & 1.5 & 0.5 & -1 \\ 1 & 0 & 1 & 0 & 0.5 & 0 \\ 2 & 0 & 0 & 1 & -0.0833 & -0.5 \\ 3 & 0 & 0 & -15 & -8.5 & 12 \end{array}$$

$Row\ [3] = Row\ [3]/(-9.7$
$5)$

$$\begin{array}{c|cccc|c} & 0 & 1 & 2 & 3 & b \\ 0 & 1 & 0 & 0 & 0.625 & -1.75 \\ 1 & 0 & 1 & 0 & 0.5 & 0 \\ 2 & 0 & 0 & 1 & -0.0833 & -0.5 \\ 3 & 0 & 0 & 0 & 1 & -2 \end{array}$$

$Row\ [0] = Row\ [0] - (0.625) * Row\ [3]$
$Row\ [1] = Row\ [1] - (-0.5) * Row\ [3]$
$Row\ [2] = Row\ [2] - (-0.0833) * Row\ [3]$

$$\begin{array}{c|cccc|c} & 0 & 1 & 2 & 3 & b \\ 0 & 1 & 0 & 0 & 0 & -0.5 \\ 1 & 0 & 1 & 0 & 0 & 1 \\ 2 & 0 & 0 & 1 & 0 & 0.3333 \\ 3 & 0 & 0 & 0 & 1 & -2 \end{array}$$

The solution of the system $\begin{bmatrix} -0.5 \\ 1 \\ 0.3333 \\ -2 \end{bmatrix}$

(D) Solving the linear equation of Gauss-Jordan elimination by using Python Code

```
#main loop
For k range (n):
#Partial Pivotin g
If np.fabs (a[k, k] )<1.0e-12: import numpy as np
Def gassjrdn(a,b):
a=np.array (a, float)
b=np.array (b, float)
n=len (b)
For i range (k+l,n):
If np . tabs (a [i, k]) > np . fabs (a[k, k]):
For j in range (k, n) :
a [k, jl, a [i, j ] = a [i, j], a [i,j ], a [k, j] b[k],b[i]=b[i],b[k]
break
#Division of the pivot row
pivot = a[k, k]
for j in range (k, n):
a [k, j] / = pivot
b [k] /= pivot
#EIimination loop
for i n range (n):
if I == k a [i, k] == 0: continue factor = a [ i, k]
a = [ [0,2,0,1], [2,2,3,2], [4,-3,0,1], [6,1,-6,-5] ]
b = [0,-2,-7,6]
```

```
x, A = g s s j r d n (a, b)
print ("The solution:")
print (X)
print ("The transformed [a]: ")
print(A)
```

The solution of the system is [-0.5, 1, 0.333333333, -2]

## IV. CONCLUSION

In this paper, firstly we have considered how to derive nodal incidence matrices from electrical networks, conversely how to sketch electrical networks from nodal incidence matrices. Secondly, we calculate the linear equation by using python code with two methods. The paper aims to show that linear equation is calculated. The advantage of this paper is that it would be desirable to continuous the study of method engineering networks, networking in the computer studies and any other scientific field.


## V. ACKNOWLEDGEMENT

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## VI. REFERENCES


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