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ROLL NO:- 21/610

SUBJECT :- MATHEMATICS

COURSE:-B.SC(HONS)
ELECTRONICS

PRACTICAL:-5

AIM:- To verify LU decomposition method

APPRATUS:- a computer system with Scilab software 6.1.1

WHAT IS LU DECOMPOSITION?

The LU decomposition method of a matrix is the factorization of given square matrix into two triangular matrices,one upper triangular matrix and one lower triangular matrix ,such that the product of these two matrices gives the original matrix.

ALGORITHM:-

1. Start
2. Compose elements of augmented matrix into matrix A and B
3. Convert the matrix into L and U.
4. Display the matrix L and U.
5. Find the elements of Y by using LY=B.
6. Find the elements of X by using UX=Y.
7. Stop

QUESTIONS TO BE SOLVED.

1) 2x+3y+3z=5
x-2y+z=-4
3x-y-2z=3

2) x-y+2z=7
3x+4y-5z=-5
2x-y=3z=12

3) x+y-z=4
x-2y+3z=-6
2x+3y+z=7

Q Equation is Given as

$$x + y - z = 4$$
$$x - 2y + 3z = -6$$
$$2x + 3y + z = 7$$

$$\begin{bmatrix} 1 & 1 & -1 \\ 1 & -2 & 3 \\ 2 & 3 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 4 \\ -6 \\ 7 \end{bmatrix}$$

FOR UPPER TRIANGULAR MATRIX

$$\begin{bmatrix} 1 & 1 & -1 \\ 1 & -2 & 3 \\ 2 & 3 & 1 \end{bmatrix}$$

$$R_2 \longrightarrow R_2 - R_1$$

$$\begin{bmatrix} 1 & 1 & -1 \\ 0 & -3 & 4 \\ 2 & 3 & 1 \end{bmatrix}$$

$$R_3 \longrightarrow R_3 - 2R_1$$

$$\begin{bmatrix} 1 & 1 & -1 \\ 0 & -3 & 4 \\ 0 & 1 & 3 \end{bmatrix}$$

$$R_3 \longrightarrow R_3 + \frac{1}{3}R_2$$

$$\begin{bmatrix} 1 & 1 & -1 \\ 0 & -3 & 4 \\ 0 & 0 & 13/3 \end{bmatrix}$$

= Upper triangular Matrix (U)

LOWER TRIANGULAR MATRIX.

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$$L = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 2 & -1/3 & 1 \end{bmatrix}$$

As $LY = B$

$$\begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 2 & -1/3 & 1 \end{bmatrix} \begin{bmatrix} y_1 \\ y_2 \\ y_3 \end{bmatrix} = \begin{bmatrix} 4 \\ -6 \\ 7 \end{bmatrix}$$

on Solving we get

$\boxed{y_1 = 4}$

$y_1 + y_2 = -6$

$4 + y_2 = -6$

$\boxed{y_2 = -10}$

$2y_1 - \frac{1}{3}y_2 + y_3 = 7$

$2(4) - \frac{1}{3}(-10) + y_3 = 7$

$y_3 = 7 - 8 + \frac{10}{3}$

$\boxed{y_3 = \frac{-13}{3}}$

$$\begin{bmatrix} y_1 \\ y_2 \\ y_3 \end{bmatrix} = \begin{bmatrix} 4 \\ -10 \\ -13/3 \end{bmatrix}$$

$UX = Y$ for values of x_1, x_2 and x_3

$$\begin{bmatrix} 1 & 1 & -1 \\ 0 & -3 & 4 \\ 0 & 0 & 13/3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 4 \\ -10 \\ -13/3 \end{bmatrix}$$

On Solving above Matrix we get.

$\frac{13}{3}x_3 = \frac{-13}{3}$

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$-3x_2 + 4x_3 = -10$

$-3x_2 + 4(-1) = -10$

$-3x_2 = -6$

$\boxed{x_2 = 2}$

$x_1 + x_2 - x_3 = 4$

$x_1 + 2 + 1 = 4$

$\boxed{x_1 = 1}$

$$\begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 1 \\ 2 \\ -1 \end{bmatrix}$$

So the values of x_1, x_2, x_3 are 1, 2, -1 respectively

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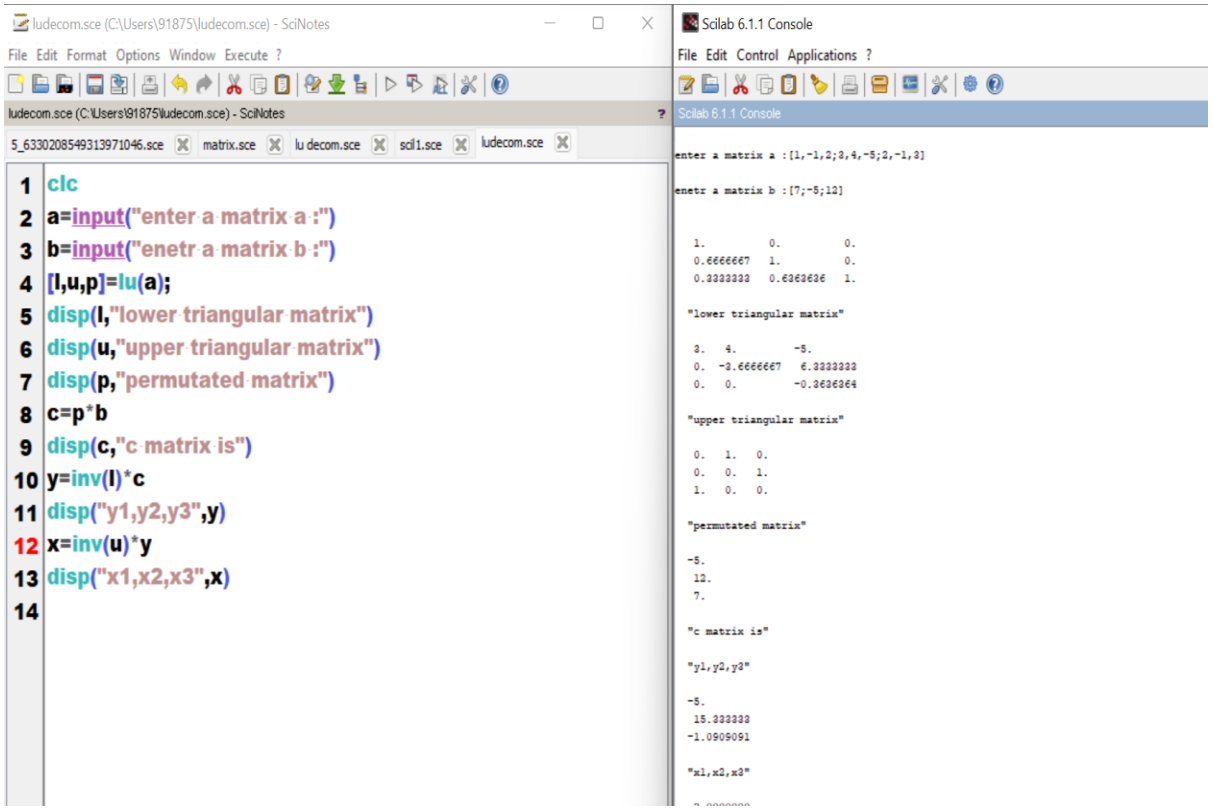
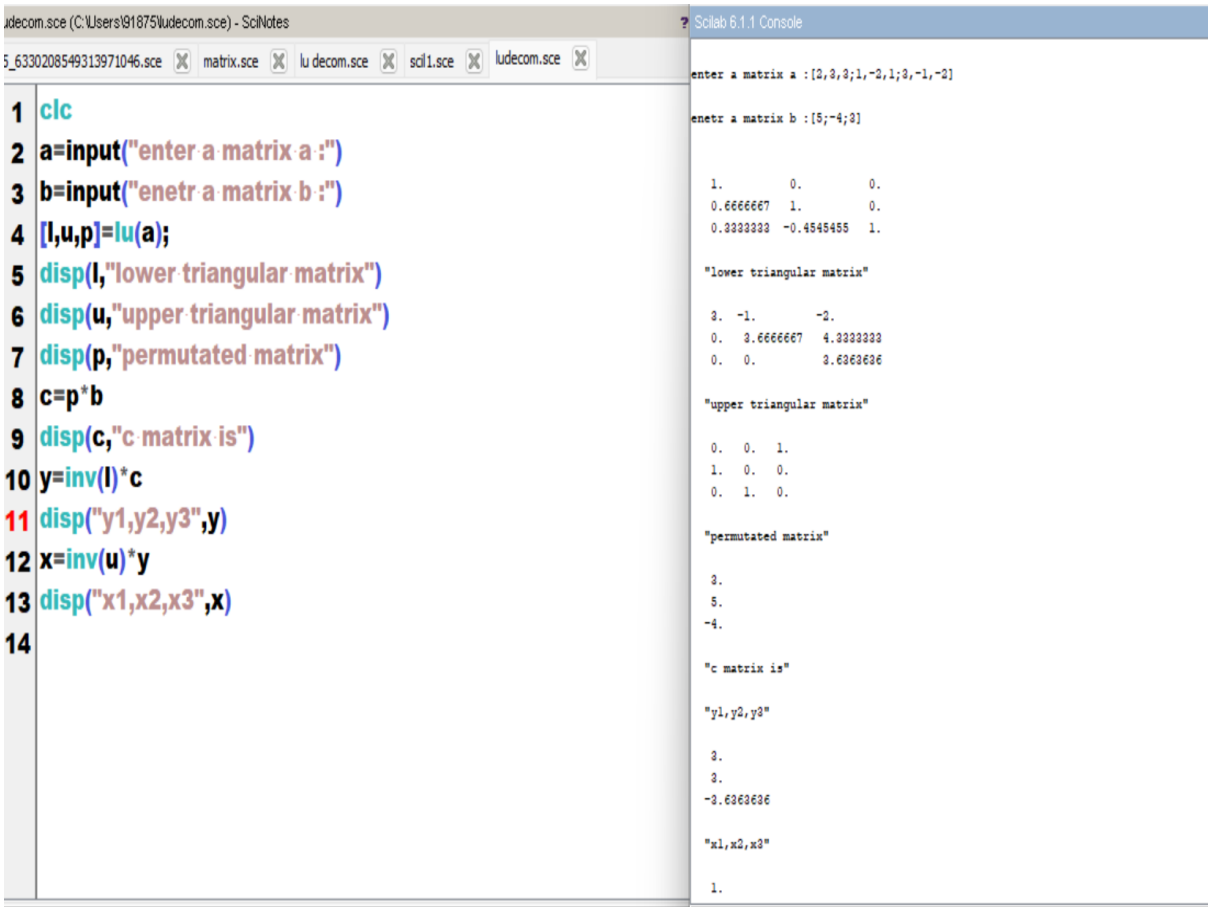
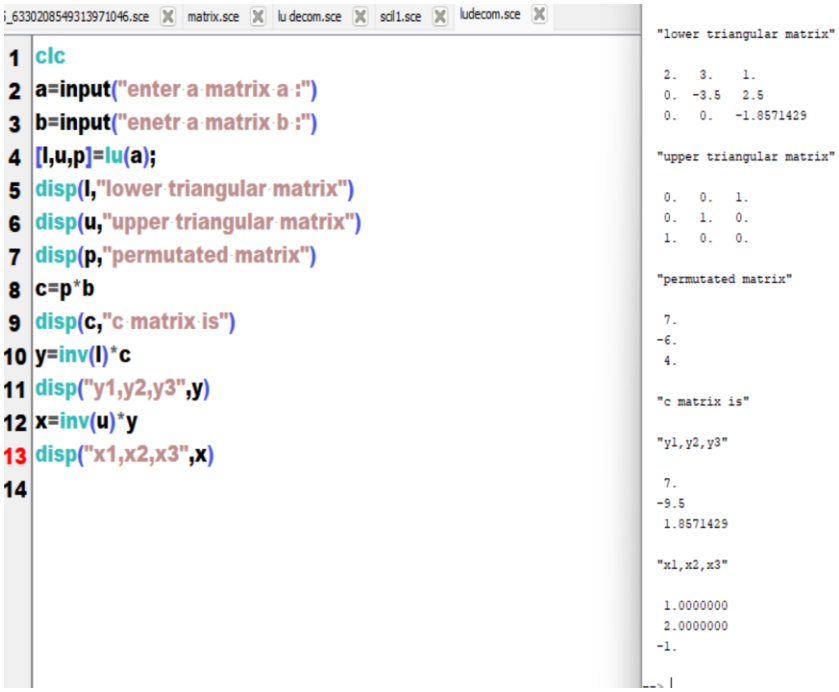
PROGRAMS IN SCILAB







RESULTS:

The theoretically solution and scilab software solution has same results so the LU decomposition method is verified