LAL Project Report - Group 2

Prepared for : C3 Assessment

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Objective -

To find the row reduced echelon form of a 4×3 matrix A and to find the rank of A.

Algorithm of the program -

1. Sort the rows in such a way that row with most number of leading zeroes comes at last.

2. Reconstruct the matrix in such a way that the leading non zero entry of first row is 1.(i.e. divide first row by its first non zero element.)

3.Make all the entries in the column which contains the leading entry of the first row equal to zero by performing elementary row operation.

4. Repeat 1.

5. Repeat 2. but this time do this for SECOND row.

6. Repeat 3. (i.e. subtract second row multiplied by suitable constant from all the other rows to make all the entries in the column containing leading entry of second row equal to zero.)

7. Repeat 1.

8 Repeat 2. but this time do this for THIRD row.

9. Repeat 3. but this time for THIRD row.

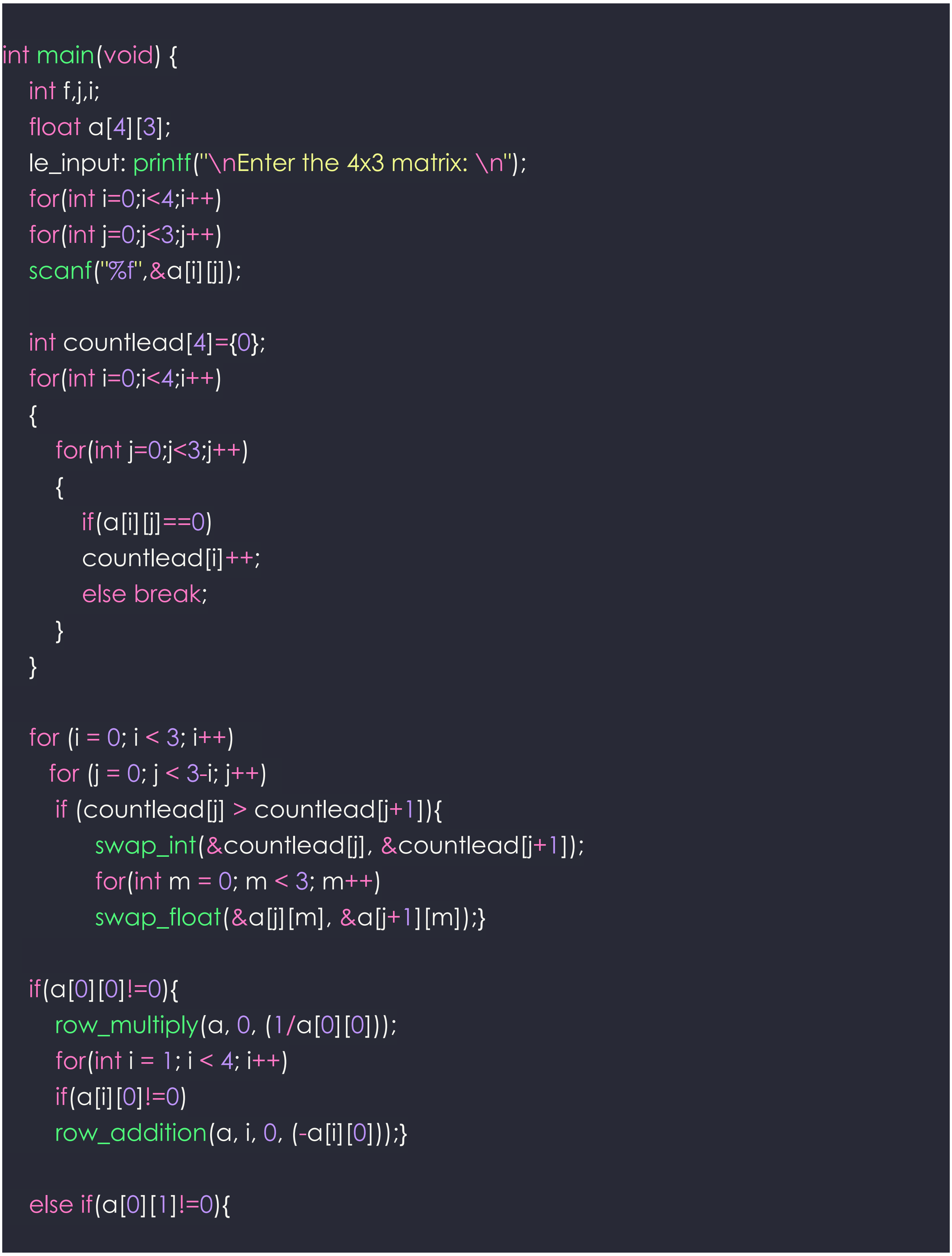
10. Repeat 7, 8, 9, but this time for FOURTH row.

11. After above steps, we get row reduced echelon form of the given matrix.

Code -

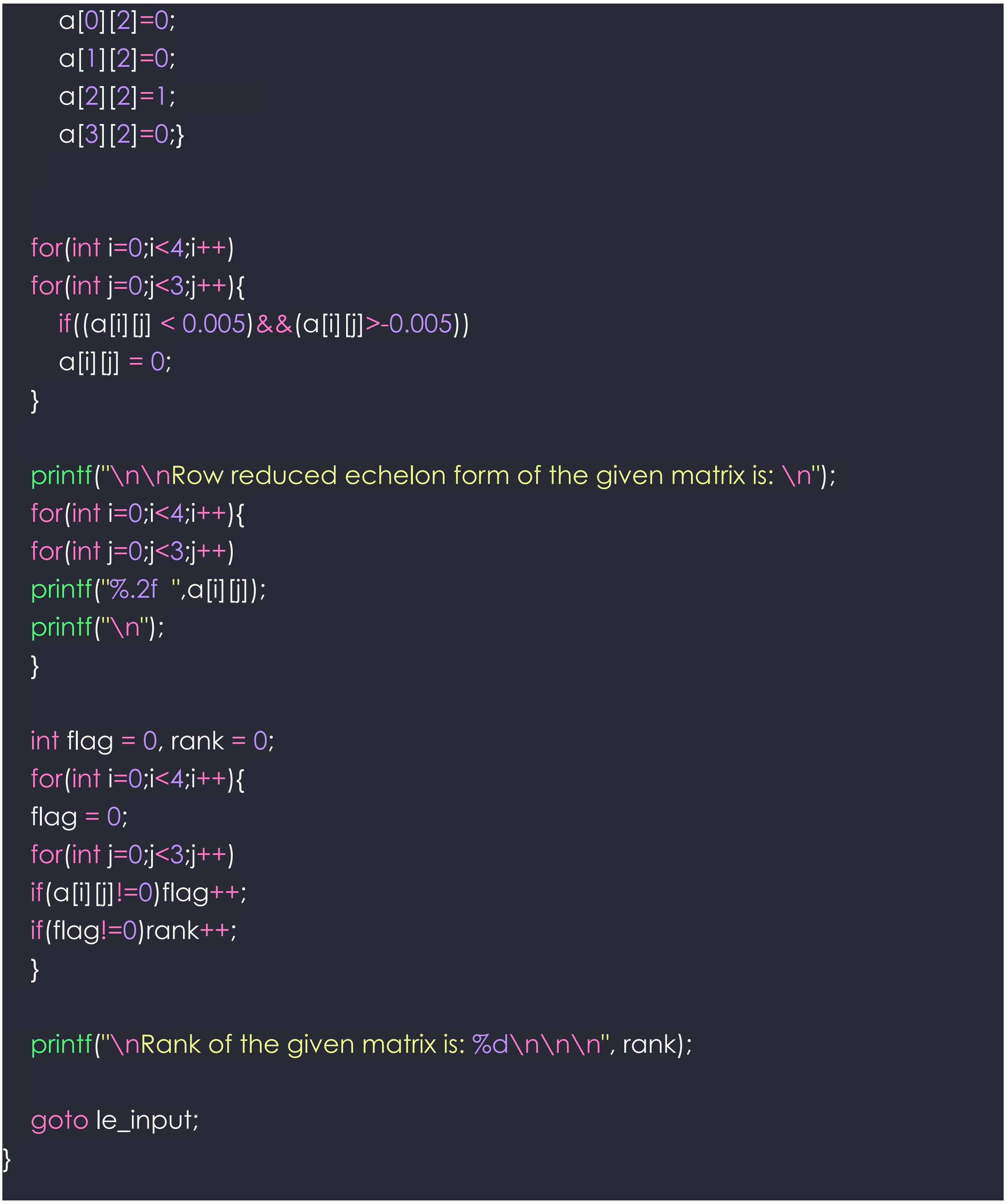
Language used - C

```
#include <stdio.h>

void swap_float(float* a, float* b){
   float c = *a;
   *a = *b;
   *b = c;}

void swap_int(int* a, int* b){
   int c = *a;
   *a = *b;
   *b = c;}

void row_multiply(float a[4][3], int row, float constant){
  for(int i = 0; i < 3; i++)
  a[row][i] *= constant;
}

void row_addition(float a[4][3], int row1, int row2, float constant){
   for(int i = 0; i < 3; i++)
   a[row1][i] += a[row2][i]*constant;}
```



```
int main(void) {
    int f,j,i;
    float a[4][3];
    le_input: printf("\nEnter the 4x3 matrix: \n");
    for(int i=0;i<4;i++)
    for(int j=0;j<3;j++)
    scanf("%f",&a[i][j]);

    int countlead[4]={0};
    for(int i=0;i<4;i++)
    {
        for(int j=0;j<3;j++)
        {
            if(a[i][j]==0)
            countlead[i]++;
            else break;
        }
    }

    for (i = 0; i < 3; i++)
       for (j = 0; j < 3-i; j++)
        if (countlead[j] > countlead[j+1]){
              swap_int(&countlead[j], &countlead[j+1]);
              for(int m = 0; m < 3; m++)
              swap_float(&a[j][m], &a[j+1][m]);}

    if(a[0][0]!=0){
        row_multiply(a, 0, (1/a[0][0]));
        for(int i = 1; i < 4; i++)
        if(a[i][0]!=0)
        row_addition(a, i, 0, (-a[i][0]));}

    else if(a[0][1]!=0){
```

```
    row_multiply(a, 0, (1/a[0][1]));
    for(int i = 1; i < 4; i++)
    if(a[i][1]!=0)
    row_addition(a, i, 0, (-a[i][1]));}

else if(a[0][2]!=0){
    row_multiply(a, 0, (1/a[0][2]));
    for(int i = 1; i < 4; i++)
    if(a[i][2]!=0)
    row_addition(a, i, 0, (-a[i][2]));}


for(int i = 1; i < 4; i++)
    if(a[i][1]!=0){
        swap_float(&a[i][1], &a[1][1]);
        swap_float(&a[i][2], &a[1][2]);
    }


if(a[1][1]!=0){
    row_multiply(a, 1, (1/a[1][1]));
    for(int i = 0; i < 4; i++)
    if(a[i][1]!=0&&i!=1)
    row_addition(a, i, 1, (-a[i][1]));}

if(a[1][1]==0)
   if((a[1][2]!=0)||(a[2][2]!=0)||(a[3][2]!=0)){
    a[0][2] = 0;
    a[1][2] = 1;
    a[2][2] = 0;
    a[3][2] = 0;}


if(a[2][2]!=0||a[3][2]!=0){
```



```
        a[0][2]=0;
        a[1][2]=0;
        a[2][2]=1;
        a[3][2]=0;}


    for(int i=0;i<4;i++)
    for(int j=0;j<3;j++){
        if((a[i][j] < 0.005)&&(a[i][j]>-0.005))
        a[i][j] = 0;
    }

    printf("\n\nRow reduced echelon form of the given matrix is: \n");
    for(int i=0;i<4;i++){
    for(int j=0;j<3;j++)
    printf("%.2f  ",a[i][j]);
    printf("\n");
    }

    int flag = 0, rank = 0;
    for(int i=0;i<4;i++){
    flag = 0;
    for(int j=0;j<3;j++)
    if(a[i][j]!=0)flag++;
    if(flag!=0)rank++;
    }

    printf("\nRank of the given matrix is: %d\n\n\n", rank);

    goto le_input;
}
```