Federal Urdu University of Arts, Sciences & Technology, Karachi

Gulshan-e-Iqbal Campus

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Batch:	**17**	**Regular**
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Course:	**Numerical Computing**	
Subject:	**Assignment 3 (Gauss Jordan)**	
Instructor:	**Prof. Syed Akhter Raza**	

Assignment 3 (Gaussian Elimination)

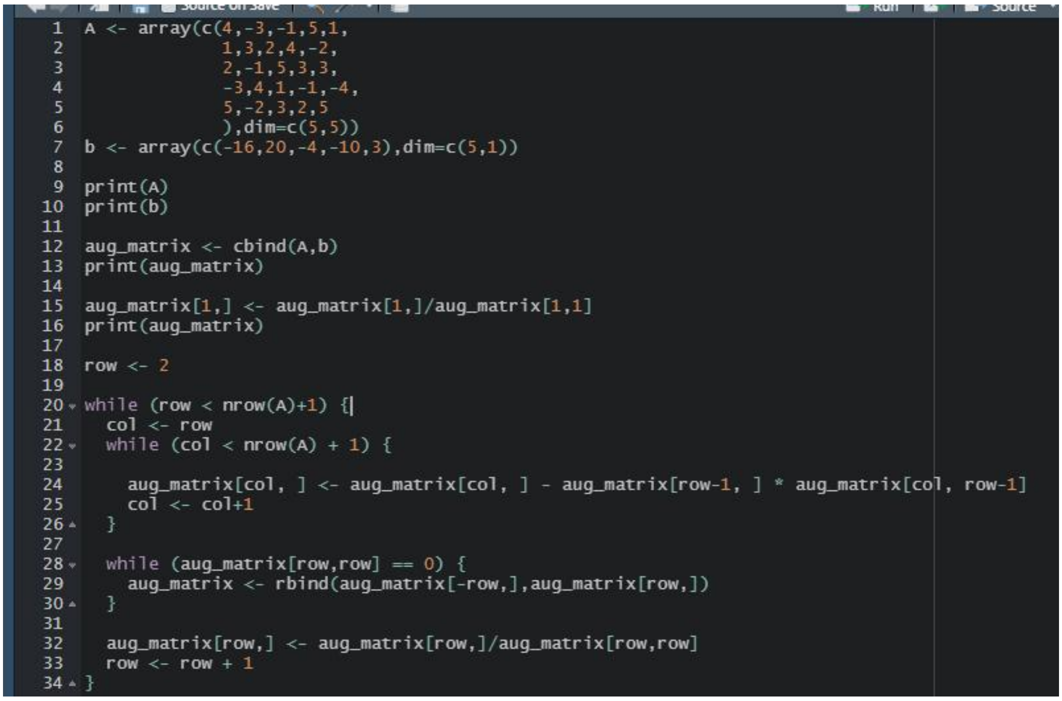
Q: Make a complete code of Gauss Jordan method in R both steps with output of random draw of matrix. Matrix of all students must be unique due to randomly drawn elements. the size of matrix should be at leat 5 X 5.

submit in a pdf file Algorithm + Code + Output

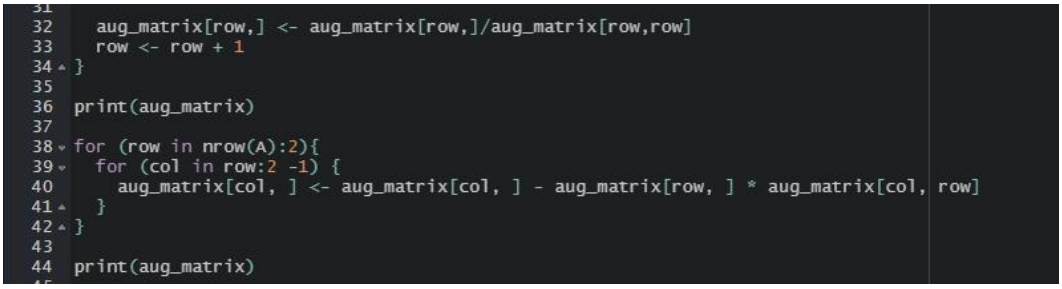
Ans: **Algorithm :**

Start
Declare matrix a,b
Read Augmented Matrix (A)
Transform Augmented Matrix (A) to Diagonal Matrix by Row Operations.
Obtain Solution by Making All Diagonal Elements to 1.
Display result
Stop

Code:

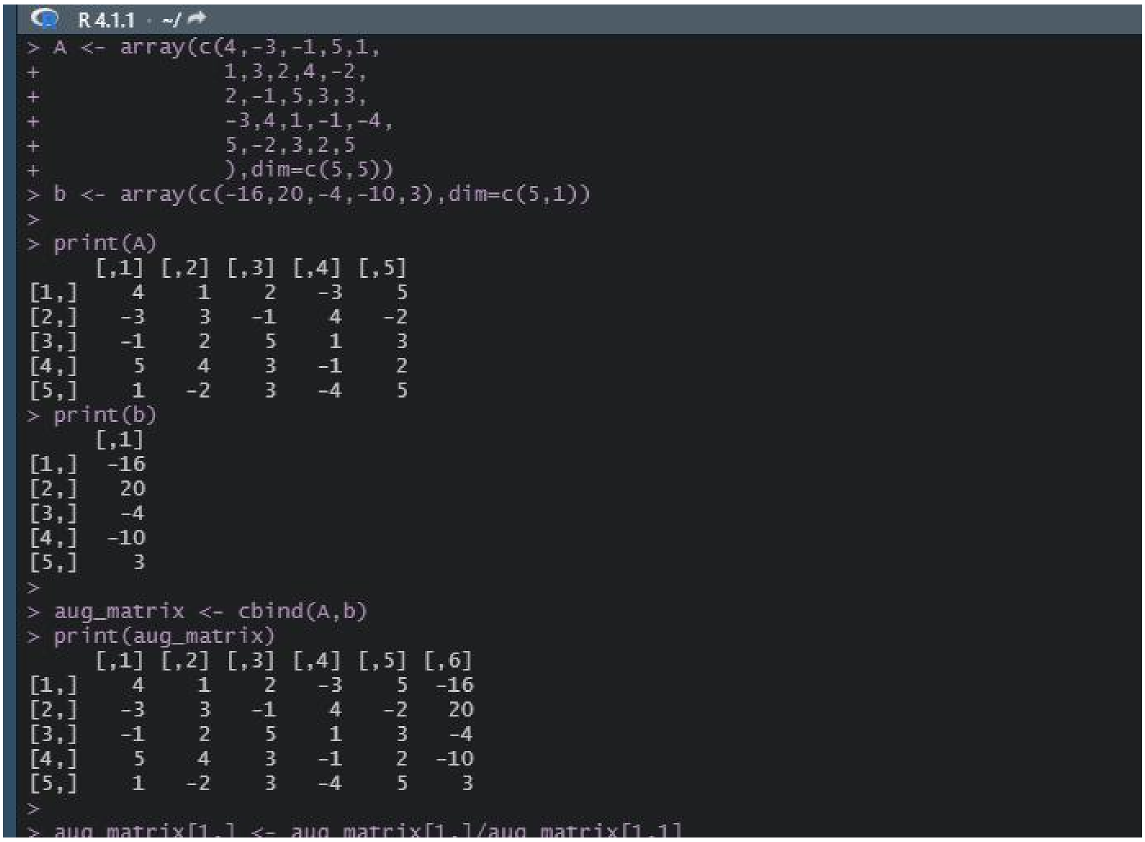


```r
A <- array(c(4,-3,-1,5,1,
             1,3,2,4,-2,
             2,-1,5,3,3,
             -3,4,1,-1,-4,
             5,-2,3,2,5
             ),dim=c(5,5))
b <- array(c(-16,20,-4,-10,3),dim=c(5,1))

print(A)
print(b)

aug_matrix <- cbind(A,b)
print(aug_matrix)

aug_matrix[1,] <- aug_matrix[1,]/aug_matrix[1,1]
print(aug_matrix)

row <- 2

while (row < nrow(A)+1) {
  col <- row
  while (col < nrow(A) + 1) {

    aug_matrix[col, ] <- aug_matrix[col, ] - aug_matrix[row-1, ] * aug_matrix[col, row-1]
    col <- col+1
  }

  while (aug_matrix[row,row] == 0) {
    aug_matrix <- rbind(aug_matrix[-row,],aug_matrix[row,])
  }

  aug_matrix[row,] <- aug_matrix[row,]/aug_matrix[row,row]
  row <- row + 1
}
```

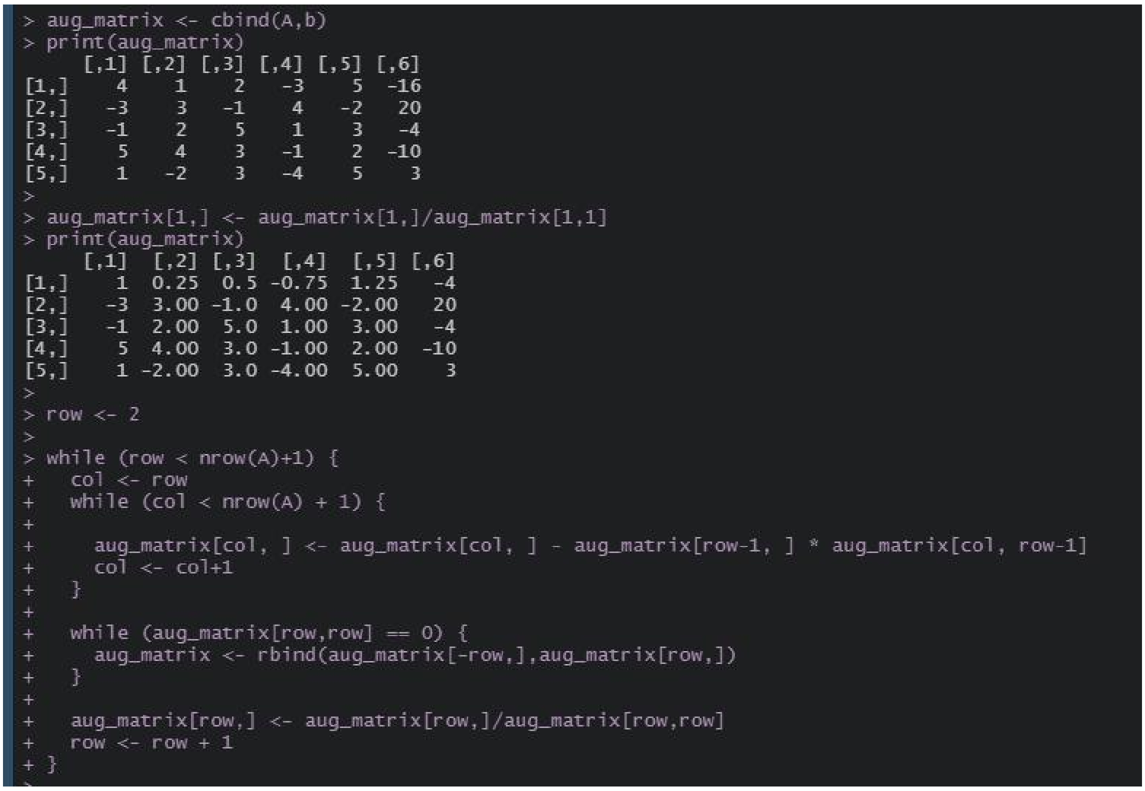


```r
  aug_matrix[row,] <- aug_matrix[row,]/aug_matrix[row,row]
  row <- row + 1
}

print(aug_matrix)

for (row in nrow(A):2){
  for (col in row:2 -1) {
    aug_matrix[col, ] <- aug_matrix[col, ] - aug_matrix[row, ] * aug_matrix[col, row]
  }
}

print(aug_matrix)
```

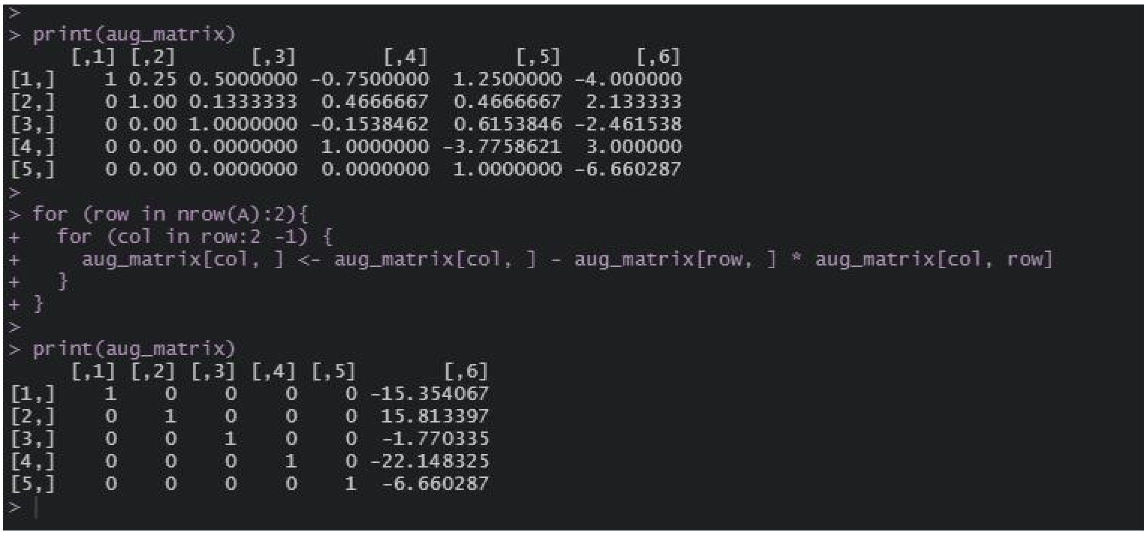
Output:



```
> A <- array(c(4,-3,-1,5,1,
+              1,3,2,4,-2,
+              2,-1,5,3,3,
+              -3,4,1,-1,-4,
+              5,-2,3,2,5
+              ),dim=c(5,5))
> b <- array(c(-16,20,-4,-10,3),dim=c(5,1))
>
> print(A)
     [,1] [,2] [,3] [,4] [,5]
[1,]    4    1    2   -3    5
[2,]   -3    3   -1    4   -2
[3,]   -1    2    5    1    3
[4,]    5    4    3   -1    2
[5,]    1   -2    3   -4    5
> print(b)
     [,1]
[1,]  -16
[2,]   20
[3,]   -4
[4,]  -10
[5,]    3
>
> aug_matrix <- cbind(A,b)
> print(aug_matrix)
     [,1] [,2] [,3] [,4] [,5] [,6]
[1,]    4    1    2   -3    5  -16
[2,]   -3    3   -1    4   -2   20
[3,]   -1    2    5    1    3   -4
[4,]    5    4    3   -1    2  -10
[5,]    1   -2    3   -4    5    3
>
> aug_matrix[1,] <- aug_matrix[1,]/aug_matrix[1,1]
```



```
> aug_matrix <- cbind(A,b)
> print(aug_matrix)
     [,1] [,2] [,3] [,4] [,5] [,6]
[1,]    4    1    2   -3    5  -16
[2,]   -3    3   -1    4   -2   20
[3,]   -1    2    5    1    3   -4
[4,]    5    4    3   -1    2  -10
[5,]    1   -2    3   -4    5    3
>
> aug_matrix[1,] <- aug_matrix[1,]/aug_matrix[1,1]
> print(aug_matrix)
     [,1]  [,2] [,3]  [,4]  [,5] [,6]
[1,]    1  0.25  0.5 -0.75  1.25   -4
[2,]   -3  3.00 -1.0  4.00 -2.00   20
[3,]   -1  2.00  5.0  1.00  3.00   -4
[4,]    5  4.00  3.0 -1.00  2.00  -10
[5,]    1 -2.00  3.0 -4.00  5.00    3
>
> row <- 2
>
> while (row < nrow(A)+1) {
+   col <- row
+   while (col < nrow(A) + 1) {
+
+     aug_matrix[col, ] <- aug_matrix[col, ] - aug_matrix[row-1, ] * aug_matrix[col, row-1]
+     col <- col+1
+   }
+
+   while (aug_matrix[row,row] == 0) {
+     aug_matrix <- rbind(aug_matrix[-row,],aug_matrix[row,])
+   }
+
+   aug_matrix[row,] <- aug_matrix[row,]/aug_matrix[row,row]
+   row <- row + 1
+ }
>
```



```
>
> print(aug_matrix)
     [,1] [,2]      [,3]       [,4]       [,5]      [,6]
[1,]    1 0.25 0.5000000 -0.7500000  1.2500000 -4.000000
[2,]    0 1.00 0.1333333  0.4666667  0.4666667  2.133333
[3,]    0 0.00 1.0000000 -0.1538462  0.6153846 -2.461538
[4,]    0 0.00 0.0000000  1.0000000 -3.7758621  3.000000
[5,]    0 0.00 0.0000000  0.0000000  1.0000000 -6.660287
>
> for (row in nrow(A):2){
+   for (col in row:2 -1) {
+     aug_matrix[col, ] <- aug_matrix[col, ] - aug_matrix[row, ] * aug_matrix[col, row]
+   }
+ }
>
> print(aug_matrix)
     [,1] [,2] [,3] [,4] [,5]       [,6]
[1,]    1    0    0    0    0 -15.354067
[2,]    0    1    0    0    0  15.813397
[3,]    0    0    1    0    0  -1.770335
[4,]    0    0    0    1    0 -22.148325
[5,]    0    0    0    0    1  -6.660287
>
```