ASSIGNMENT- 10

Q1: To check whether the given matrix is Sparse Matrix or not?

CODE: Python program to evaluate Sparse matrix

```
Import numpy as np
 rows = int(input('\nNo of rows: '))
 columns = int(input('No of columns: '))
          No of rows: 3
          No of columns: 3
 x = np.zeros(rows*columns)
 list1 = list(map(int, input().split()))
 A = np.array(list1).reshape(rows, columns)
```

```
print("\n",A)
total = rows * columns
# Count all zero elements
count = 0
for i in range(0, rows):
   for j in range(0, columns):
      if(A[i][j] == 0):
         count = count + 1
if(count > (total/2)):
   print("\nIt is sparse matrix\n")
else:
   print("\nIt is not sparse matrix\n")
```

INPUT:

Case 1: Matrix elements = [1,2,3,4,5,6,7,8,9]

Case 2: Matrix elements = [1,0,3,0,5,0,7,0,0]

Case 3: Matrix elements = [0,3,0,9,0,0,0,0,1]

OUTPUT: Evaluating Sparse matrix

Case 1: It is not sparse matrix

Case 2: It is sparse matrix

Case 3: It is sparse matrix

Q2: To generate a random Sparse Matrix of size nxn. Represent the matrix into One Chain Per Row Single Array List form, and Orthogonal List.

CODE: Python program to represent sparse matrix into One chain per row single array

```
# Importing NumPy Library
import numpy as np
import random
from scipy.sparse import random
from scipy import stats
from numpy.random import default_rng
```

```
rng = default_rng()
rvs = stats.poisson(25, loc=10).rvs
m = 4
n = 5
```

```
S = random(m, n, density=0.25, random_state=rng, data_rvs=rvs)
sparseMatrix = S.A
sparseMatrix

# initialize size as 0
size = 0

for i in range(m):
    for j in range(n):
        if (sparseMatrix[i][j] != 0):
            size += 1
```

```
rows, cols = (3, size)
compactMatrix = [[0 for i in range(cols)] for j in range(rows)]
 k = 0
for i in range(m):
    for j in range(n):
        if (sparseMatrix[i][j] != 0):
            compactMatrix[0][k] = i
            compactMatrix[1][k] = j
            compactMatrix[2][k] = sparseMatrix[i][j]
            k += 1

for i in compactMatrix:
    print(i)
```

OUTPUT:

10.1 Randomly generated Sparse matrix

```
[33.,  0.,  0.,  0.,  0.],
[ 0., 30.,  0.,  0.,  0.],
[31.,  0.,  0.,  0., 36],
[ 0.,  0., 36.,  0.,   0.]
```

10.2 One chain per row single array representation of Sparse matrix

```
[0,       1,      2,      2,      3   ]
[0,       1,      0,      4,      2   ]
[33.0, 30.0, 31.0, 36.0, 36.0]
```