PRACTICAL NO. – 1

AIM : Implement sparse matrix using array. Description of program is as follows:

a) Read a 2D array from the user
b) Store it in the sparse matrix form using an array of structures
c) Print the final array

THEORY : A sparse matrix is a special case of a matrix in which the number of zero elements is much higher than the number of non-zero elements. As a rule of thumb, if 2/3 of the total elements in a matrix are zeros, it can be called a sparse matrix. Using a sparse matrix representation — where only the non-zero values are stored — the space used for representing data and the time for scanning the matrix are reduced significantly.

PROGRAM EXECUTED :

```
#include <stdio.h>


int main() {
 int arr[3][3];
 int nz=0,z=0;
 printf("Enter the values of the array : \n");
 for (int i=0;i<3;i++){
  for (int j=0;j<3;j++){
   scanf("%d",&arr[i][j]);
  }
 }
 printf("The array is as folllows : \n");
 for (int i=0;i<3;i++){
  for (int j=0;j<3;j++){
   printf("%d",arr[i][j]);
  }
  printf("\n");
 }
 for (int i=0;i<3;i++){
```

```
    for (int j=0;j<3;j++){
      if (arr[i][j]!=0){
        nz++;
      }
      else{
        z++;
      }
    }
  }
  if (z>nz){
    printf("The matrix is sparse matrix. \n");
    printf("Column wise representation : \n");
    printf("i j value \n");
    for (int i=0;i<3;i++){
      for (int j=0;j<3;j++){
        if(arr[i][j]!=0){
          printf("%d ",i);
          printf("%d ",j);
          printf("%d ",arr[i][j]);
          printf("\n");
      }
    }
  }
}
  else{
    printf("The matrix is not a sparse matrix. \n");
  }
  return 0;

}
```

OUTPUT :

```
Enter the values of the array :
3
9
5
0
0
0
4
0
0
The array is as folllows :
395
000
400
The matrix is sparse matrix.
Column wise representation :
i j value
0 0 3
0 1 9
0 2 5
2 0 4
```

```
Enter the values of the array :
6
0
2
9
5
0
3
0
2
The array is as folllows :
602
950
302
The matrix is not a sparse matrix.
```