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**Data Structures Lab Assignment**

**QUESTION : Write a C/C++ Program to implement an array program for following: Input: m\* n matrix  
 a. Find saddle point in the Matrix.   
 B. Magic square Matrix. (Check)  
 c. Represent given matrix in its Sparse form.**

**CODE:**

#include <stdio.h>

void findSaddlePoints(int matrix[][10], int m, int n) {

int found = 0;

for (int i = 0; i < m; i++) {

int minRow = matrix[i][0], colIndex = 0;

for (int j = 1; j < n; j++) {

if (matrix[i][j] < minRow) {

minRow = matrix[i][j];

colIndex = j;

}

}

int isSaddlePoint = 1;

for (int k = 0; k < m; k++) {

if (matrix[k][colIndex] > minRow) {

isSaddlePoint = 0;

break;

}

}

if (isSaddlePoint) {

printf("Saddle Point found at (%d, %d) with value %d\n", i, colIndex, minRow);

found = 1;

}

}

if (!found) {

printf("No Saddle Points found.\n");

}

}

int checkMagicSquare(int matrix[][10], int m, int n) {

if (m != n) return 0;

int sum = 0;

for (int i = 0; i < n; i++) {

sum += matrix[0][i];

}

for (int i = 1; i < n; i++) {

int rowSum = 0;

for (int j = 0; j < n; j++) {

rowSum += matrix[i][j];

}

if (rowSum != sum) return 0;

}

for (int i = 0; i < n; i++) {

int colSum = 0;

for (int j = 0; j < n; j++) {

colSum += matrix[j][i];

}

if (colSum != sum) return 0;

}

int diag1Sum = 0, diag2Sum = 0;

for (int i = 0; i < n; i++) {

diag1Sum += matrix[i][i];

diag2Sum += matrix[i][n - i - 1];

}

if (diag1Sum != sum || diag2Sum != sum) return 0;

return 1;

}

void toSparseMatrix(int matrix[][10], int m, int n) {

printf("Sparse Matrix Representation:\n");

for (int i = 0; i < m; i++) {

for (int j = 0; j < n; j++) {

if (matrix[i][j] != 0) {

printf("%d\t%d\t%d\n", i, j, matrix[i][j]);

}

}

}

}

int main() {

int m, n;

printf("Enter the number of rows (m): ");

scanf("%d", &m);

printf("Enter the number of columns (n): ");

scanf("%d", &n);

int matrix[10][10];

printf("Enter the elements of the matrix:\n");

for (int i = 0; i < m; i++) {

for (int j = 0; j < n; j++) {

scanf("%d", &matrix[i][j]);

}

}

findSaddlePoints(matrix, m, n);

if (checkMagicSquare(matrix, m, n)) {

printf("The matrix is a Magic Square.\n");

} else {

printf("The matrix is not a Magic Square.\n");

}

toSparseMatrix(matrix, m, n);

return 0;

}

**OUTPUT:**

