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ADVANCED DATA STRUCTURES ASSIGNMENT

COURSE CODE : CA21

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MCA , SEMESTER 2

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Write a Java Program for product of two Tridiagonal matrices .

Sol :

```
import java.util.Scanner;

public class TDM {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter the size of the matrices (n): ");
        int n = scanner.nextInt();

        System.out.println("Enter the elements for the first tridiagonal matrix:");
        int[][] matrix1 = read_TDM(scanner, n);

        System.out.println("Enter the elements for the second tridiagonal matrix:");
        int[][] matrix2 = read_TDM(scanner, n);

        int[][] result = prod_TDM(matrix1, matrix2, n);

        System.out.println("Product of the two tridiagonal matrices:");
        print_TDM(result);
    }

    public static int[][] read_TDM(Scanner scanner , int n){
        int[][] matrix = new int[n][n];
        for (int i = 0; i < n; i++) {
            for (int j = 0; j < n; j++) {
                if (i == j) {
                    System.out.print("Enter value for main diagonal element [" + i + "][" + j + "]: ");
                    matrix[i][j] = scanner.nextInt();
                } else if (i == j - 1) {
                    System.out.print("Enter value for upper diagonal element [" + i + "][" + j + "]: ");
                    matrix[i][j] = scanner.nextInt();
                } else if (i == j + 1) {
                    System.out.print("Enter value for lower diagonal element [" + i + "][" + j + "]: ");
                    matrix[i][j] = scanner.nextInt();
                } else {
                    matrix[i][j] = 0;
                }
            }
        }

        return matrix;
    }

    public static void print_TDM(int a[][] ){
        for (int i = 0; i < a.length; i++) {
            for (int j = 0; j < a[i].length; j++) {
                System.out.print(a[i][j] + " ");
            }
            System.out.println();
        }
    }

    public static int[][] prod_TDM(int a[][], int b[][] , int n){
```

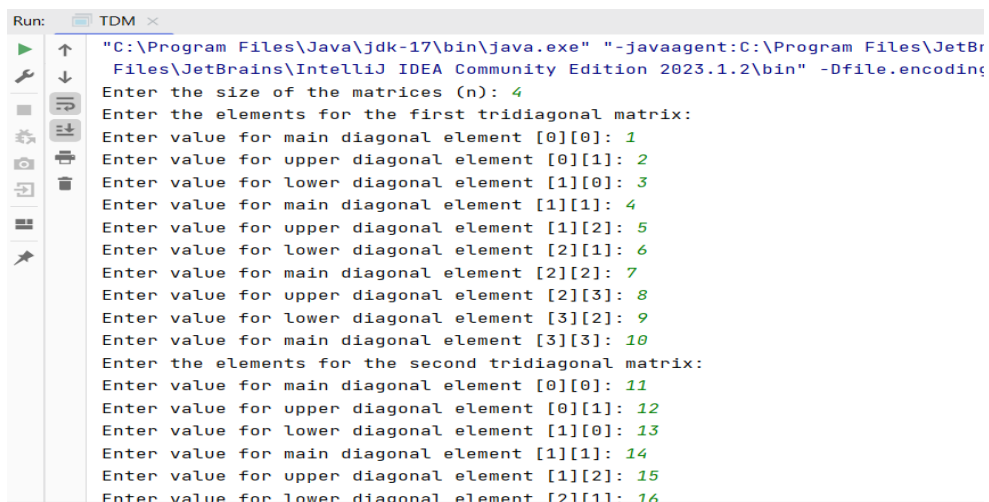
```

int[][] result = new int[n][n];
for (int i = 0; i < n; i++) {
    for (int j = 0; j < n; j++) {
        if (i == j) {
            result[i][j] = a[i][i] * b[i][i];
            if (i - 1 >= 0) {
                result[i][j] += a[i][i - 1] * b[i - 1][i];
            }
            if (i + 1 < n) {
                result[i][j] += a[i][i + 1] * b[i + 1][i];
            }
        } else if (i == j - 1) {
            result[i][j] = a[i][i + 1] * b[i + 1][j];
        } else if (i == j + 1) {
            result[i][j] = a[i][i - 1] * b[i - 1][j];
        }
    }
}

return result;
}
}

```

Output



```

Run: TDM x
"C:\Program Files\Java\jdk-17\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\JetBrains\IntelliJ IDEA Community Edition 2023.1.2\bin" -Dfile.encoding=UTF-8
Enter the size of the matrices (n): 4
Enter the elements for the first tridiagonal matrix:
Enter value for main diagonal element [0][0]: 1
Enter value for upper diagonal element [0][1]: 2
Enter value for lower diagonal element [1][0]: 3
Enter value for main diagonal element [1][1]: 4
Enter value for upper diagonal element [1][2]: 5
Enter value for lower diagonal element [2][1]: 6
Enter value for main diagonal element [2][2]: 7
Enter value for upper diagonal element [2][3]: 8
Enter value for lower diagonal element [3][2]: 9
Enter value for main diagonal element [3][3]: 10
Enter the elements for the second tridiagonal matrix:
Enter value for main diagonal element [0][0]: 11
Enter value for upper diagonal element [0][1]: 12
Enter value for lower diagonal element [1][0]: 13
Enter value for main diagonal element [1][1]: 14
Enter value for upper diagonal element [1][2]: 15
Enter value for lower diagonal element [2][1]: 16

```

```

Enter value for main diagonal element [2][2]: 17
Enter value for upper diagonal element [2][3]: 18
Enter value for lower diagonal element [3][2]: 19
Enter value for main diagonal element [3][3]: 20
Product of the two tridiagonal matrices:
37 28 0 0
33 172 85 0
0 84 361 160
0 0 153 362

```