There are two folder having the same exact program.
VectorMatrix_with_Cmake : This program is built with CMake and the compiler is MinGW (g++) with Visula studio as the project generator.
VectorMatrix_with_VS: This program is built with Visual Studio.

Note: Output is at the end Section.

Program is implemented on windows 10.
Note: It is not tested on Linux system, However, the program with CMake should run on Linux as well.

There are three files.
Main.cpp: This file contains the 'main' function. Program execution begins and ends there.
VectorMatrix.cpp: This file contains the definition of Matrix and Vector class
VectorMatrix.h: This file contains the body declaration for Matrix and Vector class

The program is so simple and self-explanatory.

Matrix Class:
void initializeMatrix(std::vector<std::vector<double> >&, int, int); => It used to declare and initialize the Matrix
void printMatrix(const std::vector<std::vector<double> >&); => It used to print the elements of the Matrix

Vector Class:
void initializeVector(std::vector<double>&, int); => It used to declare and initialize the Vector
void printVector(const std::vector<double>&); => It used to print the elements of the Vector

Operation Class:
void matMulVect(const std::vector<std::vector<double> >&, const std::vector<double>&); => Matrix Multiplication with Vector
void scalarmulmat(std::vector<std::vector<double> >& , int); =>Scalar Multiply with Matrix
void scalaraddmat(std::vector<std::vector<double> >& , int); =>Scalar Addition with Matrix
void scalarmulvec(std::vector<double>& , int); =>Scalar Multiply with Vector
void scalaraddvec(std::vector<double>& , int); =>Scalar Addition with Vector
void mataddmat(std::vector<std::vector<double> >& matr, std::vector<std::vector<double> >& matr2);=>Two Matrix Addition
void vectaddvect(std::vector<double>&, std::vector<double>&); T=>wo vector Addition

Few algorithm used for the operation purposes.

```
/*
Algorithm:Matrix - Vector Multiplication
• Simply a series of dot products
Input : Matrix mat[m][n]
        Vector vec[n]
        Output : out[m]
        for (i = 0; i < m; i++)
        {
                out[i] = 0;
                for (j = 0; j < n; j++)
                        out[i] += mat[i][j] * vec[j];
        }
```

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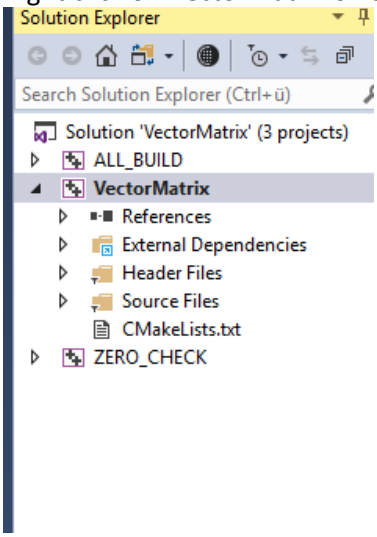
Algorithm:Matrix - Scalar Multiplication
Input : Matrix mat[m][n]
scalar
Output : out[m]
for (i = 0; i < m; i++)
{
for (j = 0; j < n; j++)
mat[i][j] *= scalar;
}

==========
Algorithm:Matrix - Scalar Addition
Input : Matrix mat[m][n]
scalar
Output : out[m]
for (i = 0; i < m; i++)
{
for (j = 0; j < n; j++)
mat[i][j] += scalar;
}

*/

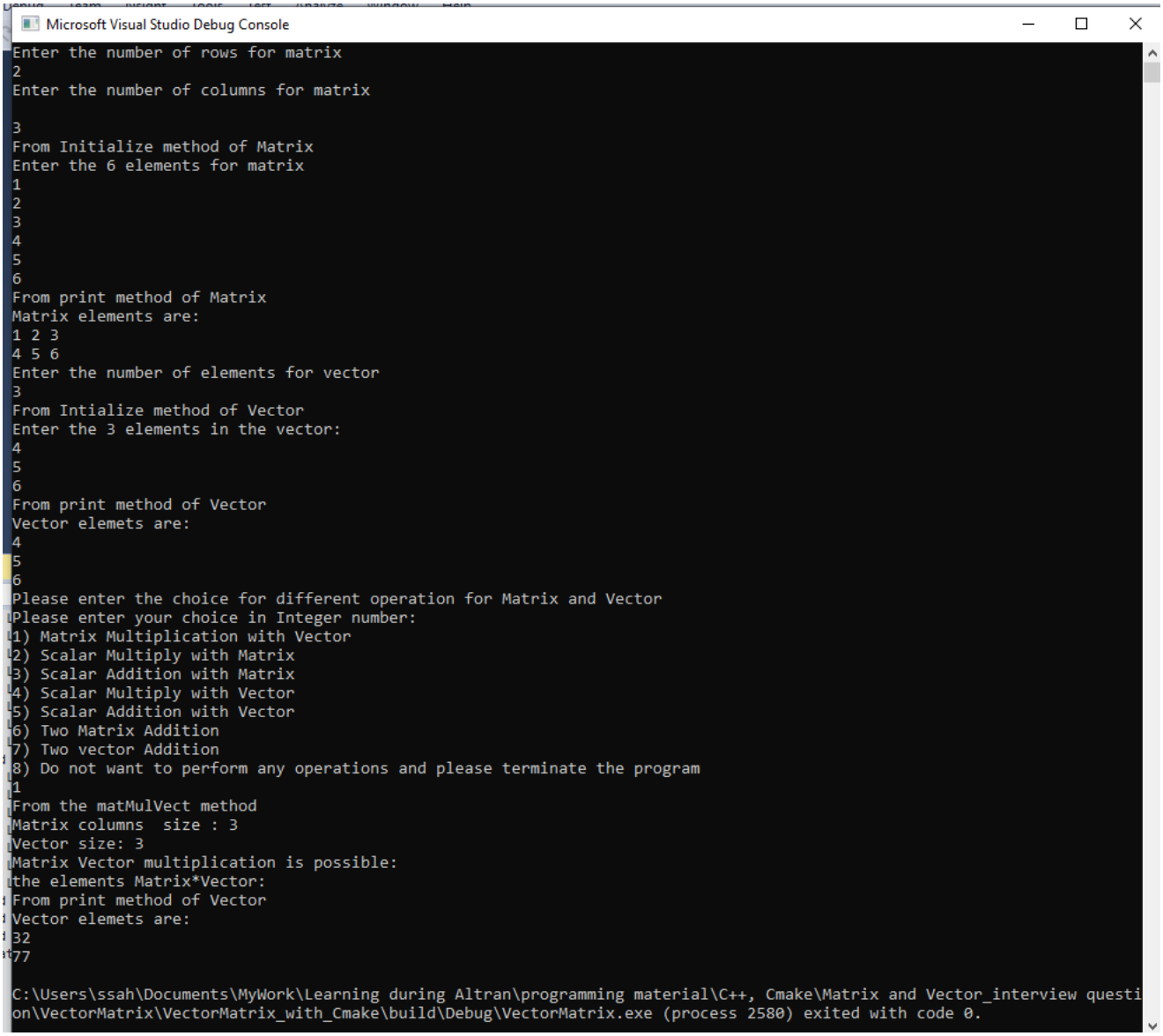
==========
O/P:
To run the VectorMatrix_with_Cmake:
Go to build folder of this program and double click on VectorMatrix.sln to run on Visual studio.

Right click on VectorMatrix on Solution Explorer and choose the set as startup project .



After this step, right click again on VectorMatrix and chose the rebuild. And once the rebuild is done, run the program.

To run the VectorMatrix_with_VS: Goto the program folder and run the VectorMatrix.sln
o/p: There are various operation. Just showing two output:
Case 1:
Matrix Multiplication with Vector



Case 2: Scalar Multiplication with Matrix