Experiment No-03(Group A)

Title:- Python program to compute various operations on matrix.

Objectives:- To understand the use of matrix operations

Problem Statement:-

Write a Python program to compute following computation on matrix:

a) Addition of two matrices

b) Subtraction of two matrices

c) Multiplication of two matrices

d) Transpose of a matrix

Outcomes:- Result of Addition, Subtraction, Multiplication and Transpose of Matrix operation.

Software and Hardware requirements:-

1. **Operating system:** Linux- Ubuntu 16.04 to 17.10, or Windows 7 to 10,
2. **RAM-** 2GB RAM (4GB preferable)
3. You have to install **Python3** or higher version

Theory-

Operations on Matrices

Addition, subtraction and multiplication are the basic operations on the matrix.

To add or subtract matrices, these must be of identical order and for multiplication, the number of columns in the first matrix equals the number of rows in the second matrix.

- Addition of Matrices
- Subtraction of Matrices
- Multiplication of Matrices
- Transpose of Matrice

Addition of Matrices

If $A[a_{ij}]_{mxn}$ and $B[b_{ij}]_{mxn}$ are two matrices of the same order then their sum A + B is a matrix, and each element of that matrix is the sum of the corresponding elements. i.e. $A + B = [a_{ij} + b_{ij}]_{mxn}$

Consider the two matrices A & B of order 2 x 2. Then the sum is given by:

$$\begin{bmatrix} a1 & b1 \\ c1 & d1 \end{bmatrix} + \begin{bmatrix} a2 & b2 \\ c2 & d2 \end{bmatrix} = \begin{bmatrix} a1+a2 & b1+b2 \\ c1+c2 & d1+d2 \end{bmatrix}$$

Subtraction of Matrices

If A and B are two matrices of the same order, then we define A-B=A+\left(-B \right).$A-B=A+(-B)$.

Consider the two matrices A & B of order 2 x 2. Then the difference is given by:

We can subtract the matrices by subtracting each element of one matrix from the corresponding element of the second matrix. i.e. $A - B = [a_{ij} - b_{ij}]_{mxn}$

$$\begin{bmatrix} a1 & b1 \\ c1 & d1 \end{bmatrix} - \begin{bmatrix} a2 & b2 \\ c2 & d2 \end{bmatrix} = \begin{bmatrix} a1-a2 & b1-b2 \\ c1-c2 & d1-d2 \end{bmatrix}$$

Matrix multiplication

If **A** is an $m \times n$ matrix and **B** is an $n \times p$ matrix,

$$\mathbf{A} = \begin{pmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{m1} & a_{m2} & \cdots & a_{mn} \end{pmatrix}, \quad \mathbf{B} = \begin{pmatrix} b_{11} & b_{12} & \cdots & b_{1p} \\ b_{21} & b_{22} & \cdots & b_{2p} \\ \vdots & \vdots & \ddots & \vdots \\ b_{n1} & b_{n2} & \cdots & b_{np} \end{pmatrix}$$

the *matrix product* **C** = **AB** (denoted without multiplication signs or dots) is defined to be the $m \times p$ matrix

$$\mathbf{C} = \begin{pmatrix} c_{11} & c_{12} & \cdots & c_{1p} \\ c_{21} & c_{22} & \cdots & c_{2p} \\ \vdots & \vdots & \ddots & \vdots \\ c_{m1} & c_{m2} & \cdots & c_{mp} \end{pmatrix}$$

such that

$$c_{ij} = a_{i1}b_{1j} + a_{i2}b_{2j} + \cdots + a_{in}b_{nj} = \sum_{k=1}^{n} a_{ik}b_{kj},$$

for $i = 1, ..., m$ and $j = 1, ..., p$.

That is, the entry c_{ij} of the product is obtained by multiplying term-by-term the entries of the *i*th row of **A** and the *j*th column of **B**, and summing these *n* products. In other words, c_{ij} is the dot product of the *i*th row of **A** and the *j*th column of **B**.

Therefore, **AB** can also be written as

$$\mathbf{C} = \begin{pmatrix} a_{11}b_{11} + \cdots + a_{1n}b_{n1} & a_{11}b_{12} + \cdots + a_{1n}b_{n2} & \cdots & a_{11}b_{1p} + \cdots + a_{1n}b_{np} \\ a_{21}b_{11} + \cdots + a_{2n}b_{n1} & a_{21}b_{12} + \cdots + a_{2n}b_{n2} & \cdots & a_{21}b_{1p} + \cdots + a_{2n}b_{np} \\ \vdots & \vdots & \ddots & \vdots \\ a_{m1}b_{11} + \cdots + a_{mn}b_{n1} & a_{m1}b_{12} + \cdots + a_{mn}b_{n2} & \cdots & a_{m1}b_{1p} + \cdots + a_{mn}b_{np} \end{pmatrix}$$

Thus the product **AB** is defined if and only if the number of columns in **A** equals the number of rows in **B.**

Transpose of a Matrix

The matrix whose row will become the column of the new matrix and column will be the row of the new matrix.

transpose of $m \times n$ matrix A, denoted A^T or A', is $n \times m$ matrix with

$$\left(A^T\right)_{ij} = A_{ji}$$

rows and columns of A are transposed in A^T

example: $\begin{bmatrix} 0 & 4 \\ 7 & 0 \\ 3 & 1 \end{bmatrix}^T = \begin{bmatrix} 0 & 7 & 3 \\ 4 & 0 & 1 \end{bmatrix}.$

Algorithm:-

1) Start

2) Declare the variables such as m, n,,p,q,Matrix A=0,Matrx=B,Matrix C=0 ,ch

3) Input the no. of rows and columns for matrix A

4) Input the no. of rows and columns for matrix B

5) Print Menu: 1) Addition of two matrix

2) Subtraction of two

3) Multiplication of two matrix

4) Transpose of matrix

5) Exit

ch= Input enter your choice

6) if ch==1 then call function Add()

a= input value of a Do you want to continue(y/n)

if a=="y" then go to step 5

else Thank you for using this program!

7) else if ch==2 then call function Sub()

a= input value of a Do you want to continue(y/n)

if a=="y" then go to step 5

else Thank you for using this program!

8) else if ch==3 then call function Mul()

a= input value of a Do you want to continue(y/n)

if a=="y" then go to step 5

else Thank you for using this program!

9) else if ch==4 then call function Transpose()

a= input value of a Do you want to continue(y/n)

if a=="y" then go to step 5

else Thank you for using this program!

10) else if ch==5 then go to step 11

else print Wrong choice

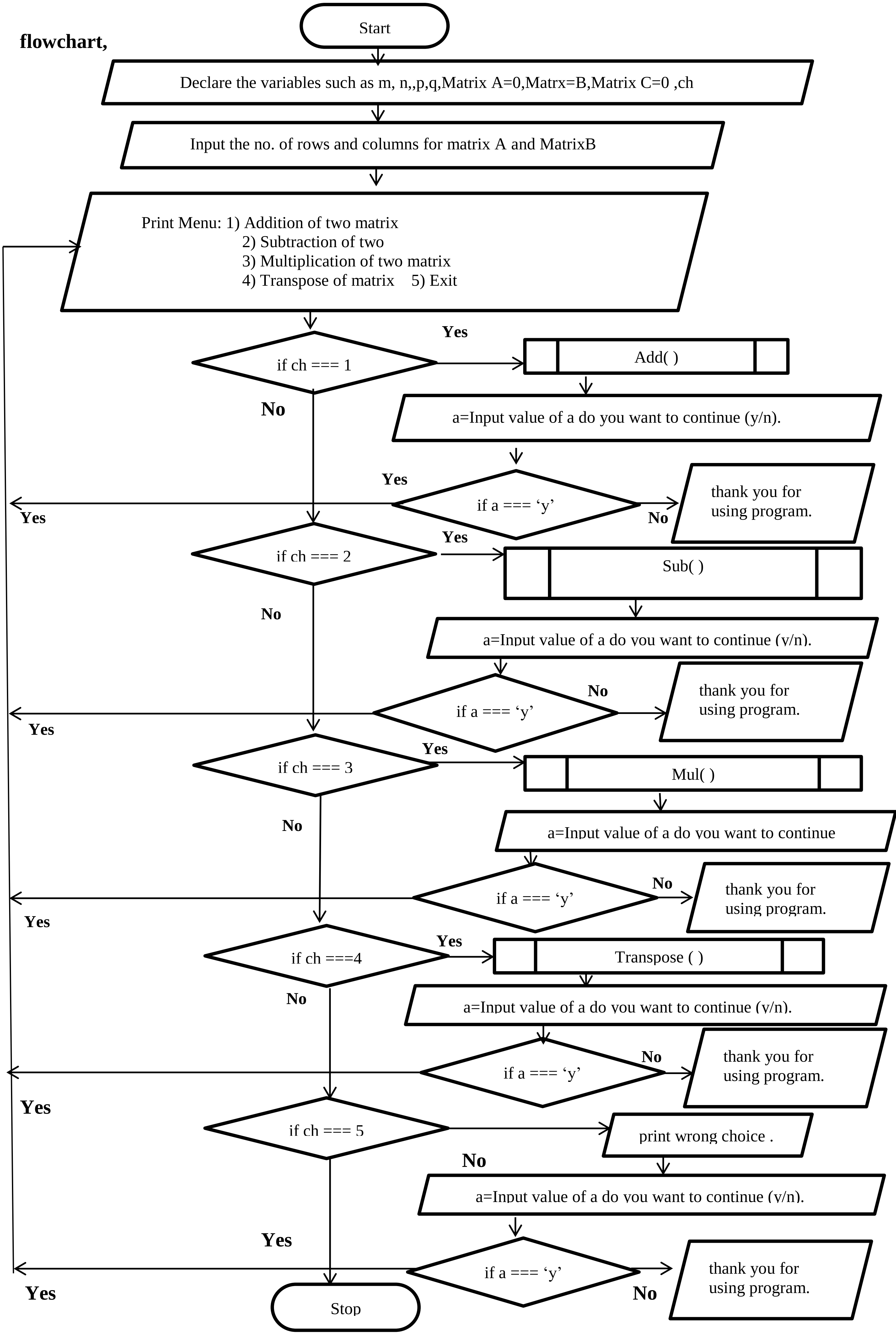
a= input value of a Do you want to continue(y/n)

if a=="y" then go to step 5

print Thank you for using this program!

11) Stop

flowchart,


Start
Declare the variables such as m, n,,p,q,Matrix A=0,Matrx=B,Matrix C=0 ,ch
Input the no. of rows and columns for matrix A and MatrixB
Print Menu: 1) Addition of two matrix
2) Subtraction of two
3) Multiplication of two matrix
4) Transpose of matrix 5) Exit
if ch === 1
Yes
Add( )
No
a=Input value of a do you want to continue (y/n).
Yes
if a === ‘y’
No
thank you for using program.
Yes
if ch === 2
Yes
Sub( )
No
a=Input value of a do you want to continue (y/n).
if a === ‘y’
No
thank you for using program.
Yes
if ch === 3
Yes
Mul( )
No
a=Input value of a do you want to continue
if a === ‘y’
No
thank you for using program.
Yes
if ch ===4
Yes
Transpose ( )
No
a=Input value of a do you want to continue (y/n).
if a === ‘y’
No
thank you for using program.
Yes
if ch === 5
print wrong choice .
No
a=Input value of a do you want to continue (y/n).
Yes
if a === ‘y’
thank you for using program.
Yes
No
Stop

Conclusion:

By this way, we perform operation on matrix successfully.