

VIVEKANANDA COLLEGE THAKURPUKUR KOLKATA-700063

NAAC ACCREDITED 'A' GRADE



Topic: Determinant of a Matrix

Course Title: Computer Practical

Paper: PHY 425

Unit: N.A.

Semester: M.Sc. Second Semester

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Name of the Department: Physics

Determinant of a matrix

c Determinant of a matrix by Pivotal Condensation method

```

Dimension a(10,10)
Write(*,*)"Enter the order of matrix"
Read(*,*)n
Write (*,*)"Enter the matrix"
Do i = 1,n
Read(*,*)(a(i,j), j = 1,n)
End do
Do k = 1,n-1
Do i = k+1,n
Ratio = a(i,k)/a(k,k)
do j = 1,n
a(i,j) = a(i,j) - Ratio*a(k,j)  !To make lower triangular terms of matrix 0
End do
End do
End do
Det = 1.0
Do i = 1,n
Det = Det*a(i,i)          !Product of diagonal terms
End do
Write(*,*)"The determinant is", Det
Stop
End

```

The above method of finding determinant of a matrix is based on Chio's Pivotal Condensation method. In this method, a matrix is converted into a upper triangular matrix using different algorithms like, $a_{ij} \rightarrow a_{ij} - ratio * a_{kj}$.

Lower triangular terms of a upper triangular matrix should be zero. Let A be a matrix which converted into an upper triangular matrix B. Then,

$$A = \begin{pmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{pmatrix} = B = \begin{pmatrix} b_{11} & b_{12} & b_{13} \\ 0 & b_{22} & b_{23} \\ 0 & 0 & b_{33} \end{pmatrix}$$

Product of the diagonal terms of an upper triangular matrix is the determinant of that matrix.

So, here , $\det(A) = b_{11} * b_{22} * b_{33}$

Try with

$$\begin{pmatrix} 1 & 2 & -3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{pmatrix}, \begin{pmatrix} 1 & 1 & 1 \\ 1 & 2 & 3 \\ 1 & 4 & 9 \end{pmatrix}, \begin{pmatrix} 2 & 4 & 6 & 8 \\ 3 & 1 & 2 & 1 \\ 1 & 2 & -2 & 2 \\ 2 & 3 & 4 & 1 \end{pmatrix}$$

Ans: 18.0 2.0 -228.0

You can use format to write the output

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Determinant of a matrix by Pivotal Condensation method

```
c  Determinant of a matrix by Pivotal Condensation method using Subroutine
Dimension a(10,10)
Write(*,*)"Enter the order of matrix"
Read(*,*)n
Write (*,*)"Enter the matrix"
Do i = 1,n
Read(*,*)(a(i,j), j = 1,n)
End do
Call Matrix(n,a,det)
Write(*,*)"The determinant is", Det
Do i = 1,n
Write(*,*)(a(i,j), j = 1,n) !To see upper triangular matrix whose lower triangular terms are zero
End do
Stop
End
```

```
Subroutine Matrix(n,a,det)
Dimension a(10,10) !See you have to define dimension of "a" in subroutine also
Do k = 1,n-1
Do i = k+1,n
Ratio = a(i,k)/a(k,k)
do j = 1,n
a(i,j) = a(i,j) - Ratio*a(k,j) !To make lower triangular terms of matrix 0
End do
End do
End do
Det = 1.0
Do i = 1,n
Det = Det*a(i,i) !Product of diagonal terms
End do
Return
End
```