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**ROLL NO. :** 21BCP094  
**DIV:** 2  
**GROUP :** 3

## Lab Assignment 1

1. Assume one 3 by 3 matrix as 1st row [3, 0, 0], 2nd row [0, 4, 5], and third row [0, 2, 3]. Calculate the possible eigenvalues for the matrix.

**Handwritten Solution :**

Handwritten solution for finding eigenvalues of a 3x3 matrix  $A = \begin{bmatrix} 3 & 0 & 0 \\ 0 & 4 & 5 \\ 0 & 2 & 3 \end{bmatrix}$ . The text states: "Here  $\lambda$ 's are Eigen values". The characteristic equation is derived as  $|A - \lambda I| = 0$ , leading to  $\begin{vmatrix} 3-\lambda & 0 & 0 \\ 0 & 4-\lambda & 5 \\ 0 & 2 & 3-\lambda \end{vmatrix} = 0$ . This simplifies to  $(3-\lambda)(\lambda^2 - 7\lambda + 2) = 0$ . The roots are found to be  $\lambda = 3$  and  $\lambda = \frac{7 \pm \sqrt{41}}{2}$ .

Handwritten solution for finding eigenvalues of a 3x3 matrix  $A = \begin{bmatrix} 3 & 0 & 0 \\ 0 & 4 & 5 \\ 0 & 2 & 3 \end{bmatrix}$ . The text states: "for roots". The characteristic equation is derived as  $\lambda^2 - 7\lambda + 2 = 0$ . The roots are found to be  $\lambda = 3, \frac{7 - \sqrt{41}}{2}, \frac{7 + \sqrt{41}}{2}$ . The text concludes: "Thus above are Eigen values of matrix."

**Code:**

```
import numpy as np

def user_matrix():
    print("Eigen Values can be calculated only of square matrix, Thus N=M")
    N = int(input("Enter no. of Rows (N)"))
    M = int(input("Enter no. of columns (M)"))
    if N != M:
        print("Matrix A is not square.")

    A = []
    print("Enter the elements row by row (each element separated by a space):")

    for i in range(N):
        while True:
            row = input().strip().split()
            if len(row) != M:
                print(f"Error: You must enter exactly {M} elements.")
```

```
        else:
            A.append([float(x) for x in row])
    return np.array(A)

def main():
    A = user_matrix()
    ans = np.linalg.eigvals(A).round(4)
    print("Eigen Values for your Matrix is : ",ans)

if __name__ == "__main__":
    main()
```

## Output:

```
(base) om-college@OM-M-PATEL-MACB00K-M1-AIR PR % python3 21BCP094_Lab_Assignment_1.py
Eigen Values can be calculated only of square matrix, Thus N=M
Enter no. of Rows (N)3
Enter no. of columns (M)3
Enter the elements row by row (each element separated by a space):
3 0 0
0 4 5
0 2 3
Eigen Values for your Matrix is : [0.2984 6.7016 3.    ]
```