

1. Using Python and NumPy, show that the solution obtained using Gaussian Elimination is the same as that of the normal equation. Note that the normal equation is expressed as  $\mathbf{x} = (A^T A)^{-1} A^T \mathbf{b}$ . Use the function `numpy.linalg.inv` to compute the inverse of a matrix.

```
import numpy as np

# Define the matrix A and vector b
A = np.array([
    [1000, 50, 150, 200],
    [50, 50, 100, 300],
    [100, 150, 200, 100],
    [50, 200, 300, 50],
    [200, 50, 250, 50],
    [300, 50, 50, 200]
])

b = np.array([2500, 2300, 3000, 2900, 3100, 4300])

# Gaussian Elimination (using numpy's solve
#   ↪ function)
x_gaussian = np.linalg.solve(A.T @ A, A.T @ b)

# Print both solutions
print("Solution using Gaussian Elimination:",
#   ↪ x_gaussian)
print("Solution using Normal Equation:", x_normal)
```