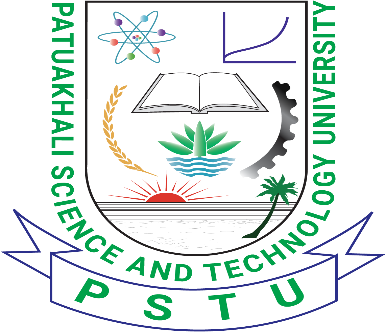
**Lab Problem: 03.**  


**Course code: CCE-312.**

**Course Title: Numerical Methods sSessional.**

**Remarks & Signature:**

**Name of the Lab Report:** Solve Real world problem and Simul equation using Gauss-elimination method.

**Submitted To**

**Professor Dr. Md. Samsuzzaman.**

**Chairman,**

**Department of Computer and Communication Engineering.**

**Faculty of Computer Science & Engineering.**

**Submitted By**

**HASAN AHAMMAD**

**ID No: 1902073**

**Reg No: 08779**

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**Faculty of Computer Science & Engineering.**

**Patuakhali Science & Technology University.**

**Dumki, Patuakhali-8602.**

1. **Consider an online store selling T-shirts (T) and Hoodies (H). The prices are as follows:**

* **A T-shirt costs $10.**
* **A Hoodie costs $20.**

**A customer buys three items (either T-shirts or Hoodies) for a total cost of $50. How many T-shirts (x) and Hoodies(y) did the customer buy?**

**Solve Using Gauss-elimination method after that implement it using Python.**

* Solve using Gauss-elimination method.

The objective is to find the values of x and y that satisfy the following system of linear equations:

10x + 20y=50 (Total cost)

x + y=3 (Total Number of items)

Converting given equations into matrix form

R2<-R2-0.1 x R1

10x+20y=50 --------------------------------------------------------------(i)

-y=-2------------------------------------------------------------------(ii)

Now, use back substitution method from (ii)

y=2

Using y=2 in (i) we find:

x=1

so, the customer bought x=1 Shirts and y=2 Hoodie

* **Implement using Python:**
* import numpy as np  
  coefficients = np.array([[10, 20], [1, 1]])  
    
  constants = np.array([50, 3])  
    
  augmented\_matrix = np.column\_stack((coefficients, constants))  
    
  n = len(constants)  
    
  for i in range(n):  
   augmented\_matrix[i, :] = augmented\_matrix[i, :] / augmented\_matrix[i, i]  
    
   for j in range(n):  
   if i != j:  
   augmented\_matrix[j, :] -= augmented\_matrix[j, i] \* augmented\_matrix[i, :]  
    
  solutions = augmented\_matrix[:, -1]  
    
  print("Number of T-shirts (x):", solutions[0])  
  print("Number of Hoodies (y):", solutions[1])

1. **Solve the following system by the Gauss-Elimination method and Implement it using Python.**

**3x1+.1x2-.2x3 = 7.85**

**.1x1+7x2-.3x3 = -19.3**

**.3x1-2x2+10x3 = 71.4**

**Soln:** We'll create the augmented matrix and perform row operations:

**Step 1:** Perform row operations to create zeros below the leading coefficient in the first column.

* R2 = R2 - (0.1/3) \* R1
* R3 = R3 - (0.3/3) \* R1

The augmented matrix becomes:

**Step 2:** Create zeros below the leading coefficient in the second column.

* R3 = R3 + (2.01/6.97) \* R2

The augmented matrix becomes:

**Step 3:** Solve for x3 using the last row:

9.935x3 = 64.99774

x3 ≈ 64.99774/ 9.935

x3 ≈ 6.54

**Step 4:** Substitute the value of x3 into the second row to solve for x2:

6.99967x2 - 0.2933x3 = -19.56167

6.99967x2 - -0.2933(6.54) = -19.56167

6.99967x2 - 1.98 ≈ -19.56167

6.99967x2 ≈ -19.56167 + 1.98

6.99967x2 ≈ -17.5817

x2 ≈ -17.5817/ 6.99967

x2 ≈ -2.51

**Step 5:** Substitute the values of x2 and x3 into the first row to solve for x1:

3x1 + 0.1x2 - 0.2x3 = 7.85

3x1 + 0.1(-2.51) - 0.2(6.54) ≈ 7.85

3x1 - 0.251 – 1.308 ≈ 7.85

3x1 ≈ 7.85 + 1.559

3x1 ≈ 9.409

x1 ≈ 9.409 / 3

x1 ≈ 3.136

Please check the calculation twice

* **Implement using python:**
* import numpy as np  
  coefficients = np.array([[3, 0.1, -0.2],  
   [0.1, 7, -0.3],  
   [0.3, -2, 10]])  
  constants = np.array([7.85, -19.3, 71.4])  
  augmented\_matrix = np.column\_stack((coefficients, constants))  
    
  # Perform Gaussian elimination  
  n = len(constants)  
    
  for i in range(n):  
   augmented\_matrix[i, :] = augmented\_matrix[i, :] / augmented\_matrix[i, i]  
    
   for j in range(n):  
   if i != j:  
   augmented\_matrix[j, :] -= augmented\_matrix[j, i] \* augmented\_matrix[i, :]  
    
  solutions = augmented\_matrix[:, -1]  
    
  print("Solution:")  
  for i, sol in enumerate(solutions):  
   print(f"x{i + 1} =", sol)