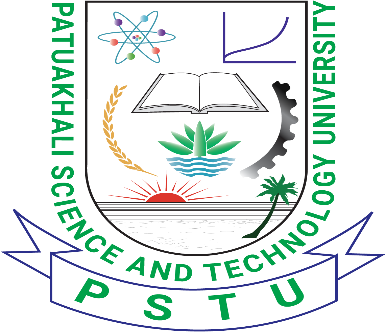
**Lab Problem: 05.**  


**Course code: CCE-312.**

**Course Title: Numerical Methods sessional.**

**Remarks & Signature:**

**Name of the Lab Report:** Solve Real world problem and Simul equation using Cramer’s rule after that implement it by Python.

**Submitted To**

**Professor Dr. Md. Samsuzzaman.**

**Professor,**

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**Level- 3, Semester- 1**

**Session: 2019-2020**

**Faculty of Computer Science & Engineering.**

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1. **A total of 8,500 taka was invested in three interest earning accounts. The interest rates were 2%,3% and 6% if the total simple interest for one year was 380 taka and the amount invested at 6% was equal to the sum of the amounts in the other two accounts, then how much was invested in each account? (Use Cramer’s rule) and implement with python.**

Let the amounts invested in the three accounts be Tk. x, Tk. y and Tk. z

Interest for the three accounts are (2/100)x, (3/100)y and (6/100)z

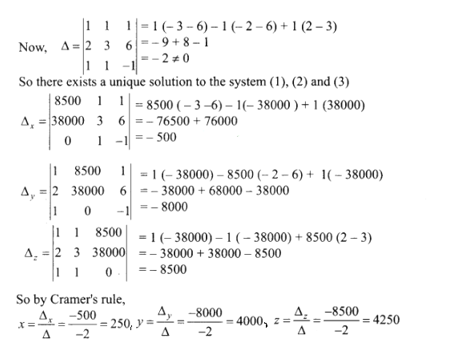
According to the problem,

x + y + z = 8500 ……..…………………………………………… (1)

(2/100)x + (3/100)y + (6/100)z (or) multiplying by 100,

2x + 3y + 6z = 38000 ……………………………………………. (2)

z = x + y or x + y - z = 0............................................. (3)



Thus the amount invested at 2% is Tk. 250, at 3% is Tk. 4000 and at 6% is Tk. 4250.

* **Implement using Python:**
* import numpy as np  
    
  coefficients = np.array([[1, 1, 1],  
   [2, 3, 6],  
   [1, 1, -1]])  
    
  constants = np.array([8500, 38000, 0])  
    
  det\_coefficients = np.linalg.det(coefficients)  
    
    
  coefficients\_x = coefficients.copy()  
  coefficients\_x[:, 0] = constants  
    
  coefficients\_y = coefficients.copy()  
  coefficients\_y[:, 1] = constants  
    
  coefficients\_z = coefficients.copy()  
  coefficients\_z[:, 2] = constants  
    
    
  det\_x = np.linalg.det(coefficients\_x)  
  det\_y = np.linalg.det(coefficients\_y)  
  det\_z = np.linalg.det(coefficients\_z)  
    
    
  solution\_x = det\_x / det\_coefficients  
  solution\_y = det\_y / det\_coefficients  
  solution\_z = det\_z / det\_coefficients  
    
  print("Solution:")  
  print(f"x = {solution\_x}")  
  print(f"y = {solution\_y}")  
  print(f"z = {solution\_z}")
* Using Cramer's rule solve the following after that implement it using Python.

.3x1+.52x2+x3=0.01

.5x1+.3x2+.5x3=.67

.1x1+.3x2+.5x3=-.44

**Soln:** Let us write these equations in the form AX=B

D=|A|==.3(.5x.3-.5x.3)-.52(.5x.5-.5x.1)+1(.5x.3-.3x.1)=0.016

Dx1==0.0444

Dx2== -0.1255

=0.05054

X1= Dx1/D=0.0444/0.016=2.775

X2= Dx2/D=-0.1255/0.016=-7.84375

X3=/D=0.05054/0.016=3.158

* **Implement using python:**
* import numpy as np  
  coefficients = np.array([[0.3, 0.52, 1],  
   [0.5, 0.3, 0.5],  
   [0.1, 0.3, 0.5]])  
    
  constants = np.array([0.01, 0.67, -0.44])  
    
  det\_coefficients = np.linalg.det(coefficients)  
    
  coefficients\_x = coefficients.copy()  
  coefficients\_x[:, 0] = constants  
    
  coefficients\_y = coefficients.copy()  
  coefficients\_y[:, 1] = constants  
    
  coefficients\_z = coefficients.copy()  
  coefficients\_z[:, 2] = constants  
    
  det\_x = np.linalg.det(coefficients\_x)  
  det\_y = np.linalg.det(coefficients\_y)  
  det\_z = np.linalg.det(coefficients\_z)  
    
    
  solution\_x = det\_x / det\_coefficients  
  solution\_y = det\_y / det\_coefficients  
  solution\_z = det\_z / det\_coefficients  
    
  print("Solution:")  
  print(f"x = {solution\_x}")  
  print(f"y = {solution\_y}")  
  print(f"z = {solution\_z}")