ME426: Applied Computational Methods in Mechanical Sciences

SUBMITTED BY: HIMANSHU KUMAR (16ME234) AUGUST 5, 2019

ASSIGNMENT 1

PROBLEM STATEMENT:

The upward velocity of a rocket is given at three different times.

Time 't' (in seconds)	Velocity 'v' (in m/s)
5	106.8
8	177.2
12	279.2

Velocity curve is approximated by a polynomial as : $v(t) = at^2 + bt + c \quad for \quad 5 \leq t \leq 12$

Find the value of a, b, c using gauss elimination method. Find the velocity at $t = 6s$.

Python Code:

```
import time
A = [[25,5,1],
    [64,8,1],
    [144,12,1]]
B = [106.8,177.2,279.2]
# Step 1: Gaussian elimination.
i=0
while i < 3:
    # pivots
    pivot = A[i][i]
    j=i+1
    while j<3:
        r = A[j][i]/pivot
        # row opreation
        k=i
        while k<3:
            A[j][k] = A[j][k] - A[i][k]*r
```

```
            k=k+1
        B[j]=B[j]-B[i]*r
        #print (A)
        #print (B)
        #print("\n")
        j=j+1
    i=i+1
#Step 2: Back Substitution from nth row
x= [0]*3
n=3
i = n-1
x[i] = B[i]/A[i][i]
i=i-1
while i>=0:
    sum = 0
    k=i+1
    while k<n:
        #print("kth")
        sum = sum + A[i][k]*x[k]
        k=k+1
    x[i]=(B[i]-sum)/A[i][i]
    i=i-1
    #print("ith")
print ("\n Values of a,b,c are: ")
print (x)
print ("\n CPU time: ", time.process_time(),'s')
print ("\n Velocity at t=6s:",x[0]*6*6+x[1]*6+x[2],"m/s")
```

RESULTS:

```
Values of a,b,c are:
[0.2904761904761892, 19.690476190476197, 1.0857142857142739]
CPU time:  0.0625 s
Velocity at t=6s: 129.68571428571425 m/s
```