Pemrograman Berbasis Fungsi - RB
TA Genap 2021/2022

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Tugas Exercise

>> Exercise 1 >>

1.a.

```
#Encryption
def checkLen(psswrd, lim):
    return False if (len(psswrd) > lim) or (len(psswrd) <=0) else True
def tf1(ch, params):
    return chr(( ord(ch) // params['c'])+ params['b'])
def tf2(ch, params):
    return chr( (ord(ch) % params['c'])+ params['b'])
def tf3(firstval, secval):
    return '+' if (firstval> secval ) else '-'
def tf(ch, params):
    return tf1(ch, params)+ tf2(ch,params)+(tf3(tf1(ch, params), tf2(ch, params) ) )
def enkrip(psswrd, params):
    return ''.join ([ tf( passw, params) for passw in psswrd] )

#Decryption
def d_sisa(ch, params):
    return ord(ch) - params['b']
def d_div(ch, params):
    return d_sisa(ch, params) *params['c']
def dtf(ch1, ch2, params):
    return chr (d_div(ch1, params)+d_sisa(ch2, params))
def dekrip(psswrd, params):
    return ''.join( [ dtf(psswrd[i], psswrd[i+1] ,params) for i in range(0, len(psswrd), 3) ] )
```

```python
#Visualization
import os
def clear():
    os.system('cls' if os.name=='nt' else 'clear')
def show_password(db):
    clear()
    print('Menampilkan Password :')
    print()
    maks = max(map( lambda x: len(x[0]), db))
    maks_total= max( map(lambda x:len(x[0] + x[1] ),db) )
    hiasan = lambda n:'' .join( ['-' for i in range(n) ])
    span= 5
    connector =':'
    print( hiasan (maks_total+ span+ len(connector) ) )
    for passw in db:
        tambahan_space= maks-len(passw[0])+span
        tam = ' '.join( ['' for i in range(tambahan_space) ] )
        print( passw[0] + tam + connector + passw[1] )
        print( hiasan (maks_total+ span + len(connector) ) )

lim = 100
p ={'c': 26, 'b': 80}
db = []

print("Pilih 1 = Enkripsi dan 2 = Dekripsi")
pilih = int(input("Masukkan Pilihan : "))
if pilih == 1:
    print("Enkripsi")
    psswrd = input("Masukkan Password : ")
    if checkLen(psswrd, lim) == False:
        print("Password terlalu panjang atau kurang dari 1")
    else:
        print("Password yang di enkripsi : ", enkrip(psswrd, p))
        db.append([psswrd, enkrip(psswrd, p)])
        show_password(db)
elif pilih == 2:
    print("Dekripsi")
    psswrd = input("Masukkan Password : ")
    if checkLen(psswrd, lim) == False:
        print("Password terlalu panjang atau kurang dari 1")
    else:
        print("Password yang di dekripsi : ", dekrip(psswrd, p))
        db.append([psswrd, dekrip(psswrd, p)])
        show_password(db)
```

1.b.

```
--------------------------------------------------------------------------------
anakanakcerdas2020    :Sc-TV-Sc-TS+Sc-TV-Sc-TS+Se-Sg-TZ-Sf-Sc-T[-Qh-Qf-Qh-Qf-
--------------------------------------------------------------------------------
```

1.c.

```
----------------------------------------------------------------------------------------
Sc-TV-Sc-TS+T[-Sc-TQ+TV-T[-Sf-Sc-T\-Sc-Qh-Qf-Qh-Qf-TS+Sg-Se-Sg-    :anaksainsdata2020kece
----------------------------------------------------------------------------------------
```

>> Exercise 2 >>

- File txt Bilangan Pertama

PBF > exercise2 > bilangan1.txt

```
1   9502561694858652150281747994108545943651521215096841995237040384498740803993469376602031341619585763
```

- File txt Bilangan Kedua

PBF > exercise2 > bilangan2.txt

```
1   2116068642696162934965789080530992805391900568978958496201555855833896833372295507803936243187061092
```

- Main Program untuk menghitung penjumlahan Big Number Tersebut

PBF > exercise2 > main.py > ...

```python
with open('bilangan1.txt','r') as x:
    ConvertString1 = x.read()
    ConvertString1 = int(ConvertString1)
    #Cek Import Data
    print('Nilai Bilangan 1 adalah : ', ConvertString1)

with open('bilangan2.txt','r') as y:
    ConvertString2 = y.read()
    ConvertString2 = int(ConvertString2)
    #Cek Import Data
    print('Nilai Bilangan 2 adalah : ', ConvertString2)

def Jumlah():
    return ConvertString1 + ConvertString2

print('Hasil dari penjumlahan 100 digit bilangan adalah : ',Jumlah())
```

- Hasil Output dari Penjumlahan Big Number

```
D:\PYTHON\PBF\exercise2>C:/Users/ASUS/AppData/Local/Programs/Python/Python310/python.exe d:/PYTHON/PBF/exercise2/main.py
Nilai Bilangan 1 adalah :  9502561694858652150281747994108545943651521215096841995237040384498740803993469376602031341619585763
Nilai Bilangan 2 adalah :  2116068642696162934965789080530992805391900568978958496201555855833896833372295507803936243187061092
Hasil dari penjumlahan 100 digit bilangan adalah :  1161863033755481508524753707463953874904342178407580049143859624033263763736576488440596758480646855
```

>> Exercise 3 >>

1. Apakah modul solver.py dapat digunakan untuk menyelesaikan persamaan differensial orde 2 selain kasus non linear pendulum? Jelaskan mengapa!
   Bisa, Karena pada modul solver.py terdapat rumus matematika yang dapat menyelesaikan persamaan differencial orde 2 selain kasus Non Linear Pendulum
2. Implementasikan solver tersebut dengan cara membuat file solver.py

module > solver.py > ...

```python
def euler(t,h,y,dy,Func):
    d2y = Func(t,y,dy)
    y_next = y + (h * dy)
    dy_next = dy + (h * d2y)
    return ( y_next, dy_next )

def euler_cromer(t,h,y,dy,Func):
    d2y = Func(t, y, dy)
    dy_next = dy + (h * d2y)
    y_next = y + (h * dy_next)

    return (y_next, dy_next)

```

3. Untuk menyelesaikan persamaan dengan solver.py, bentuk fungsi harus diubah menjadi:

$$\frac{d^2\alpha}{dt^2} = -\frac{g}{L} * sin(\alpha)$$

Definisikan fungsi Func sebagai fungsi yang me return nilai -g/L * sin(a) !

```python
g = 9.81
l = 1
k = 0
u0 = 0.5 * pi
du0 = 0
t0 = 0
t_akhir = 4
h = 0.01
w0 = g/l

def Func(t,u,du):
    return -w0 * sin(u) - k*du
```

4. Menggunakan Parameter Parameter yang ada dalam tabel diatas, buatlah program yang menggunakan solver.py untuk menemukan solusi persamaan diferensial non linear tersebut! Hint(Solusi Akhir berupa plot)

module > solver.py > ...

```python
def euler(t,h,y,dy,Func):
    d2y = Func(t,y,dy)
    y_next = y + (h * dy)
    dy_next = dy + (h * d2y)
    return ( y_next, dy_next )

def euler_cromer(t,h,y,dy,Func):
    d2y = Func(t, y, dy)
    dy_next = dy + (h * d2y)
    y_next = y + (h * dy_next)

    return (y_next, dy_next)

```

module > metode_euler.py > ...

```python
from solver import *

def cauchy_euler(params,Func):
    # Initial Condition
    t0 = params['t0']
    t_akhir = params['t_akhir']
    h = params['h']
    y0 = params['y0']
    dy0 = params['dy0']

    res_euler = []
    t = []
    step = int((t_akhir - t0) / h)

    for i in range(step):
        tm = (i + 1) * h
        (y_next, dy_next) = euler(tm, h, y0, dy0, Func)
        res_euler.append(y_next)
        t.append(tm)
        y0 = y_next
        dy0 = dy_next

    return (t,res_euler)

def cauchy_eulercromer(params,Func):
    # Initial Condition
    t0 = params['t0']
    t_akhir = params['t_akhir']
    h = params['h']
    y0 = params['y0']
    dy0 = params['dy0']

    res_euler_cromer = []
    t = []
    step = int((t_akhir - t0) / h)

    for i in range(step):
        tm = (i + 1) * h
        (y_next, dy_next) = euler_cromer(tm, h, y0, dy0, Func)
        res_euler_cromer.append(y_next)
        t.append(tm)
        y0 = y_next
        dy0 = dy_next
    return (t, res_euler_cromer)
```

$$\frac{d^2y}{dx^2} = -y - \frac{dy}{dx} + sin^2(x)$$

5.

Perhatikan Persamaan Diferensial Diatas! Buatlah program untuk menyelesaikan PD tersebut dengan menggunakan solver.py sebagai modul dengan parameter berikut!

Parameter	Deskripsi	Value
X_0	X awal	0
X_n	X akhir	50
h	Step Size	0.05
y(X_0) = y_0	Nilai awal Y	1
y'(X_0) = y'_0	Nilai awal dy/dx	-9/2

```python
from solver import *
from math import *
import matplotlib.pyplot as plt
from metode_euler import *


def Func(t,y,dy):
    return (-1 *y) + (-1 * dy) + sin(t)**2

def eksak(t):
    return ((5/13)*exp(-0.5*t) * cos( 0.5 * sqrt(3) * t ) ) - ( 108/(13 * sqrt(3)) * exp(-0.5*t) * sin(0.5 * sqrt(3) * t )  ) + 0.5 + ((3/26) * cos(2*t)) - ((1/13)*sin(2*t))

def solusi_analitik(params):
    t0 = params['t0']
    t_akhir = params['t_akhir']
    h = params['h']
    step = int((t_akhir - t0) / h)
    t = []
    res_eksak = []
    for i in range(step):
        tm = (i + 1) * h
        y_next = eksak(tm)
        res_eksak.append(y_next)
        t.append(tm)
    return (t,res_eksak)

params = {
    't0' : 0,
    "t_akhir" : 50,
    "h" : 5 * 10**-2,
    "y0" : 1,
    "dy0" : -9/2
}

params2 = {
    't0' : 0,
    "t_akhir" : 50,
    "h" : 5 * 10**-1,
    "y0" : 1,
    "dy0" : -9/2
}
```

```
res_eksak = []
res_euler = []
res_euler_2 = []
res_eulercromer = []
res_eulercromer_2 = []
t = []

plt.subplot(2,1,1)


# Plot Euler
(t,res_eksak) = solusi_analitik(params)
plt.plot(t,res_eksak,color='y',label='Solusi Analitik')

(t,res_euler) = cauchy_euler(params,Func)
plt.plot(t,res_euler,color='g', label = 'h = 0.05')

(t,res_euler_2) = cauchy_euler(params2,Func)
plt.plot(t,res_euler_2,color='r',label = 'h = 0.5')
plt.title('Metode Euler')
plt.xlabel('t')
plt.ylabel('y(t)')
plt.ylim(-4,2)
plt.legend()

plt.subplot(2,1,2)

(t,res_eksak) = solusi_analitik(params)
plt.plot(t,res_eksak,color='y',label='Solusi Analitik')

(t,res_eulercromer) = cauchy_eulercromer(params,Func)
plt.plot(t,res_eulercromer,color='g', label = 'h = 0.05')

(t,res_eulercromer_2) = cauchy_eulercromer(params2,Func)
plt.plot(t,res_eulercromer_2,color='r',label = 'h = 0.5')
plt.title('Metode Euler-Cromer')
plt.xlabel('t')
plt.ylabel('y(t)')
plt.ylim(-4,2)
plt.legend()

plt.figure()
```

```
plt.figure()

(t,res_eksak) = solusi_analitik(params2)
plt.plot(t,res_eksak,color='y',label='Solusi Analitik')

(t,res_euler_2) = cauchy_euler(params2,Func)
plt.plot(t,res_euler_2,color='r',label = 'Euler ')

(t,res_eulercromer_2) = cauchy_eulercromer(params2,Func)
plt.plot(t,res_eulercromer_2,color='b',label = 'Euler-Cromer')
plt.title('Euler vs Euler-Cromer at h= 0.5')
plt.xlabel('t')
plt.ylabel('y(t)')
plt.ylim(-4,2)
plt.legend()



plt.show()
```

>> Exercise 4 >>

1.

```python
#Menghitung goal yang dicetak oleh tim tuan rumah
def tuanRumah(homeRating,awayRating):
    global lamda1
    global x
    global y
    if x == y:
        raise ValueError
    else:
        lamb = lamda1**(int(homeRating)-int(awayRating))
        homeScore = 0
        z = random.random()
        while z > 0:
            z = z - ((lamb**homeScore * math.exp(lamb * -1))/(math.factorial(homeScore)))
            homeScore += 1
        return (homeScore-1)

#Menghitung goal yang dicetak oleh tim lawan
def timLawan(homeRating,awayRating):
    global lamda2
    global x
    global y
    #Pengecekan untuk menghentikan pemain
    if x == y:
        raise ValueError
    else:
        lamb = lamda2**(int(homeRating)-int(awayRating))
        awayScore = 0
        z = random.random()
        while z > 0:
            z = z - ((lamb**awayScore * math.exp(lamb * -1))/(math.factorial(awayScore)))
            awayScore += 1
        return (awayScore-1)
```

2.

```
for x in range(leagueSize):
    print(namatim[x] + " Pertandingan Kandang : ")
    print("----------------------------------------\n")
    for y in range(leagueSize):
        error = 0
        try:
            homeScore = tuanRumah(skill[x],skill[y])
        except ValueError:
            pass
            error += 1
        try:
            awayScore = timLawan(skill[x],skill[y])
        except ValueError:
            pass
        if error == 0:
            #Update List
            print(namatim[x],homeScore,"-",awayScore,namatim[y],"\n")
            teamFor[x] += homeScore
            teamFor[y] += awayScore
            perlawanan[x] += awayScore
            perlawanan[y] += homeScore
            if homeScore > awayScore:
                kemenangan[x] += 1
                kekalahan[y] += 1
                point_tim[x] += 3
            elif homeScore == awayScore:
                seri[x] += 1
                seri[y] += 1
                point_tim[x] += 1
                point_tim[y] += 1
            else:
                kemenangan[y] += 1
                kekalahan[x] += 1
                point_tim[y] += 3
        else:
            pass
```

3.

```
D:\PYTHON>C:/Users/ASUS/AppData/Local/Programs/Python/Python310/python.exe "d:/PYTHON/PBF/Tugas4_PBF_120450016_Masayu Franstika.py"
Masukan Jumlah Tim Dalam Liga : 2
Tim  : 1 Nama Tim: Madrid
Tim  : 2 Nama Tim: Arsenal
Nama Tim : Madrid Peringkat : 80
Nama Tim : Arsenal Peringkat : 79
Madrid Pertandingan Kandang :
-----------------------------------------

Madrid 1 - 0 Arsenal

Arsenal Pertandingan Kandang :
-----------------------------------------

Arsenal 1 - 1 Madrid

Hasil Akhir :
Madrid          Peringkat : 80    Point: 4    For: 2    Perlawanan: 1    Selisih Gol: 1    Menang : 1    Seri : 1    Kalah : 0
Arsenal         Peringkat : 79    Point: 1    For: 1    Perlawanan: 2    Selisih Gol: -1   Menang : 0    Seri : 1    Kalah : 1
[1, 4]
```