SEE1002, Semester B, 2021/22
Final Examination
30 April 2022

There are 5 questions. The total is 85 marks. One sheet of handwritten A4 notes (one side only) is allowed. No other aids are permitted.

I. [**8 marks**] Complete the sentences by filling in the blanks OR choosing the best answer. You can assume that the sentences refer to Python 3.

1. A variable defined inside an explicit main has _____ scope.
2. The *(a) columns; (b) rows; (c) numbers; (d) labels* of a CSV file are separated by a delimiter.
3. A Python variable name can include *(a) -; (b) +; (c) %; (d) _*.
4. A list of lists can be used to represent a _____ .
5. *(a) while; (b) for; (c) if; (d) def* is typically used for repeated testing.
6. Sequential access is always used for _____ files.
7. A *(a) module; (b) function; (c) list ; (d) a file object* is needed in order to access a file.
8. A Python function _____ returns a value.

II. **[30 marks]** What is the output from the following code fragments?

1. (3 marks)

```
list3d = [ [[0,1],[1,2]], [[3,4],[5,6]] ]
print( list3d[0][0][1] )
print( list3d[0][1] )
print( list3d[-1][1][0] )
```

2. (3 marks)

```
l=[]
string='absolutelynothing'
for i in range(0,5,2):
    l.append(string[i]+'-'+string[i+1])
print( l[0]+l[2] )
```

3. (2 marks)

```
f1=open('opfile.txt','w')
f1.write('2 \n')
f1.close()
f1=open('opfile.txt','a')
f1.write('1 \n')
f1.close()

f2=open('opfile.txt','r')
for i in range(2):
    x=f2.readline()
    print (x, end='')
f2.close()
```

4. (2 marks)

```
list1=[0,1,3]
list2=[2,4,6]
newlist=list1+list2
print( newlist[2:4] )
```

5. (4 marks)

```
def residual(x):
    return(abs(x**2-1.0))

def decrease(x):
    return(0.5*x)

def main():
    x=4.0
    while(residual(x)>1.0):
        print('{:.2f} is not a root'.format(x) )
        x=decrease(x)
    print()
    print('root={:.2f}'.format(x) )

main()
```

6. (2 marks)

```
for i in range(2,10):
    if int(i**0.5)-i**0.5 == 0:
        print(i,end=' ')
    else:
        pass
```

7. (2 marks)

```
def treble(x):
    print( y )
    x=3.0*x
    return

y=2
treble(x)
print( x )
```

8. (2 marks)

```
N=3
L=1.0
dx = L/(N-1)

for i in range(N):
    x = i*dx
    if x>= 0.5:
        print('i=',i,'x=',x)
```

9. (3 marks)

```
from math import log
for i in range(2):
    try:
        print( 'The natural log of {:d} is {:.2f}'.format(i
           ,log(i)) )
    except:
        print( 'Error: log is not defined for {:d}'.format(
           i) )
```

10. (5 marks)

```
string1 = 'Let us go, through certain half-deserted streets
   '
string2 = 'Oh, do not ask, "What is it?"'
bigstring = ''
for string in [string1, string2]:
    bigstring += string
bigstring = bigstring.split(',')
print( bigstring[2] + bigstring[0] +  bigstring[3] )
```

11. (2 marks)

```
item1 = {'colour':'blue', 'name':'shirt', 'price':150}
item2 = {'colour':'green', 'name':'jacket', 'price':450}
item3 = {'colour':'black', 'name':'shoes', 'price':900}
items = [item1, item2, item3]
print( 'colour={:s}'.format(items[0]['colour']) )
print( 'price={:.0f}'.format(items[2]['price']) )
```

III. [**16 marks**] Each of following code fragments contains several errors. Identify and fix them. Sample output is shown.

1. This program is supposed to calculate the area of a trapezoid, $area = \frac{1}{2}b(s1 + s2)$.

```
1  def areaTrap(b,s1,s2):
2      area=0.5*b*(s1+s2)
3      return
4
5  def get_params():
6      params=input('Enter b,s1,s2:')
7      for i in range(3):
8          params=float(params[i])
9
10
11 main()
12
13 def main():
14     get_params()
15     print('Area of the trapezoid=',areaTrap() )
```

```
Enter b,s1,s2:1,2,3
The area of the trapezoid= 2.5
```

2. This program is supposed to prompt a user repeatedly to enter a number between 0 and 5. For each valid number entered, the corresponding English word is printed. Invalid input generates a warning but does not raise an exception. Entering -1 causes the program to terminate.

```
1  names = ['zero', 'one', 'two', 'three', 'four', 'five']
2
3  numdict = ()
4  for i in range(5):
5      numdict.update( (i:names) )
6
7  while True:
8
9      try:
10         number = input('Enter a number between 0 and 5;
               enter a negative number to quit: ')
11         print('{:d} is called {:d}'.format(number,numdict[
               number]))
12
13         if number < 0:
14             pass
15
16     except:
17         print('Illegal input. Enter a valid number.')
18         return
```

```
Enter a number between 0 and 5; enter a negative number to quit: abc
Illegal input. Please enter a valid number.

Enter a number between 0 and 5; enter a negative number to quit: 4
4 is called four

Enter a number between 0 and 5; enter a negative number to quit: 6
Illegal input. Please enter a valid number.

Enter a number between 0 and 5; enter a negative number to quit: -1
```

IV. [**19 marks**] You have been given a textfile `met.dat` that contains the following data:

```
# Meteorological data for March 2022
date,temperature(C),p(hPa)
03/01/2022,23.0,1003
04/02/2022,N.A.,N.A.
05/03/2022,24.1,1001
[...]
```

Requirements:

1. The temperature and pressure should be stored in separate variables.
2. Count the number of days for which the data are recorded. On days for which no data are available, 'N.A' is recorded.
3. Print the average temperature and pressure (in degrees Celsius and hPa, respectively) to one decimal place.
4. The average should be calculated using a function.
5. All variables must have local scope.

Sample output:

```
Number of days on which data are recorded: 2
average temp: 23.6
average pressure: 1002.0
```

Hints.
1. Choose an appropriate data structure.
2. The file contains text and numbers.
3. The program should work with files containing any number of days.

V. [**12 marks**] Write a program that asks a user to enter a specified number of words and generates a sentence containing twice as many words as the original list. Requirements:

1. Each word in the sentence should be chosen randomly from the original list of words.
2. Capitalise the words with probability = 1/4 (otherwise leave them unchanged).
3. Separate each word by a space.
4. The sentence should end with a period.
5. Use an explicit main containing two lines only (apart from the declaration).

Sample output:

```
How many words?: 5

Enter a word: I

Enter a word: ice

Enter a word: cream

Enter a word: don't

Enter a word: like

 I  I  I  ice like don't I  I  LIKE cream.
```

-END-