PROGRAMMING (CT240)

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Time allowed: *one* hour.
Attempt *three* questions.

1. (a) Given

```
s = ['a', [1,'ab'], 25]
```

state whether or not each of the following is valid, and if valid, state the value and the data type:

i. `s[0]`
ii. `s[2][0]`
iii. `s[1][1][1]`
iv. `s[-2:]`
v. `s[1][1][:1]`
vi. `s[1][0][1]`

(b) Explain (with a short example) the difference between `break` and `continue` as used in a `for` loop.

2. (a) Explain the general principles of the *Greedy Strategy* when designing an algorithm.

(b) Suppose you are given a bag of capacity $K = 9$ kg, and 5 items with weights $w(i) = 3, 5, 6, 2, 7$ kg and corresponding values $v(i) = 8, 17, 16, 4, 15$ euro. State what choices the Greedy Strategy would make based on

i. minimizing the weight.
ii. maximizing the value.

Do either of these correspond to the best answer?

3. The Fibonacci Numbers are given by

$$1, 1, 2, 3, 5, 8, 13, 21, 34, 55, \ldots$$

where each number is the addition of the previous two numbers. Write code in PYTHON to calculate the nth Fibonacci Number (using any method you choose). (The user should be asked to `input` the number n to your program.)

4. (a) There are a number of errors in the following PYTHON code. Spot and explain 4 of them:

```
import sys
j=sys.argv[0]
x=len(sys.argv)
for i in range(x+1)
  if i>j:
    print sys.argv[i]
  else
    print sys.argv[j]
```

(b) Write a function in PYTHON which takes as input the width and height of a rectangle, and which calculates and returns both the area and perimeter length of the rectangle.