Inter-State School Of higher Education
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RESIT EXAM
LEVEL

JUNE 2022 Session
Academic year: 2021/2022

INITIATION TO ALGORITHM
SPECIALITY: Software Engineering

Duration: 1hour

Exercise 1: (8 mark)

As part of the study of the thermomechanical behaviour of an iron rod, a student needs to determine the hardness of each of these 5 specimens. For each specimen, he/she measures the hardness 3 times. He/she notes his results in a draft table T_b then draws on his report a new table T_f in a single line containing the average of the 3 harnesses measured for each of the test specimens.

Write an algorithm that captures, processes and displays these two tables (T_b and T_f) of hardness measurement.

Problem 1: (12 marks)

Let's consider the following algorithm

```
Procedure selection (Data: int N, Data/Result: int T[])
Begin
for i=1 To N-1 Do
        min ← T[i]
        for j=i+1 to N Do
                if (min>T[j]) then
                        T[i] ← T[j]
                        T[j] ← min
                        min ← T[.]
                endif
        endfor
endfor
End
```

a) Give a version of the procedure using a while loop (1.75 mark)
b) Give a version of the iterative structure using a repeat loop. (1.75 mark)

Let's define permutation as the sequences of primitive actions below:

```
T[i] ← T[j]
T[j] ← min
min ← T[i]
```

c) What are the number of permutations in terms of N found in a), b) and in a general case (4 marks)?

Let's define comparism as the condition min>T[j]:

d) What is the number of comparisms in terms of N in the inner most for loop? (1.25 marks)
e) What is the number of comparisms in terms of N in the procedure? (1.25 marks)
f) After running the program in a) and b) deduce what the procedure is doing (2 marks)

Bonus: Determine the time complexity in O(n*) (1 marks)

COURSE INSTRUCTOR: M. NDENGE