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## DEPARTMENT OF INFORMATICS

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Informatics II  
Spring 2021

Mock of Final Exam  
26.05.2021

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Name: \_\_\_\_\_ Matriculation number: \_\_\_\_\_

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### About Exam

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You have 90 minutes to answer the questions; you have 20 minutes to download the exam questions and submit your solutions through EPIS. Only submissions through EPIS are accepted, and only PDF files are accepted.

Submit your solution in one of the following ways:

1. You can print the pdf file, use the available whitespace to fill in your solution, scan your solution, and upload the pdf file to EPIS.
2. You can use blank white paper for your solutions, scan the sheets, and upload the pdf file to EPIS. Put your name and matriculation number on every sheet. State all task numbers clearly.
3. You can use a tablet and pen (iPad, Surface, etc) to fill in your solution directly into the pdf file and upload the completed pdf file to EPIS.
4. You can use a text editor to answer the questions and submit the document as pdf.

Notes:

- If you do not have scanner it is possible to take pictures of your solution with your phone. We recommend Microsoft Office Lens or CamScanner. Create a pdf file that includes all pictures and submit a single pdf file.
- The 20 minutes include downloading exams, preparing your solutions for your submission, and submitting the PDF files through EPIS.
- We suggest that you submit your solutions several minutes earlier than the deadline.
- You bear the risk for your last-minute submission.

Signature:

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Correction slot

Please do not fill out the part below

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Exercise				Total
Points Achieved				
Maximum Points				

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**Exercise 1**

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- 1.1 [10 points] Assume a non-negative decimal number is represented as an array of single decimal digits with the least significant digit at the end. For example, 123 is represented with array **A** where  $A[0] = 1$ ,  $A[1] = 2$ , and  $A[2] = 3$ . Consider two non-negative integers that are represented with arrays **A** and **B**. The arrays have the same length  $n$ . Implement a C function `int sum(int A[], int B[], int n)` that computes and returns the sum of **A** and **B**. Give your solution in C; pseudocode is not accepted.

```
int sum(int A[], int B[], int n){
    int cur_sum = 0;
    for (int i = n-1; i ≥ 0; --i){
        cur_sum = cur_sum + B[i] * 10(n-i)
                + A[i] * 10(n-i);
    }
    return cur_sum;
}
```

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- 1.2 [13 points] Consider algorithm **Algo1** shown below. Input array **A** contains  $n$  **distinct** integers in the range from 0 to  $n - 1$ .

**Algorithm: Algo1(A,n)**

```

1 index = 0;
2 while index ≤ n - 1 do
3   while index ≠ A[index] do
4     temp = A[index];
5     A[index] = A[temp];
6     A[temp] = temp;
7   index = index + 1;
```

- (a) [5 points] Apply the algorithm on array **A** = [4, 6, 5, 1, 3, 2, 0]. Complete the table below to show step-by-step how **A** is modified. The first line of the table shows the initial state of array **A**.

index	A[0]	A[1]	A[2]	A[3]	A[4]	A[5]	A[6]
-	4	6	5	1	3	2	0

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- (b) [2 points] What does algorithm **Algo1** do?

- (c) [2 points] What is the asymptotic complexity of algorithm **Algo1** in the worst case? Explain.

- (d) [2 points] What is the asymptotic complexity of algorithm **Algo1** in the best case? Explain

- (e) [2 points] Precisely quantify the costs of the computations that are done in the worst case but not in the best case.