

This exam contains 4 questions. Total of points is 10.

Grade Table (for teacher use only)

Question	Points	Score
1	1	
2	3	
3	4	
4	2	
Total:	10	

Remarks:

- All subjects are mandatory.
 - All the results must be accompanied with detailed solution.
 - Carefully read and apply the instructions from the Exam assignment on Google Classroom.
1. (1 point) Write a Java regular expression to describe valid IP addresses of the form a.b.c.d where each letter can represent 1, 2, or 3 digits, and the periods are required. Example: 196.26.155.241.
 2. (3 points) (a) (0.10 + 0.10 points) What is an algorithm for DFA minimization doing and what are its benefits? (b) (0.10 + 0.70 points) Give example of such an algorithm and explain its steps. (c) (2 points) Minimize the following DFA using the algorithm at (b). Explain all decisions and steps:

		0	1
→ A	B	E	
B	C	F	
*C	D	H	
D	E	H	
E	F	I	
*F	G	B	
G	H	B	
H	I	C	
*I	A	E	

3. (4 points) (a) (0.5 points) Write a grammar of type 2 which constructs a palindrome from your first name. Example: From *Madalina* one gets *MadalinaaniladaM*.
 - (b) (0.25 points) Formally define a PDA. Explain each notation from the definition.
 - (c) (0.5 points) What are the similarities and dissimilarities of a PDA and a FA? Use the definitions of the two automata in this comparison.
 - (d) (1.25 point) Construct a PDA which accepts the palindrome generated by your first name and rejects any other string.
 - (e) (1.5 point) How does the PDA work on the accepted string? Give 10 instantaneous descriptions and explain the type of acceptance.

4. (2 points) Let $\Sigma = \{a, b, \dots, z\}$ and L the language of your first and last name.
- (a) (0.2 points) Write regular expressions for the first, respectively, the last name.
 - (b) (0.8 points) From these regular expressions, construct the corresponding ε -NFA using the Thomson encoding. Apply also the Thomson encoding for constructing the ε -NFA for L .
 - (c) (1 point) Using the eager construction algorithm, transform the ε -NF into a DFA.