

Test I, Example

For each task, a student takes a position on each statement circling the selected answer. Each correct answer has a value of one point. The lack of an answer gives zero points. An incorrect answer costs one point.

If the sum of points for a single task is negative, then the total assessment of the task is zero.

1. Find equivalence classes for the relation induced by a language L of words consisting of concatenated following non-empty strings of letters a, b , and c . When the number of a is even, the number of c is odd. When the number of a is odd, the number of c is even. The number of b is not relevant.

$$aabc, abbcc \in L, aac, abc \notin L.$$

Evaluate the following statements:

Statement	Answer	
The empty word ϵ creates a separate equivalence class $\{\epsilon\}$.	T	F
The language L is regular.	T	F
At least two classes have the finite number of elements.	T	F
The number of the equivalence classes is higher than 8.	T	F

2. For language L over alphabet $\Sigma = \{a, b, c\}$ with the number of a twice as high as the number of b , and the number of b twice as high as the number of c evaluate the following statements:

Statement	Answer	
L is regular.	T	F
It is possible to create a context-free grammar for L .	T	F
L is neither regular nor context-free.	T	F
In contraposition of the pumping lemma for a context-free grammar, it is enough to discuss $vwxyz$ that contains only a symbols.	T	F

3. For the grammar $G = \{V = \{S, A, B, C\}, T = \{a, b, c, \}, P, S\}$

$$\begin{aligned}
 P: & S \rightarrow ABC \\
 & A \rightarrow BCa|a \\
 & B \rightarrow BC|b \\
 & C \rightarrow c|\epsilon
 \end{aligned}$$

evaluate the following statements:

Statement	Answer	
A translation of G into CNF needs not more than two new nonterminals.	T	F
Productions from B can be replaced by $B \rightarrow bD b$ and $D \rightarrow C CD$	T	F
The grammar contains some useless symbols.	T	F
The grammar contains unit production or such productions can be created during elimination of ϵ -productions.	T	F

4. Using the CYK algorithm to check if word $w = seeds$ belongs $L(G)$

$$G = (V = \{S, E, D\}, T = \{s, e, d\}, P, S)$$

$$\begin{aligned}
 P: & S \rightarrow sEs|SD \\
 & E \rightarrow e|eE \\
 & D \rightarrow Ed|sDs
 \end{aligned}$$

evaluate the following statements:

Statement	Answer	
Word w belongs to the language.	T	F
Exist at least two derivation trees for w .	T	F
Word w can be derived from other symbol than S .	T	F
The algorithm CYK can be applied for the grammar in the current form.	T	F