

Grading key

Grade	Points
1.0	≥ 59
1.3	≥ 56
1.7	≥ 53
2.0	≥ 50
2.3	≥ 47
2.7	≥ 44
3.0	≥ 41
3.3	≥ 38
3.7	≥ 35
4.0	≥ 32

Problem 1

0P if the answer is wrong or no justification is given

Problem 1a

- **1P** if the principle behind the counterexample is correct, but no DFA for $L_1 \cup L_2$ with 12 states exists
- **1.5P** if the principle behind the counterexample is correct, a DFA for $L_1 \cup L_2$ with 12 states exists, but the DFA for L_1 or L_2 does not have the required number of states (e.g. the trap state is forgotten about)

Problem 1b

- **+1P** for the statement that \bar{L} is finite, or another reason why \bar{L} is regular
- **+1P** for the rest of the proof

Problem 1d

- **1P** if the automata are put side by side, but the acceptance condition is incorrect or unclear

Problem 1e

- **2P** if the automaton is a correct counterexample, but the order in which *NestedDFS* processes the states is not mentioned

Problem 1e

- **-1P** if the counterexample ends with $\{r\}^\omega$ where $\{q, r\}^\omega$ would have been correct
- **-0.5P** if σ is given as an ω -regular expression or as a word in AP^ω

Problem 2

Problem 2a

- **+1P** for using pairing/product construction
- **+1P** for marking all states which can reach a final state as final
- **+2P** for the rest of the construction

Problem 2b

- **+1P** for using pairing/product construction
- **+3P** for the rest of the construction

Problem 3

- **+0.5P** for the preprocessing
- **+1P** for each state removal step (up to **+4P**)
- **+0.5P** for each transition merger step (up to **+1.5P**)
- **-0.5P** for a step which simplifies the automaton, but neither removes a state nor merges transitions. The algorithm does not perform such steps!
- **-1P** if the states are removed in the wrong order

Problem 4

Problem 4a

- **0P** if two separate DFAs for L_1 and L_2 are given. It is essential which states are shared by the two DFAs; drawing them separately does not give any information about that.

Problem 4b

- **-0.5P** if the solution does not indicate which state q_3 is
- **-1P** if a new state is incorrectly created

Problem 6

Problem 6a

- +2P for the correct answer
- +2P for the proof (only if the answer is correct)

Problem 6b

- +1P for the idea to alternate between steps in N_1 and N_2
- +1P for using pairing/product construction
- +2.5P for the transitions
- +0.5P for the initial states
- +2P for the acceptance condition

Problem 7

Problem 7a

- -0.5P if the trap state is missing a self-loop
- -1P for other missing transitions

Problem 7b

- 0P if the expression contains some word with aaa
- 0P if the expression only contains finitely many words without aaa , or only words with less than three a 's
- $\leq 1P$ if the expression misses infinitely many words without aaa . Exception: 1.5P if the expression can be fixed by replacing one symbol, e.g. $(b + ab + aab)^* + (\varepsilon + a + aa)$

Problem 7c

- +1P for 1. and 2., +2P for 3.
- 1P for 3. if it is ensured that every a is followed by a b , but not that every b is preceded by an a

Problem 7d

- **+1P** for the $(\{q\} + \{p, q\})^\omega$ part
- **+2P** for the $(\{p\} + \{p, q\})^* \{p, q\}^\omega$ part

Problem 7e

- **0P** if no formula is given

Problem 7f

- **0P** if the automaton accepts words it should not accept
- **3P** if the semi-automaton is correct, but the acceptance condition enforces “and” instead of “or”. Otherwise:
- $\leq 1P$ if the automaton neither accepts all words with infinitely many ab nor all words with finitely many c
- $\leq 2.5P$ if the automaton accepts all words with infinitely many ab , but not all words with finitely many c , or the other way round