

ANKARA UNIVERSITY COMPUTER ENGINEERING
2019-2020 COM364 AUTOMATA THEORY
HOMEWORK AS MIDTERM EXAM

14.04.2020

You should submit a scanned pdf of your handwritten answers to the following problems **on 14 April, until 19.00.**

Important Note 1: Please write your answers clearly and explain your reasoning. Points will be deducted if your final result is correct but how you obtained it is not clear.

Important Note 2: Your solutions **MUST** be your own work. Plagiarism will **NOT** be tolerated.

Important Note 3: Please make sure that the pdf of your solutions is readable.

1. [20 points] Give a DFA for the following language on alphabet $\{a,b,c\}$:
Strings ending with bca.
2. [20 points] **Background:** If we have two DFAs, $M_1 = (Q_1, \Sigma, \delta_1, q_1, F_1)$, which recognizes language A_1 , and $M_2 = (Q_2, \Sigma, \delta_2, q_2, F_2)$, which recognizes language A_2 , we can construct a machine $M = (Q, \Sigma, \delta, q_0, F)$ that recognizes language $A_1 \cap A_2$ as follows:
 - $Q = Q_1 \times Q_2$
 - For each $(r_1, r_2) \in Q$ and each $a \in \Sigma$, $\delta((r_1, r_2), a) = (\delta_1(r_1, a), \delta_2(r_2, a))$
 - $q_0 = (q_1, q_2)$
 - $F = F_1 \times F_2$

Question: The following language is an intersection of two simpler languages. First construct DFAs for the simpler languages, then combine them using the construction described above in the background. $\Sigma = \{a, b\}$,
 $\{w \mid w \text{ has at least three } a\text{'s and at least two } b\text{'s}\}$
3. [40 points] Language L is as follows:
 $L = \{w \mid w \text{ either contains odd number of 1's or does not contain } 01\}$
 - a. [20 points] Give a NFA (with ϵ -transitions if you want) that recognizes L .
 - b. [20 points] Give the regular expression that generates L .
4. [20 points] L is a language defined as $L = \{0^n 1^m \mid m > n\}$. Show that L is not regular using the pumping lemma.