KBTU, School of IT & Engineering, Fall 2022, Computation Theory

Midterm Exam (November 03, 2022) 15 points

Midterm 1 Samples of Tasks

Surname and Name: _____

Task 1. (SAMPLE) (1 pt). Let A={0, 1}. Find a regular expression r such that L(r) consists of all words w containing ……..

Task 2. (SAMPLE) (1 pt=0.5+0.5). Let A={a, b, c}, r=……, and let w=…….

1. Find L(r) 2. Whether w belongs to L(r)

Task 3. (SAMPLE) (8pt=0.5*2+3+4) NDFSA's **M_A** and **M_B** are defined by Tables 1 and 2 below:

Table 1 (M_A)				**Table 2 (M_B)**			
State	f			State	f		
	Input				Input		
	0	**1**			**0**	**1**	
Start State – Final States:				Start State – Final States:			

Subtask (a) (1 pt=0.5*2). Provide state diagrams for **M_A** and **M_B**

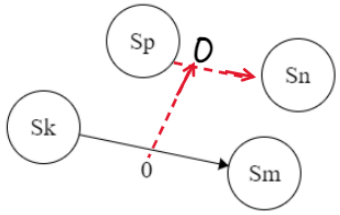
Subtask (b) (3 pt). Use Kleene's method to construct state diagrams for NDFSA **M_{AB}**.

Provide a description **of start the state, final states, and new transitions in M_{AB}. No description – no points.**

Subtask (c) (4 pt). Use Kleene's method to construct state diagrams for NDFSA **M_{A^*}.**

Provide a description **of start the state, final states, and new transitions in M_{A^*}. No description – no points.**

Note: In Exam papers **ALL new transitions** generated for **M_{AB}**, and **M_{A^*}** must be shown in state diagrams ***by dashed lines.*** Besides, if an old transition α: $S_k \to S_m$, say on 0, generates a new transition β: $S_p \to S_n$ on the same symbol 0 then connect the transition α and the transition β by a colored and dashed arrow from $S_k \to S_m$ to $S_p \to S_n$ as shown in the picture below



Task 4. (SAMPLE) (3 pt=2+0.4+0.6). Based on NDFSA given in Table 3 and the algorithm in the proof of the Theorem 2 (page 19 of Lecture Notes) solve the following subtasks:

Table 3 (NDFSA)		
State	F	
	Input	
	0	1
Start state: Final States:		

Subtask i. Create an equivalent DFSA in "table form" (**2 pt**)

Subtask ii. Draw NDFSA in Table 1 in state diagram form (**0.4 pt**)

Subtask iii. Draw the equivalent DFSA you created in subtask (i) in state diagram form (**0.6 pt)**

Task 5. (SAMPLE) (2 pt) Let I={0, 1}. Construct a deterministic finite-state automaton that recognizes the set of all bit strings such that …….

NOTE.

In Exam, a student can use the following materials:

- Lecture Notes (printed version)
- File "Solutions of some tasks from HW1" (as a sample) (printed version)
- File "Fall 2022 Computation Theory – SAMPLES for the tasks 3 and 4 of Midterm 1" (printed version).

03.11.2022
Good Luck.
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