UNIVERSITY OF COLOMBO, SRI LANKA

UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

BACHELOR OF SCIENCE IN COMPUTER SCIENCE

Academic Year 2016/2017 – Second Year Examination – Semester II – 2019

SCS2212 – Automata Theory – Part A

TWO (2) HOURS for both parts A and B

To be completed by the candidate

Examination Index No: .....

Important Instructions to candidates:

1. The medium of instruction and question is **English**.
2. **Write your answers** in **English.**
3. If a page or a part of this question paper is not printed, please inform the supervisor immediately.
4. Note that questions appear on both sides of the paper. If a page is not printed, please inform the supervisor immediately.
5. Write your index number on each and every page of the Question paper.
6. Answer **ALL** questions.
7. This paper has **03** questions and **7** pages for **Part A**.
8. **Part A** of the paper will carry **60** marks and **Part B** of the paper will carry **40** marks.
9. Any electronic device capable of storing and retrieving text including electronic dictionaries and mobile phones are **not allowed**.
10. Calculators are **not allowed**.

For Examiner's use only	
Question No	**Marks**
1	
2	
3	
Total	

Question 1

a. State the formal definition of a deterministic finite automaton (DFA) M, and then formally define the language L, accepted by M.

[2 marks]

b. With reference to a DFA, what is meant by a trap state? Explain with the aid of a diagram.

[2 marks]

c. Construct a deterministic-finite-automaton (DFA) over Σ = {a,b} for the following criteria [2 x 8 marks]

i. Every string accepted by the automaton **must contain the substring** abb.

ii. Every string accepted by the automaton **must start and end with the same symbol.** (eg: awa, bwb, a, b,...etc., where w can be any string formed using Σ = {a,b}).

Question 2

a. List 3 main differences between deterministic-finite-automata (DFA) and non-deterministic-finite-automata (NFA).

[4 marks]

b. Draw a transition table and transition graph for the following finite automaton (M). [4 marks]

$M = (\{q_0, q_1, q_2, q_3\}, \{a, b\}, \delta, q_0, \{q_3\})$ where δ is defined as below.

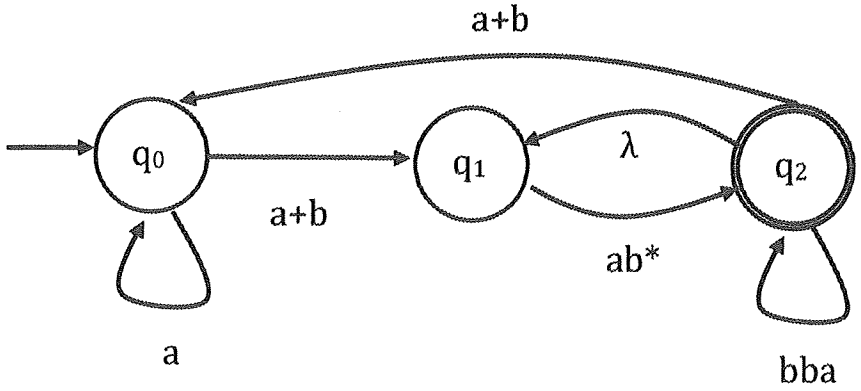
$\delta(q_0, a) = \{q_0, q_1\}$, $\delta(q_0, b) = \{q_0\}$, $\delta(q_1, b) = \{q_2\}$, $\delta(q_2, b) = \{q_3\}$.

c. What is the language accepted by the automation mentioned in part (b)? [4 marks]

d. Convert the above automaton to a **DFA**. [8 marks]

Question 3

a. Consider the following generalized transition graph.



i. Find an equivalent generalized transition graph **with only two states**. [4 marks]

ii. What is the language accepted by the above generalized transition graph? [2 marks]

b. Construct a **left linear** and **right linear** grammar for language $L=\{a^n b^m : a \geq 3 , b \geq 2\}$

[6 marks]

c. Find a **DFA** that accepts the language L, described as $L(aa^* + aba^*b^*)$.

Hint: First convert the regular expression to corresponding NFA and then convert it into a DFA.

[8 marks]