UNIVERSITY OF COLOMBO, SRI LANKA

UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

UCSC

BACHELOR OF SCIENCE IN COMPUTER SCIENCE

Academic Year 2020/2021 – Second Year Examination – Semester 2 – 2021

SCS2212 – Automata Theory – Part B

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. There are 2 Questions on 6 pages. 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 consists of two parts, Part A (Question No 1 and Question No 2) and Part B (Question No 3 and Question No 4) to be **submitted separately**.
8. **Part A** of the paper will carry **50** marks and **Part B** of the paper will carry **50** 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**
3	
4	
Total	

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Question 3

a. What is a context-free grammar?

[5 marks]

b. Give an example of a context free grammar and a grammar which is not context free. Justify your answer.

[5 marks]

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c. How can it be proven that a given a context-free grammar is not *ambiguous*?

[5 marks]

d. Is the context-free grammar = ({a} , {A} , A, {A → A + A | A − A | a}) is ambiguous? In this grammar capital letters represent non-terminals and simple letters the terminals. Justify your answer. State your assumptions, if any.

[10 marks]

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Question 4

a) What are the main components of a push-down automata?

[5 marks]

b) Explain how a push-down automaton works on a given string?

[5 marks]

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Parts c) and d) of this question are based on a push-down automata with the following transition function.

$\delta(q_0, \in, z) = \{(q_1, Sz)\}$, $\delta(q_1, a, S) = \{(q_1, SA), (q_1, \in)\}$,
$\delta(q_1, b, A) = \{(q_1, B)\}$, $\delta(q_1, b, B) = \{(q_1, \in)\}$,
$\delta(q_1, \$, z) = \{(q_f, \in)\}$

The set {S, A, B} is the set of non-terminals, {a, b} is the set of terminals, $\{q_0, q_1, q_f\}$ is the set of states, $\{q_f\}$ is the set of final states q_0 is the initial state, S is the start non-terminal symbol and the stack is initialized by pushing the symbol z onto the top of the stack .

c) Construct a transition graph to represent the transition function. What is the stack alphabet?

[5 marks]

d) Show how the above push-down automata processes the string ***aabb$***. Where the symbol $ represents the end of string. State your assumptions, if any.

[10 marks]

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