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UNIVERSITY OF COLOMBO, SRI LANKA

UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

UCSC

BACHELOR OF SCIENCE IN COMPUTER SCIENCE

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

SCS2212 – Automata Theory – (Part B)

TWO (2) HOURS (For both parts A & B)

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 **01** question and **06** pages.
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**
4	
Total	

Question 4

(a) Briefly explain the difference between **regular grammar** and **context-free grammar** with the aid of some examples.
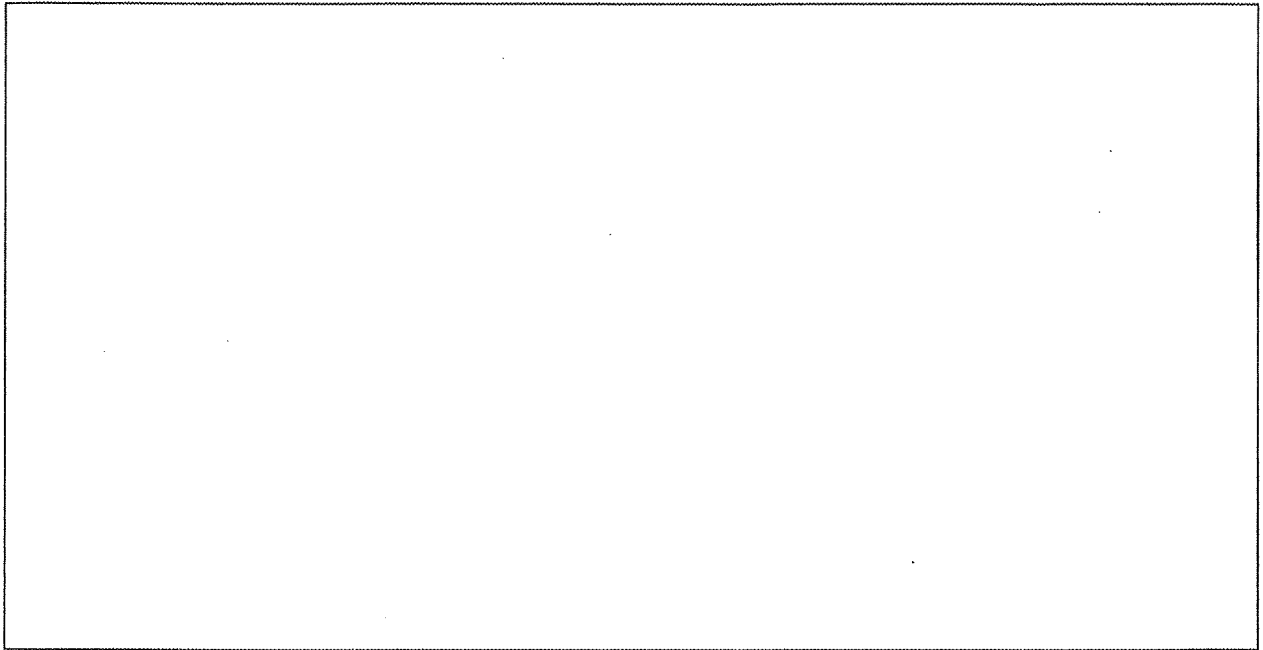
(4 Marks)

(b) Consider the following grammar where {S, A, B} is the set of non-terminals, {a,b} is the set of terminals, and S is the start symbol:

S → AB
A → aaaA
A → λ
B → Bbb
B → λ

(i) Is this a context-free grammar or regular grammar? Justify your answer. **(3 Marks)**

(ii) Write down the language that generates from the above grammar? Show some derivations to prove your claim. **(5 Marks)**
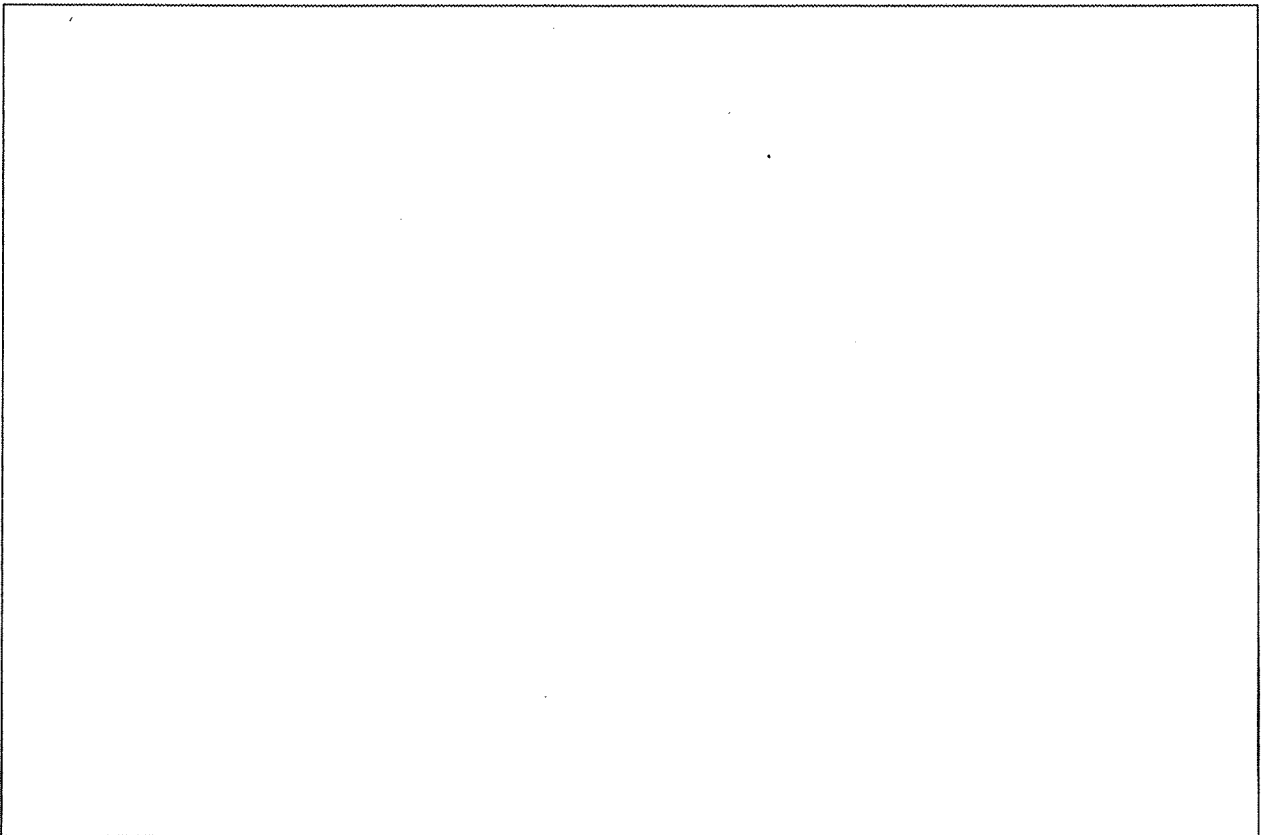
2

(c) Show that the following grammar is ambiguous, and show how the ambiguity of this grammar can be removed. **(6 Marks)**
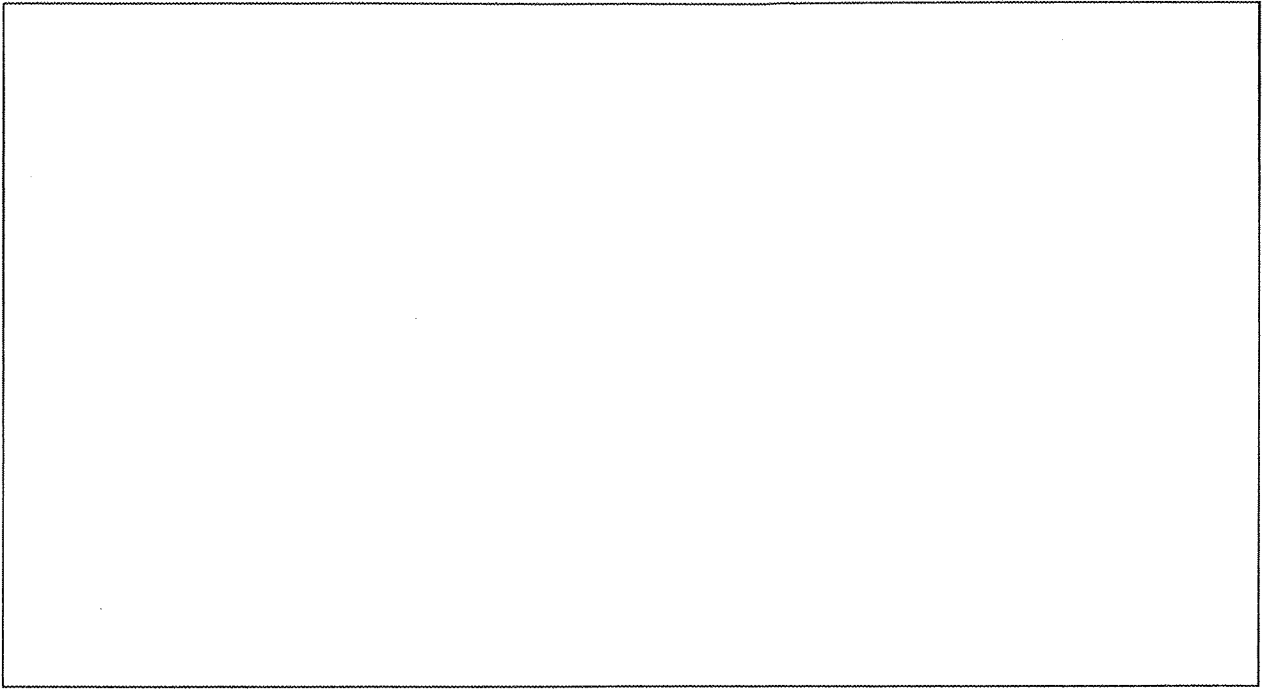
```
S → AB | aaaB
A → a | Aa
B → b
```

(d) Remove all λ – productions, unit productions and useless productions from the following grammar.
(7 Marks)

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S  →  aA  |  aBB
A  →  aaA  |  λ
B  →  bB  |  bbC
C  →  B
```
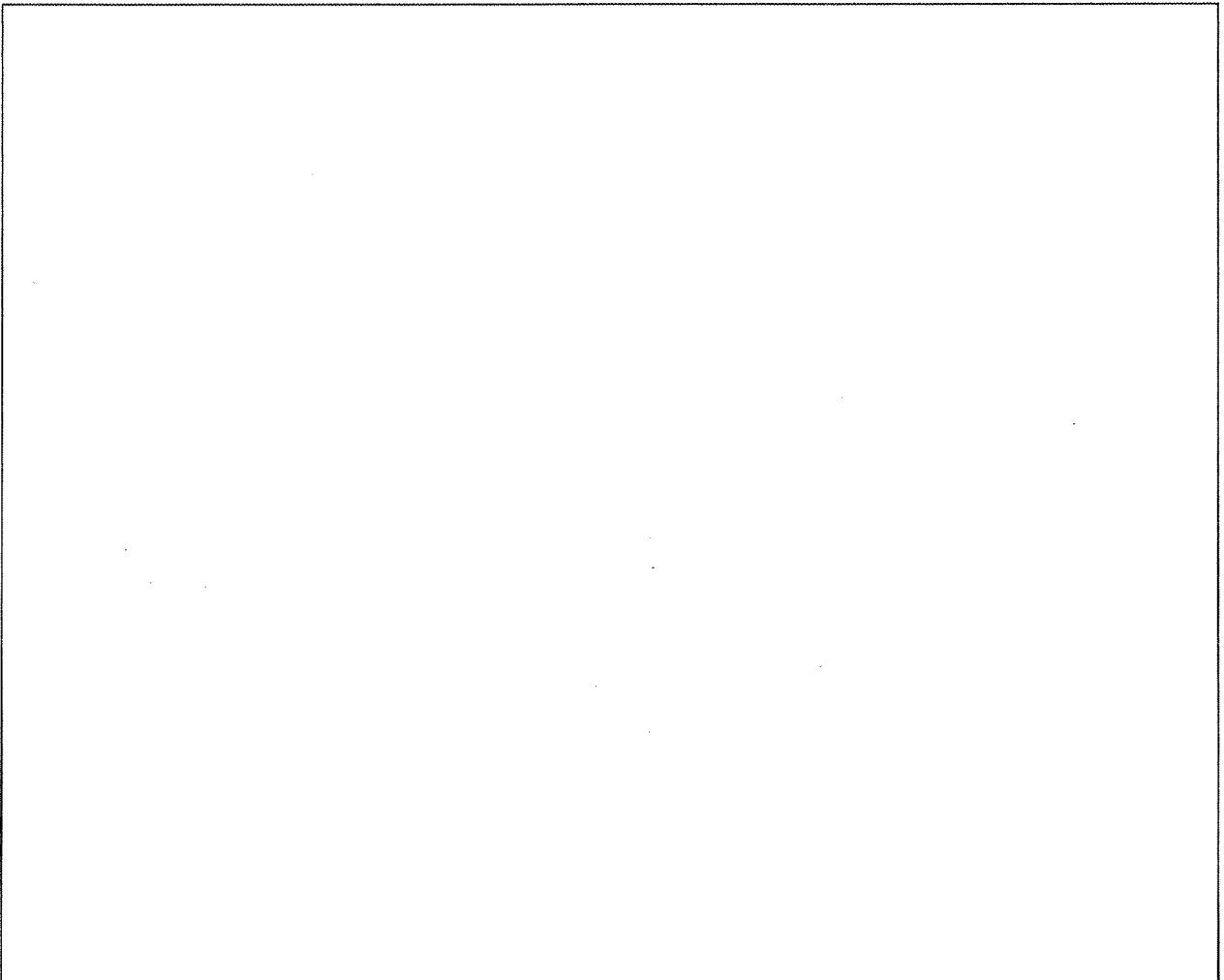
(e) Convert the following grammar into *Greibach* normal form (5 Marks)

$$S \rightarrow ab \mid aSb \mid aaSb$$

(f) Construct non-deterministic push-down automata that accept the following language on $\Sigma = \{a, b, c\}$. (**Note**: use either a transition function or a state transition diagram)

$$L = \{a^n b^m c^{n+m} : n \geq 0, m \geq 0\}.$$

(10 Marks)