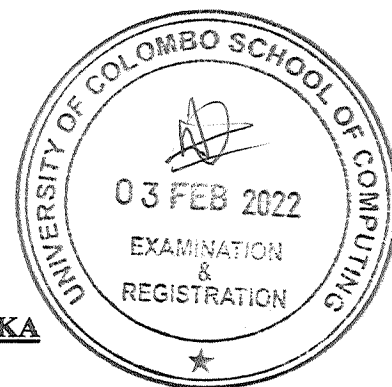




**UNIVERSITY OF COLOMBO, SRI LANKA**



**UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING**

**BACHELOR OF SCIENCE IN COMPUTER SCIENCE**

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



**SCS2212 – Automata Theory – Part A**

**TWO (2) HOURS for both parts A and B**

**131**

***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 consists of two parts, Part A (Question No 1 and Question No 2) and Part B (Question No 3 and Question No 4) and **submit 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
1	
2	
<b>Total</b>	

Index No: .....

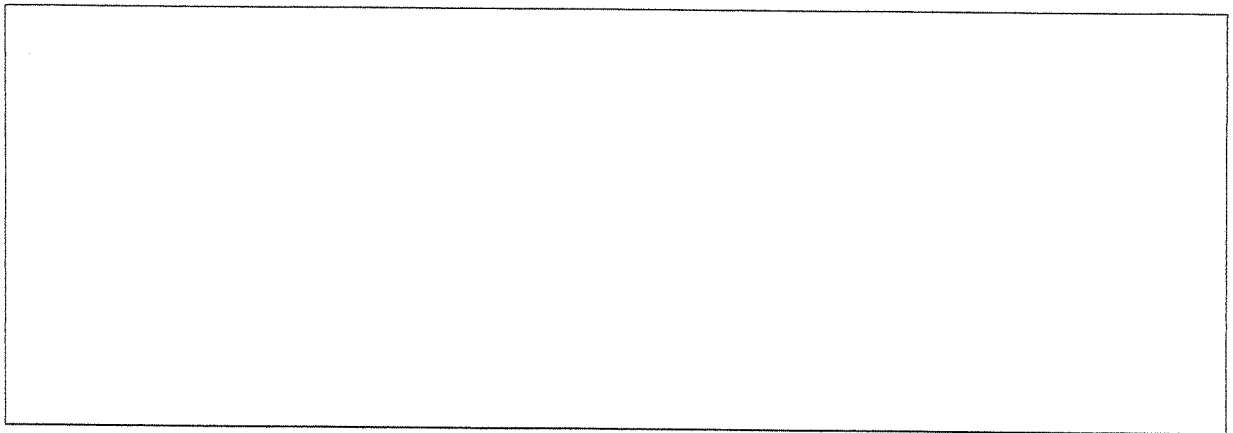
**Question 1**

- a. Consider the following grammar.

$G = (\{S, B\}, \{a, b\}, S, \{S \rightarrow aS, S \rightarrow B, B \rightarrow bB, B \rightarrow \lambda\})$

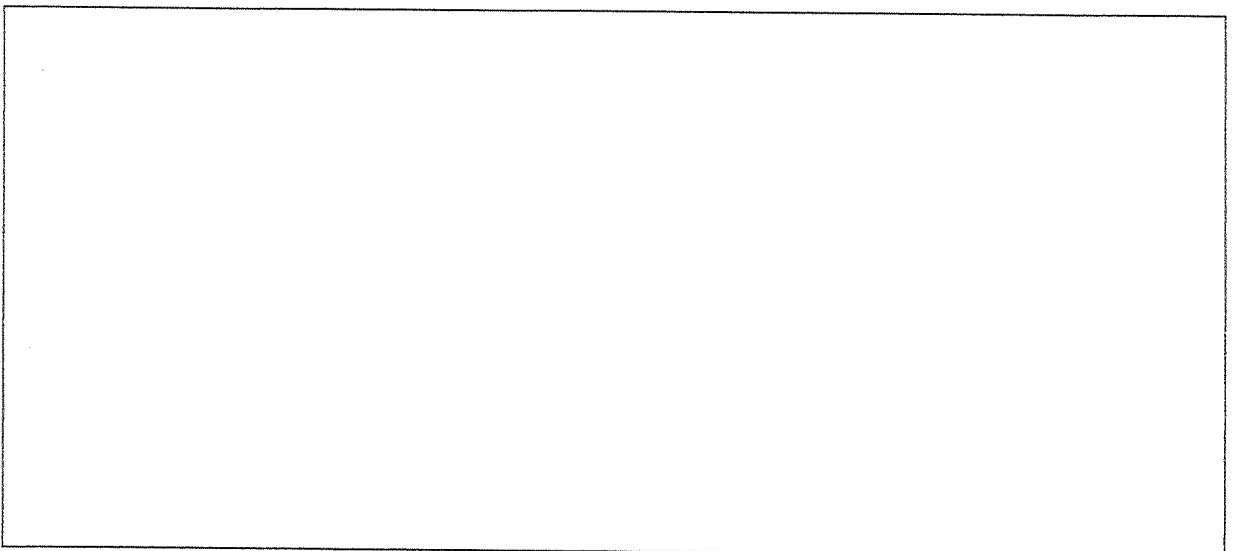
Is this grammar linear? Show the sentential form and derived sentence of the above grammar considering derivation steps.

[5 marks]



- b. What is meant by a *dead state*? Explain with the aid of a diagram.

[4 marks]



Index No: .....

c. Construct a finite automaton over  $\Sigma = \{a,b\}$  for the following criteria.

[ 2 x 8 marks]

- i. Construct a deterministic finite automation (DFA) where every string accepted by the automaton **must contain the substring aba**.

- ii. Construct a non-deterministic finite automation (NFA) with **three (3) states** that accepts a language  $\{a, ab, abc\}^*$ .

Index No: .....

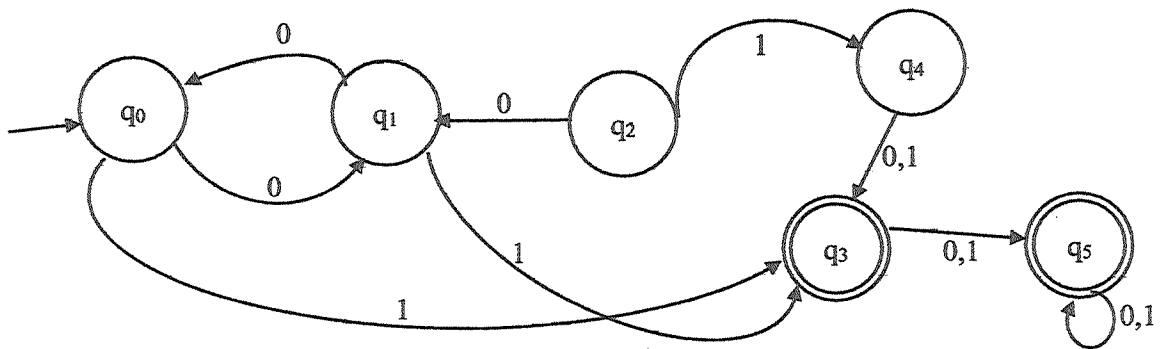
**Question 2**

- a. List the main difference between Mealy and Moore machines.

[2 marks]

- b. Consider the following transition graph of the automaton  $M$ ,  $\Sigma = \{0,1\}$ . Minimize the states in  $M$ .

[10 marks]



Index No: .....

c. What is the language accepted by the automaton of part b?

[2 marks]

d. Consider the grammar  $G = (\{S, A, B\}, \{a, b\}, \{S\}, P)$  and production rules defined below:

$S \rightarrow abA$

$A \rightarrow baB$

$B \rightarrow aA|bb$

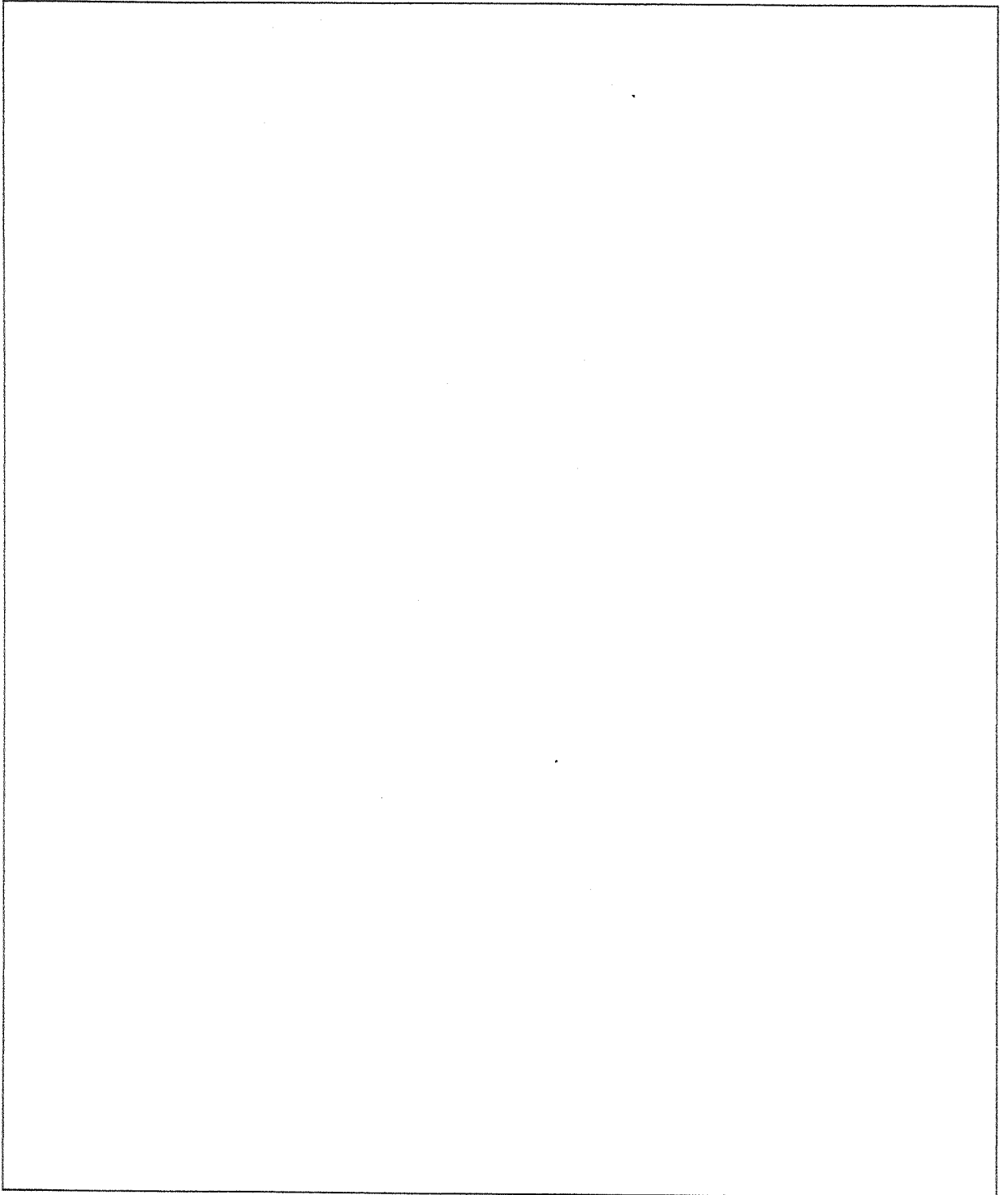
Is this a regular grammar? Justify your answer.

[1 mark]

e. Construct a deterministic finite automation (DFA) for the grammar  $G$  in (d) where  $G = (\{S, A, B\}, \{a, b\}, \{S\}, P)$ . The production rules are as defined in part (d).

[10 marks]

Index No: .....



\*\*\*\*\*